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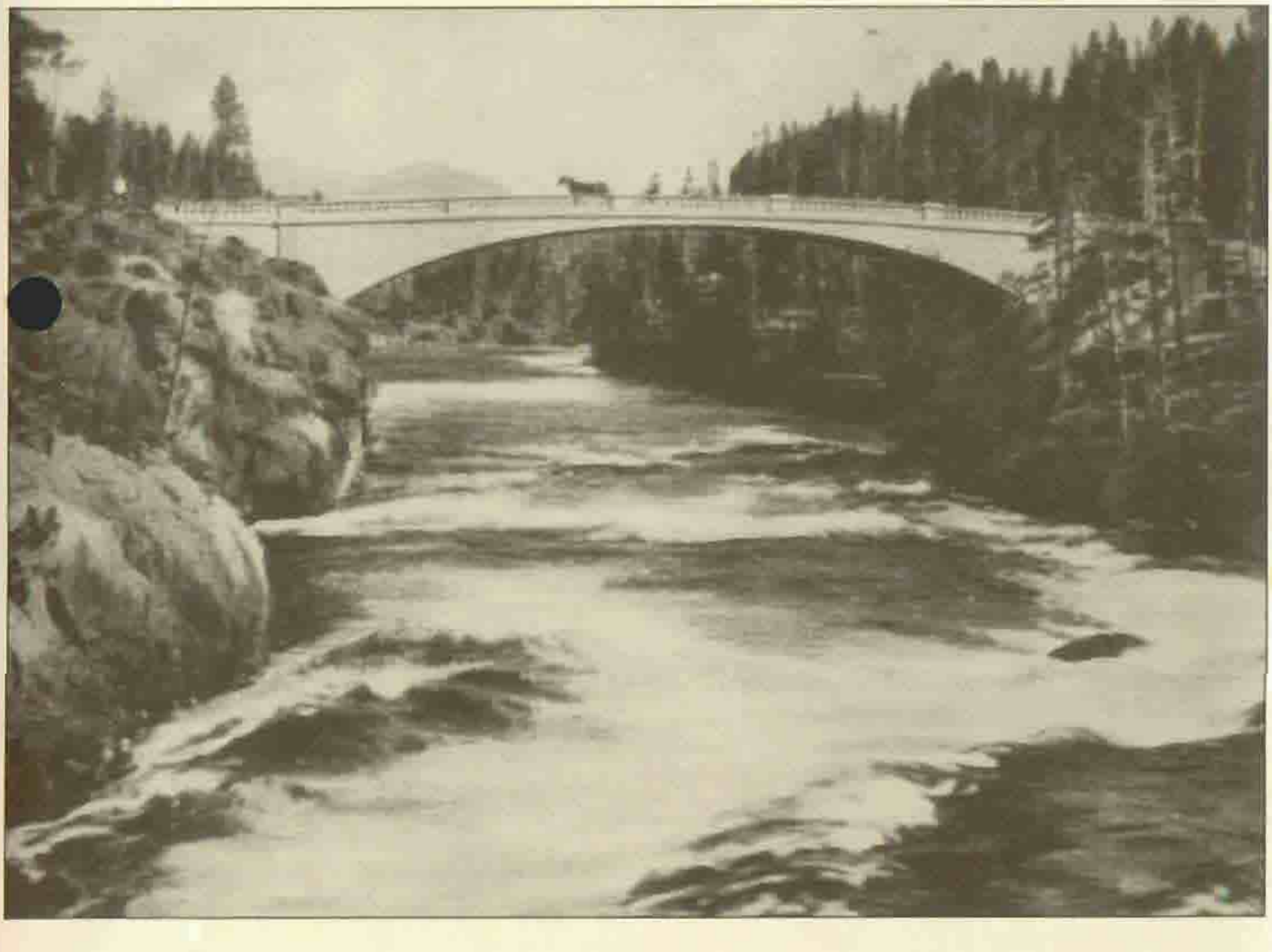
The History of the Construction of the Road System in Yellowstone National Park, 1872-1966
Historic Resource Study Volume I

By
Mary Shivers Culpin



SELECTIONS from the DIVISION OF CULTURAL RESOURCES
Rocky Mountain Region
National Park Service

No.5
1994

PREFACE

This study began as a response to the Federal Highway Administration's multi-decade road construction project in Yellowstone National Park. In order to meet the compliance needs of the National Historic Preservation Act of 1966, as Amended in 1980 for this project, I was asked to survey and evaluate the historic resources related to the road system. I felt very strongly that this document should serve more than just compliance needs, thus the idea for Part I. of a Historic Resource Study for the Park.

Prior to the research, I talked to many people who have an interest in the management of the Park's resources. I found that information gathered for this study could be useful to the maintenance, safety, interpretation, and natural resources divisions, and also for general interest. The Wyoming State Historic Preservation Office has also shown keen interest in how the development of the roads in the Park relate to the development of Wyoming state roads.

Some academic historians may find that this type of history has needless information, however as a management tool for the Park, this method was intended. Sometimes it is important to know the type of material or paint used on a bridge, etc.!

The project took on many dimensions before completion, including the participation of the Historic American Engineering Record Division of the National Park Service in Washington D.C. Combined with their recordation work, an approved Memorandum of Agreement, and the National Register portion of this study, the compliance and mitigation needs of historic resources for the multi-decade road project should go smoothly.

As with many research projects, gaps in the more modern record left some sections not completely covered. However, there was sufficient information to complete the evaluation portion.

There are many people who assisted in the completion of this work and it is difficult to name each one. However, I would like to express my appreciation to those whose assistance was invaluable, Superintendent Robert Barbee, Chief of Maintenance Tim Hudson, Park Engineer Nancy Ward, Park Historian Tom Tankersley, and former Park Historian Tim Manns, former Cultural Resource Specialist Sonya Capek and Cultural Resource Specialist Catherine Smith, Park Photographer Jim Peaco, and Librarian Beverly Whitman, all of Yellowstone National Park; Rodd Wheaton, Chief of the Division of Cultural Resources, Acting Editorial Assistant, Christine Maylath, Jannette Wesley, Librarian, and the Maintenance Division of the National Park Service, Rocky Mountain Regional Office; Douglas Caldwell, Public Affairs Office, Rocky Mountain National Park. A special thanks to Eric DeLony of the Historic American Engineering Record Division, National Park Service, Washington D.C., and to the staff of the Wyoming State Historic Preservation Office.

I would like to mention that the choice for the photograph on the cover of this study is a small tribute to the U. S. Army Corps of Engineers and to Hiram Chittenden in particular. His Melan type bridge no longer exists in Yellowstone National Park, but the design philosophy used in its creation is the basis for the National Park Service design philosophy. Without the very early guidance of Engineering Officers Hiram Chittenden and Dan Kingman, a visit to Yellowstone National Park might have offered a lesser experience.

FOREWORD

As part of the National Park Service mission to protect and interpret its resources, it is important to make valuable, historical information readily available. Therefore, I am pleased to present this volume in our occasional series of publications on the Rocky Mountain Region's past.

This study, prepared by Mary Shivers Culpin, when she was Regional Historian of the National Park Service, Rocky Mountain Regional Office, provides detailed historical information covering nearly 100 years of road construction in Yellowstone National Park. In addition to the history of road construction in the Park, the study also provides Cultural Resource Management information in regards to the significance of the roads and bridges. This valuable information will assist park managers in planning the changes to the road system as part of the Federal Highway Administration's multi-decade road construction project.

Bob Baker
Robert M. Baker
Regional Director
Rocky Mountain Region

Mission: As the Nation's principal conservation agency, The Department of Interior has responsibility for most of our nationally-owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration. NPS-D-524.

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THE HISTORY OF THE GRAND LOOP AND THE ENTRANCE ROADS

CHAPTER I

THE EARLY YEARS 1872-1883

. . . the public highway was cut
through the timber over rolling ground
with stumps left from 2 to 20 inches above
the ground, and instead of grading a hill
it went straight up on one side and straight
down on the other. Fifteen Thousand Miles by Stage,1880
- Carrie Strahorn

Yellowstone National Park remained a mysterious land until late in the 19th century. For years, tales of this wondrous area were recounted, but most of the descriptions were questioned or denied. In 1860, weather, scheduling, and rugged topography prevented Capt. William F. Raynolds, the head of a government survey expedition to explore the Yellowstone and Missouri Rivers, from penetrating the park. However, he did produce a map based upon the celebrated Jim Bridger's description of *Terra Incognita,* and in his report Raynolds wrote, ". . . I cannot doubt, therefore, that at no very distant day the mysteries of this region will be fully revealed, and though small in extent, I regard the valley of the upper Yellowstone as the most interesting unexplored district in our widely expanded country."[1]

Raynolds' perceptions were true. The next decade saw official and semiofficial expeditions successfully explore the Yellowstone, each making contributions of different sorts. As late as 1869, three years before the park's establishment, Charles Cook of the Folsom, Cook, and Peterson Expedition submitted a description of the area to *Lippincott's Magazine* which elicited the response "Thank you but we do not print fiction."[2] Nevertheless, prompted by the descriptions, the urging of members of these expeditions and of other interested citizens and politicians, Congress set aside the area as the Nation's first national park on March 1, 1872.[3]

THE LANGFORD YEARS 1872-1877

In Superintendent Nathanial P. Langford's first report to the secretary of interior for the year 1872, he wrote, "The park is at present accessible only by means of saddle and pack trains, a mode of travel attended with many privations and inconveniences."[4] He advised the secretary of the interior that he would report on the park after he had completed a "thorough exploration" of it, and shortly afterwards, he joined the United States Geological Survey expedition led by Ferdinand Hayden and spent the next two months exploring the Yellowstone and Teton area. As a member of such a well organized and scientifically focused group, Langford probably added much to his prior knowledge of the topography and of the locations of the significant points within the park.[5]

Among Langford's concerns about administering the park, was the need for a park road system and good wagon "approach" roads, which resulted in a road system that was an almost mirror image of the present-day configuration. His idea for a "circuit of perhaps ninety miles" would enable visitors to reach all of the significant scenic or scientific wonders and would become the genesis of the Grand Loop.[6] Carriage-bound tourists would be able to explore the interior of the park from these important points.

In 1872, there were two routes into the Yellowstone: travel by Union Pacific Railway to Corrine, Utah, then via stage on the Montana Stage Line or the Wells Fargo and Company lines to Virginia City, Montana; or by river transportation to Fort Benton, Montana, then stage conveyance to Bozeman or Virginia City, Montana. Between 1872 and 1873, the final leg of the journey into the park was over very rough "roads," either from the north entrance, through the Yankee Jim Canyon to Mammoth Hot Springs, or through the west entrance, via the Madison Canyon to the Lower Geyser Basin.

Gilman Sawtell built the west entrance road which originated in Virginia City, Montana, and reached the Lower Geyser Basin by way of the Madison Canyon in 1873. Sawtell named the toll-free west entrance road The Virginia City and National Park Free Road, in order to differentiate it from the North Entrance toll road. Sawtell, who catered to the park visitors at his hotel on Henry's Lake, observed the behavior of his clientele toward the park resources, and in 1874, offered his services as Superintendent for the park. Sawtell felt that a person who lived nearer the park could protect it better.[7]

The privately built toll road to Mammoth Hot Springs from Bozeman, completed in 1873, covered 75 miles. The first Yellowstone National Park guidebook, Henry J. Norton's *Wonderland Illustrated: or, Horseback Rides Through the Yellowstone National Park,* describes it as an "excellent wagon road."[8] However, some travelers revealed more critical views about the condition of the road in published accounts of their journeys. In her reminiscences, Mrs. George Cowan wrote: "The road through the Yellowstone canyon below Cinnabar was scarcely more than a trail, but by careful driving, unhitching the horses and drawing the wagon by hand over the most dangerous places, we made it safely." [9]

Edwin Stanley, a Methodist minister who toured the Park in 1873, called the road, "a passable wagon road";[10] but another account called it:

> a dangerous road as an upset wagon inevitably lands in the river and is lost.
> The wagon road winds among these masses and over a projecting spur, high above the river thence descends over boulders to the level of the stream.
> It is a bad place for a long team and in one place the animals have to be detached or pulled at right angles up the bank in order to give a wagon room to make the turn. [11]

The situation created by the conditions of the roads and the imposition of tolls to the tourists worried Langford. He perceived that the Yellowstone National Park would become a destination for travelers from both across the United States and abroad, and with good wagon roads, the park could provide the government with considerable revenue. Langford requested from the secretary of the interior an explanation of his authority in regard to the building of public houses and the protection of the rights of the visitors, since he had received numerous applications for leases of property for lodging purposes at the important points in the park.[12] Regarding the protection of visitor rights, he feared that the toll-road company that had recently "graded a few steep hills in the line of travel" would charge the park visitor exorbitant rates.[13]

At the time of the park's creation, most road building responsibility across the country lay with the local towns and/or private road companies, and road conditions throughout the country were considered to be in a "wretched state of repair and neglect."[14] The territories of Montana, Wyoming, and Idaho were crisscrossed with Indian, fur trade, exploring expeditions, and emigrant trails, military roads, and stage and freight line roads. In 1869, the Union Pacific Railroad crossed the southern part of Wyoming Territory connecting both coasts, but it would be 1879 before the Utah Northern, a branch of the Union Pacific, extended to the Montana Territory boundary. The Northern Pacific Railroad, which reached the eastern boundary of the Montana Territory in 1881, joined the Utah Northern at a junction west of Butte in 1883.

During the park's infancy, the area was considered an important knot in geographic determinants of migration. Thus, all of the major trails and/or wagon roads were to the north and west in Montana Territory and to the east and south in Wyoming Territory.

The enabling legislation for Yellowstone National Park allowed the secretary of the interior to "make and publish such rules and regulations as he may deem necessary or proper for the care and management of the same," but it would take the passage, in 1894, of the Lacey Act, before specific rules were outlined. In the efforts towards the creation of the park, Professor F.V. Hayden, who had done the survey of the Yellowstone area for the U.S. Geographical and Geological Survey of the Territories, was "compelled to give a distinct pledge that he would not apply for an appropriation for several years at least," otherwise he felt the legislation would probably not pass. Thus, no appropriations for management of the park, the construction of roads and trails, or salaries had been requested in 1872.[15] Apparently without knowledge of this "distinct pledge," in February of 1873, Langford appealed for an appropriation of $15,000 to enable him to open the park and to construct roads within the park. In a letter to the secretary of the interior, Langford wrote that the opening of roads would lead to "men of entire reliability" leasing properties, which would in turn "lead them to preserve, in all their beauty, the surroundings of the springs."[16]

Not being successful with the Forty-second Congress, Third Session, Langford made additional requests of the Forty-third Congress during the fall of 1873. Governor Potts of Montana and Gov. Benjamin Campbell of Wyoming wrote to the secretary of the interior seeking money for the protection and improvement of the park, including a "liberal appropriation to employ a resident superintendent of the park, and make such roads as are necessary, and preserve from spoilation the numberless curiosities of that wonderful region."[17]

Again Langford had no success, nor would any result from repeated requests including one that was based upon Capt. William A. Jones' expedition of 1873. Captain Jones had surveyed northwestern Wyoming for a wagon-road route from Camp Brown, Wyoming, via Yellowstone Lake, to Fort Ellis, Montana. He recommended a wagon-road route through the park that followed the Upper Yellowstone River, via the east side of Yellowstone Lake, to Tower Junction and on to Gardiner, through Mammoth Hot Springs. While Jones did suggest that "There was good reason for believing that the Yellowstone National Park will, in time, become the most popular summer-resort in the country, perhaps the world, this, of itself, is a sufficient reason for opening the way to it at once." His proposal was mainly based on economics. His proposed route would save great distances in reaching the major cities of Montana and would open the Wind River Valley and the Teton Basin for settlement.[18]

Professor Hayden wrote to Secretary of the Interior Columbus Delano pointing out that "good roads approaching the park from various points can be readily made by private enterprise. A moderate rate of toll might be levied on visitors to keep these roads in repair." He felt it was the government's responsibility to construct the roads to the principal points in the park, but the income from the leases of public facilities could be used to maintain the roads. He advised the secretary that if the government initiated steps toward opening the park, private enterprise would be ready to establish stagelines and telegraph lines within the park.[19]

In 1874, Superintendent Langford asked for an appropriation of $100,000 for the protection and improvement of the park. He stated more than 500 people visited the park during 1873 arriving on "good roads to its borders," but that accessibility in the park was by packtrains. He explained again to the secretary that the construction of roads would in turn lead to better protection of the park by responsible persons and an income for maintenance by the leases. Langford pointed out that since the creation of the park, more than $150,000 in destruction to the park had taken place. Without an adequate appropriation, the other choice for the needed improvements and protection would be leasing the entire park for a term of years, to responsible persons who would provide the needed improvements and protection.[20]

Also in 1874, Secretary of War William Belknap sent a recommendation from the Commanding General of the Department of the Platte for construction of a military road between Green River, Wyoming, via Yellowstone National Park, to Fort Ellis, Montana.[21] None of the 1874 recommendations for appropriations were satisfied.

Two more military expeditions during 1875 demonstrated the Army's continuing attention to the park. Secretary of War Belknap made a tour through the park with Lt. Gustavus Doane and Brig. Gen. W.E. Strong, Ret. The other military expedition led by Capt. William Ludlow produced sound recommendations for the improvement and protection of the park. A guest of the expedition, William Bird Grinnell, later editor of the *Forest and Stream* magazine and a leading late 19th-century conservationist, drew the nation's attention to the "reckless destruction" of the elk in the park. Eventually, some of Captain Ludlow's recommendations came to fruition:

1. transfer of the park to the control of the War Department until such time that a resident civilian Superintendent can hire mounted police to provide protection

2. troops should be stationed at Mammoth, Lake, and Geyser Basin

3. an appropriation of $8,000 to $10,000 for a thorough and accurate topographical survey to locate the best routes for roads and trails

4. an observatory on Mount Washburn

5. rough bridges constructed where needed

6. worst portions of trails corduroyed

7. lodging facilities constructed at Mammoth, the bridge, the falls, the lake, and the geyser basins

8. visitors should be forbidden to kill any game

9. arms and spoils should be confiscated and persons liable to prosecution[22]

But, despite Captain Ludlow's sound recommendations for Yellowstone's management, no appropriation was approved after submittal of his report in 1876.

It was June 13, 1878, before the first appropriation of $10,000 for the improvement and protection of Yellowstone National Park passed the Congress.[23] A new Superintendent, Philetus W. Norris, appointed in 1877, would begin the first road projects in the park.

THE NORRIS YEARS 1877-1882

Philetus W. Norris wasted little time in getting to Yellowstone National Park after his appointment as superintendent on April 19, 1877. Norris, who had made two previous visits, would take a very aggressive approach on road construction, as well as other issues. Prior to his arrival, only packtrains could manage the park "roads;" but in 1877, the first wagons entered the park. One, an ox-drawn wagon bound from Gardiner to the Clark's Fork mines just east of the park, had to be disassembled before it could be taken over Baronett's Bridge. The bridge, built in 1871 by the Scot, C.J. "Yellowstone Jack" Baronett, was the first built across the Yellowstone River and predated the park by one year. During August of 1877, Maj. Gen. O.O. Howard pursued Chief Joseph and the Nez Perce with his troops, wagons, and horses along the Madison River to the Lower Geyser Basin, and on to Nez Perce Creek. At the creek, Howard's men had to cut a "road" over Mary Mountain on the Mary's Lake trail to the

Yellowstone River. From there, the group followed the Nez Perce by way of Dunraven Pass to Baronett's Bridge.[24] On August 30, 1877, a band of the Indians partially destroyed the bridge by burning the stringers on the east abutment.

Norris did not receive an appropriation the first year, but he did understand the necessity for pressing for sufficient funds to "survey and plainly and permanently mark its boundaries, and also salary of a superintendent to justify his residence there, and efforts to protect the wonders, open roads, and assist tourists with information and guidance."[25] In fact, before he officially arrived at the park, he explored the Slough Creek-Rosebud area for another potential northern route.[26] During the 1877 season, Norris placed a "large number of spirited cautions against fire and depredations in the park." These printed cloth signs affixed to trees were placed at strategic points of interest throughout the park.[27]

In Norris' first report to the secretary of the interior, he devoted a large section to transportation issues. The construction of a wagon road from Mammoth Hot Springs to Henry's Lake, via the Tower Falls, Mount Washburn, Cascades, Yellowstone Falls, the Lake, Firehole Basin, and the Nez Perce route through the west side, was deemed a "pressing necessity." Norris felt this route would connect almost all of the major points of interest; the existing north and western approach roads, and the southern approach route proposed by Capt. William A. Jones in his 1873 exploration report of the Wind River Valley and Togwatee Pass; and his other northern approach route from near the forks of the Yellowstone via Slough Creek, to the Stillwater River and on the navigable part of the Yellowstone River. Norris also proposed the immediate construction of a bridle path from the Stillwater River to the Upper Geyser Basin, via the Clark's Fork mines and Soda Butte, into the park through the petrified forests, to Amethyst Mountain, Pelican Creek and the outlet of Yellowstone Lake, then by way of Shoshone Lake, and to Old Faithful in the Geyser Basin. The other bridle path he recommended connected the Firehole to Mammoth Hot Springs via Gibbon's Fork and Gardner Falls. Norris recognized that "many short, and some tolerably elevated, bridges will be required" and "some long causeways, especially in the miry, often nearly impassable, Upper Firehole Valley" may be needed.[28]

Superintendent Norris believed that the construction of roads into and through the Yellowstone National Park would be of great benefit to many. Not only would the "teeming throngs of tourists to the bracing air, the healing bathing-pools, and matchless beauties of the 'wonder-land'," be encouraged to come, but the opening of a route through the park would reduce the cost of transportation to the government of supplying the chain of military posts in the west. The improved transportation route through the "knot" in the Rockies would promote settlement in the nearby areas and assist with the "Indian question." [29]

Before leaving the park for his home in Michigan, Norris realized that the question of the pre-park improvements, the Baronett Bridge and the McCartney accommodations at Mammoth Hot Springs, had not been legally addressed. He felt that Baronett Bridge and the McCartney Hotel should be purchased by the government outright or that C.J. Baronett and J.C. McCartney should be allowed a fair preference for a ten or twenty years' lease on their holdings. Norris preferred the lease option for McCartney and Baronett and suggested to the secretary of the interior that leases of ten or twenty years be given for other hotel accommodations at Yellowstone Falls, the geyser basins, and at Yellowstone Lake. He also recommended leases for yacht and ferry operations at Lake.[30]

Norris arrived in the park for his second season with the park's first appropriation of $10,000. Due to the Nez Perce activities from the previous summer and the continuing potential threat from the Bannock Indians, Norris discarded his plans for building facilities at Mammoth Hot Springs in favor of building a road from Mammoth Hot Springs to the Lower Geyser Basin. The park road would facilitate the movement of the military from Fort Ellis, Montana, to Henry's Lake in Idaho or Virginia City, Montana, and of course, be used by the ever-increasing number of visitors to the park.[31]

Superintendent Norris began his active role in the road construction program by writing to the secretary of the interior stating that he would need to hire an assistant at a salary of $1,000 per year so he could proceed with the road plans. He also said that he planned monies for the purchase of a small barometer, prismatic compass, field glasses, thermometer, and other necessary equipment.[32] Prior to his explorations for appropriate routes, Norris took "some 20 well-armed, mounted, equipped, resolute, and reliable mountaineer laborers" to build a road up the Mammoth Hot Springs terraces and through a pass into the Swan Lake Flats. Using his field glasses, Norris viewed other possible park routes in the far distances from the top of Sepulcher Mountain. He could spot the route that his party took in 1875 and he visualized a route to the south, through the park, via Gibbon Canyon, Firehole Basin, the continental divide, and on to the Tetons. He knew construction through the canyons and the geyser basins could prove to be difficult and dangerous, but it appeared to be the most straightforward and practical wagon route.[33]

The condition of this area in 1878 was described by Luther "Yellowstone" Kelly, a frontier scout, in his account of his travel through this part of the park:

> In the chill mist of early morning we passed like ghosts along a rude road into the geyser basin, . . . the trail had disappeared and we were treading a crust that sounded hollow and was hot to touch. I dismounted and led my horse carefully around the thin places for fear he would break through and scald his legs. . . .
> At this time there were practically no trails in the park aside from the game trails, only a rough track connecting the geyser basin with Mammoth Hot Springs. The east side of the lake was heavily timbered with considerable underbrush. It was not easy traveling and the course I took, as nearly straight to the head of the lake as was feasible, was rough enough. . . . I knew there was no trail from the west side of the lake.[34]

While Norris was exploring for new routes and examining some of the trails, a small crew began improving roads to the geyser basins and one toward Fort Ellis. They began a new road on the Gardner River toward the falls and Yellowstone Lake and several new bridle paths and bridges. After bad weather began in the autumn, Norris relieved the construction crews, and he and several reliable scouts set off for more exploration of the mountain passes and to determine new routes for roads and bridle paths. Norris felt that exploration of the Grand Canyon to Mount Washburn and of the routes connecting the wagon roads approaching the park entrances were his most significant accomplishments. However, he also felt that much of the other scouting was "of considerable interest and value."[35] "Various paint pools, fossil forests, and other places of interest were "discovered" during Norris' search for possible wagon road routes and bridle paths.[36] These features would later be described and illustrated by Ferdinand Hayden of the U.S. Geological Survey.

In addition to necessary proposed work, Norris' 1878 report revealed the inhospitable conditions and the potentially difficult situations for road construction. With two veteran mountaineers, Adam Miller and R.B."George" Rowland, Norris sought a more desirable route around Mount Washburn, the unavoidable obstacle between the forks of the Yellowstone River and its falls and lake. This route was lower in elevation and thus less snowy than the existing route over the western spur of the mountain. Norris trekked through the Tower Falls Canyon, on to the canyon of Antelope Creek to the forested plateau between them and on to the Grand Canyon. He found the spectacular plateau "very elevated, but open, smooth, and grassy, with a fine lake upon its summit, and mainly an excellent route."[37] He saw this as an excellent wagon road route.

From this area, Norris headed for the Yellowstone Falls describing his venture as follows:

> . . . I sent my men with the animals to seek a route through the remaining spurs and timber to the cascade and Great Falls, instructing them to await there a day before searching for me, should I fail to arrive. Then with rifle and hatchet, afoot, and alone, I descended a side canon through all its labyrinth of windings, tangled timber, and crumbling walls, to the pent-up, roaring Yellowstone in the nearly hidden recesses of the Grand Canyon. Nearly fronting me was the mouth of a yawning side canon soon hidden in its windings, somewhat above a side cascade nearly lost in spray in its fully 1,000 feet descent, and about and above me the stifling sulphur fumes of hissing fireholes, alike a serious obstacle to my purposed exploration of the canon to the falls, and a warning to leave it without delay. Through great exertion, I breathless and exhausted reached the timbered plateau, and through fast-descending, large, downy, snow-flakes ascended to the Great Falls, the thunders of which for miles came in rumbling echoes from the fearful depths. I there, in the gathering twilight, thankfully enjoyed the greeting shout and blazing camp fire of my men, just safely arrived with the welcome intelligence that they had found a route in all respects preferable to that over the mountain to Cascade Creek. . . . the snow, which was more than a foot deep before night, really benefit, plainly disclosing the various hot springs and sulphur basins, as well as the clearest edge of the Grand and side canyons, and brink of the large yawning land slides.[38]

Not seeing any traces of man, hatchet-hacks, or trails, Norris believed that he was the first man to explore the brink of the Grand Canyon of the Yellowstone. Norris concluded that any wagon road along the brink would have to be elevated and it would be very expensive. He discounted the eastern rim as impractical, but found one of the other explored routes to be preferable. Norris felt that the canyon and the falls were "a leading wonder of the park and of the world, every way worthy of a route along or as near as possible to its misty and sulphur-tinted walls."[39]

Norris made his way to Yellowstone Lake, but deep snow and Indian activity prevented completion of a planned trip around the lake. Instead, he departed Steamboat Point for Mammoth Hot Springs, via Pelican Creek, Amethyst Mountain, the forks of the Yellowstone, and the East Gardner canyon. Shortly after his return home to Norris, Michigan, he summarized his thoughts and proposals in the Annual Report for 1878. In regard to transportation and the construction of roads, Norris believed that the Park needed to open a wagon road along the route he explored, as well as a route that would complete a circuit passing by the great wonders of the Park - Yellowstone Lake, Yellowstone Falls, and the Canyon. The building and extension of railroads and steamboat service, plus coach service to nearby communities would pressure the Park to complete these wagon roads. The superintendent felt a trail was needed from the Upper Firehole Basin to the trails around Heart, Lewis, and Shoshone Lakes and around the eastern shore of Yellowstone Lake. One would follow Pelican Creek to the East Fork of the Yellowstone at the mouth of Soda Butte.[40] Norris called for a new crossing near the forks of the Yellowstone River, which would be preferable to the dangerous, burned and decayed Baronett Bridge and to the newly commenced miner's bridge above the Baronett's Bridge.[41] At the close of 1878, there were 103 miles of road, or in some cases, trails in Yellowstone National Park.

The isolation of the Park required that Norris purchase necessary construction and maintenance equipment in Michigan before the beginning of his third year of administration. He scheduled the purchases for shipment to Bismark, Dakota Territory, on the first steamboat heading up the Yellowstone River. Luckily, his shipment missed the connection for loading on the ill fated steamboat, YELLOWSTONE, which was lost on the Buffalo Rapids. The equipment and Norris later arrived in Fort Benton and then freighted to Bozeman by way of Helena. Norris made the 3,000-mile trip from his home in Norris, Michigan, to Mammoth Hot Springs by many forms of travel: railroad, steamboat, freighter wagon and coach. Heavy rains during June caused the shipment of supplies to be delayed as the roads were nearly impassable.[42]

Norris felt the existing three routes to the headquarters at Mammoth Hot Springs were not acceptable and would be very costly to be rendered serviceable and safe.[43] Thus he cut a new:

> roadway across countless spurs and gulches along the mountain side[sic] midway between them. In this I finally succeeded, and without sharp curvatures, carried a line of easy grades for some three miles, and with only a moderate amount of bridging, constructed a road much shorter and in all respects superior to what could have ever been made upon either of the other routes at manifold its cost.[44]

The new route expedited the delivery of construction materials and supplies for the building of the park's first administrative headquarters at Mammoth Hot Springs. By August, Norris left the headquarters on the road built in 1878 to the geyser basin, with a large crew, animals, and three wagons of supplies. Along the way, the crews cleared large quantities of fallen timber on the roads, repaired and constructed culverts, and bridges. Norris supervised improvements and the widening of the grades at Obsidian Cliff, Norris Plateau, Gibbon Canyon, and down Madison Canyon to the western boundary of the park.

Locating a direct route from the Upper Firehole Geyser Basin to Yellowstone Lake became Norris' next priority and the principal project for the 1879 season. This area baffled many past expeditions, and Norris claimed "from the commencement of explorations within the park . . . it led to greater efforts and more failures than any other trail . . . ."[45] Norris found evidence of other explorers during his first unsuccessful trek crisscrossing the Continental Divide.[46] On his next attempt, he spent several days of "excessive exposure and hardship, and nights of sleepless cold and anxiety" in tracing a route down the north bank of the Firehole River south to the Continental Divide and over two miles east to Shoshone Lake, then in a zigzag direction to the West Thumb area on Yellowstone Lake. Norris selected six mountaineers to accompany him on a pack trail to open the approximate 22-mile route from the Upper Geyser Basin to Yellowstone Lake. From the West Thumb area, he followed the shoreline, opening a trail for approximately 26 miles to the lake outlet. From the outlet, Norris and crew improved the existing trail to Mammoth Hot Springs via the Mud Volcano, Sulphur Mountain, Great Falls and Canyon of the Yellowstone, Mount Washburn, Tower Falls, the Forks of the Yellowstone, and the east canyon of the Gardner River. [47]

While the road accomplishments seem small, Norris felt that more of the Park had been opened to the 1,030 people who visited Yellowstone in 1879. By taking the new route from the Upper Geyser Basin to Yellowstone Lake, tourists could now visit more hot springs and cascades, and by using bridle trails, were able to visit Shoshone, Lewis, and Heart Lakes.[48] Snow cover prevented Norris from completing a trail along the rim of the Grand Canyon of the Yellowstone, which he continued to feel was the "true one" for a wagon road or bridle trail to the eastern spurs of Mount Washburn, instead of over it. He did, however, spend part of September improving the 35-mile trail from the forks of the Yellowstone River to Soda Butte and constructing a new 30-mile trail from Soda Butte, via the Fossil Forest, over Amethyst Mountain to Pelican Creek on Yellowstone Lake.

Norris mentioned no particular or unusual problems in the building of a bridge over the Yellowstone River above the falls. However, spanning the Gibbon, Firehole and Madison rivers, or their creeks and streams proved more interesting.

Norris wrote in his report, "Few of the anomalous features of the LAND OF WONDERS are of greater scientific interest or of more practical value than the placid, uniform water-flow in its hot spring and geyser-fed rivulets and streams."[49] Because these watercourses are generally "broad, shallow, grassy channels, uniformly smooth banks, with a dense growth of short grass and flowers carpeted to the water's brim, . . . with long stretches of flowing grass and occasional hot spring pools in the channels, . . . with overhanging turfy banks," Norris eliminated the need for some bridges by cutting a slope through the turf, forming a very good and permanent ford. Instead of a bridge he placed "long, limber poles and foot-logs, only a few inches above the low stage of water."[50]

Norris improved the quality of the road signs and guide boards. Two years prior, cloth had been affixed to trees, but by 1879, odd pieces of wood remaining from construction projects were painted white and lettered in black. The signs directed visitors to significant rivers, streams, geysers, etc., in addition to displaying distances to and between various points. The wooden signs were attached to trees, posts, and stones.[51]

Norris' concern for providing the visitor with scenic and interesting views along the roads, was also fulfilled with his finding a route around the base of Bunsen Peak. The drive, which connected with the road to the geyser basin from Mammoth Hot Springs, provided the visitor with views overlooking the Gardner Canyon. He felt that the seven miles were worthy of becoming a carriage way. The Bunsen Peak Road thus became the first planned secondary road.[52] At the end of 1879, there were 234 miles of roads and trails in the park.[53]

The beginning of the 1880 season witnessed extremely unfavorable weather conditions, in which the state of the roads reflected the effects of swollen streams and unusual snow depths in the mountains. Norris asked the chief signal officer in Washington, D.C., to warn the public of these conditions and suggested visitors delay their trips to Yellowstone until late July. In addition to the possible inconvenience of the visitors' travel, Norris felt the conditions would generate "much unjust criticism and censure for the park."[54] Norris knew that many of the visitors to the park in 1879, were disappointed in the condition of the park's roads and trails. Norris devoted most of the 1880 season to improving existing roads, trails, or important routes, with some time set aside for new exploration. He explained to the secretary of interior that ". . . it, [Yellowstone] is also one of the largest, most elevated, and mountainous, as well as far the most humid, densely timbered and difficult in which to construct or maintain roads or trails, of all of our great mountain parks." Norris felt the existing roads were passable, but certainly not ready for "heavy broad-track military wagons or mule train."[55] In further pursuit of his defense, Norris justified his priorities:

> "I have deemed it more important to construct buildings for defense of the government property from the frequently recurring and ever-threatened Indian raids and to explore the proper routes for permanent use and open all possible . . . than to hazard the loss of government animals, outfit, and probably valuable lives by Indians, for the construction of a few miles of fine coach-road, leaving the remainder of the Park as I found it--mainly an unexplored pathless region of crags, and forests."[56]

Shortly after arriving in Yellowstone on July 2, he met O. J. Salisbury, a partner in Gilmer & Salisbury Company, who requested his assistance in selecting a new coach and mail route connecting the Utah Northern Railway with the headquarters at Mammoth Hot Springs. The existing route along the Madison River, which required much bridging, was impassable for parts of the year and was considered dangerous by many.

After two days of exploration, an acceptable route that cut south from the Madison River at Riverside, was found.[57] Salisbury left men to construct a mail station at the Riverside cutoff, while he proceeded East to secure his mail contract. Norris, who once considered the mountainous area south of the Madison River inaccessible, was surprised to find "a dry, undulating, but beautifully timbered plateau, allowing a judiciously located line of wagon road with nowhere an elevation much in excess of 1,500 feet above the Forks of the Fire Hole."[58] This route, some six miles shorter than the Madison Canyon route, would be cheaper to construct and maintain and also would open up new observation points for scenic and geologic interests.[59] Traveling through the beautiful pine forests on an August trip to the West Entrance via the new route, Norris commented that this dry route was preferable to the often snow-covered and flooded canyon route. He felt that this would be the preferred route. However the other, if necessary, could be used for part of the summer.[60]

The remainder of the season was spent exploring a new and shorter route from Mammoth Hot Springs to the Grand Canyon of the Yellowstone, the Yellowstone Lake area, and the fascinating Hoodoos in the eastern section of the Park, as well as working on the Gardner River road. Bridges were constructed on branches of the Gardner and Gibbon rivers, across Tower Creek, Cascade, and other creeks near the Great Falls of the Yellowstone.[61] Near Yellowstone Lake, Norris examined the Natural Bridge and determined that the 10-foot stone structure could be used as a carriageway by the "thousands of eager pilgrims to this wonderland."[62] Use of the Natural Bridge would divert the route away from the undesirable sandspits, gullies, and other wet areas near Bridge Bay.

Necessary construction and improvements to the West Entrance Road and the Fire Hole road delayed Norris' desire to construct a needed road from the Upper Geyser Basin area, via Shoshone Lake and on to the foot of the Yellowstone, via Mary's Lake and on to the East Fork of the Fire Hole River. However, Norris made improvements to the Fire Hole River Road, opening a new road to meet the old road along the Gibbon River, bridging the Norris Fork and other branches. Costly, long causeways, turnpikes, and grades along the stretch had to be built, as well as the stretches along Obsidian Creek and Gibbon River. An extension of the road to the Forks of the Gardner River was completed, including a road up "through the eastern branch nearly halfway through its terrible canon[sic], necessitating a grade of over 1,000 feet within two miles."[63]

Toll bridges within the Park continued to be a pressing problem. In late 1879, James Demings and George Huston requested permission to build a bridge on the Clark's Fork Mines route. In a letter to Congressman Martin Maginiss, the two Montanans stated that this would enable tourists to visit the mining area and would offer the opportunity for them to see "fine hunting country," which could not be seen in Yellowstone.[64] Representative Maginiss reported to the secretary of the interior that the Baronett Bridge was unsafe and in a state of decay and that these two Montanans were "good men, personally known to me."[65] Shortly after the first of the year, correspondence continued regarding the request for a bridge, but no action took place during 1880. Norris also received a proposal from John Ponsford of Bozeman offering the Baronett Bridge for sale. He requested an inspection of the bridge and a report on its value. Again no action was taken during 1880.[66] In Norris' report to the secretary of the interior, he reiterated his position that "all roads previously made within the park or public lands of the Nation shall remain free from toll."[67]

Norris felt that his 1879 sign program had been a success with the travelers, but he recognized that vandalism by "a small despicable class of prowlers" had prevented travelers from following the roads and trails and had deprived them of the information regarding specific scientific interests. In addition to sign vandalism, these people were "kindling devastating fires, slaughtering game, despoiling geysers and other interesting formations," and robbing tourists. These actions prompted Norris to press for a "speedy enactment of laws to properly protect the Park, its contents, officers, and visitors, and the enforcement of the same by a body of determined police."[68] Nature also took its toll, as forest fires, the effects of chemical action, hot water and steam destroyed the wooden signs. Knowing that stone would probably crumble and oxidization and corrosion would probably affect ordinary iron, Norris was faced with the problem of providing a permanent type of sign or guide-post.[69]

In contrast to 1880, the 1881 season opened with favorable weather conditions. In fact, good weather prevailed during the early spring, but Norris was unable to take advantage of it since his funding was not available until July 1. Nevertheless, in late June, he began to select crews and assemble necessary tools and equipment to begin work on the Fire Hole route and the Yellowstone route on the morning of July 1. Because Norris was particularly interested in scientific phenomena, and the prehistoric and historic Indian occupations of the Park, he promulgated the following rules for his road crews:

> While labor in the construction of roads and bridle-paths will be our main object, still, with trifling care and effort, much valuable knowledge may be obtained of the regions visited, especially by the hunters and scouts, all of which, including the discovery of mountain passes, geysers, and other hot springs, falls, and fossil forests, are to promptly be reported to the leader of each party. As all civilized nations are now actively pushing explorations and researches for evidences of pre-historic peoples, careful scrutiny is required of all material handled in excavations; and all arrow, spear,or lance heads, stone axes and knives, or other weapons, utensils or ornaments; in short, all such objects of interest are to be regularly retained and turned over daily to the officer in charge of each party for transmittal to the National Museum in Washington.[70]

Norris was in sympathy with Wyoming Territory citizens and officials in their request for the construction of a route into the Park, since most of the park lay within Wyoming Territory. More exploration parties searched for possible wagon routes into the Park from points to the east and southeast in Wyoming.[71] Plans for work within the Park kept Norris busy for most of the season. Norris pursued the earlier plan for construction of a route connecting Mammoth Hot

Springs with the west entrance, via the Forks, Great Falls, Yellowstone Lake, and the Forks of the Fire Hole. A heavy push was made to work on the canyon of the East Gardner. Even though the appropriation scheduling forced him to begin this project after July 1, he was fortunate in having experienced laborers and a dependable assistant. Faced with the difficulties of both climatic and environmental conditions, a veteran crew was invaluable. In addition to completing the circuit route from Mammoth Hot Springs to the West Entrance, this section of road was needed to transport a portable steam sawmill to supply lumber for constructing bridges, a steamboat for Yellowstone Lake, and two hotels, one at the foot of Yellowstone Lake and the other at the falls of Yellowstone River.[72]

The road crews altered the 1880 approach route to the Natural Bridge affording the visitors observation points and the opportunity to see the natural feature before crossing it. Concerned about a general conflagration, Norris resisted the burning of fallen timber to shorten the route to the thumb of the lake.[73]

At year's end, an aggregate of 54 miles of road had been constructed: four miles from Sage Creek (now known as Trout Creek) by Sulphur Mountain to the mouth of Alum Creek; 30 miles from the forks of the Fire Hole River to the foot of Yellowstone Lake, via the East Fork, Mary's Lake, and Mud Geyser; and 20 miles along the Gardner River, from near its bridges to Tower Falls, via East Fork Canyon, Dry Canyon and the forks of the Yellowstone. Sixty-five miles of bridle paths were opened: 11 miles to Paint Pot, 22 miles to Passamaria, 3 miles to Painted Cliffs, and 29 miles to Hoodoos or Goblin Land. Nine miles of trails were constructed: seven miles to Terrace Mountain, one mile to East Gardiner Falls, and one mile to Monument Geyser Basin.[74] More than 12 bridges and 4 footbridges were built during 1881.[75]

Norris in his 1881 report to the secretary of the interior, recommended additional bridge and road construction and also repeated the need to settle the private holdings situation. In October of 1881, C.J. Baronett sought permission to either retain his toll bridge and collect fees, or sell the bridge to the government.[76] The position of a reliable bridge over the Yellowstone River near the Baronett Bridge was crucial to any further development of routes to the Hoodoos or Goblin Land, the pass to Pelican Creek and Yellowstone Lake, and to the Clark's Fork mines. Norris, anxious to complete the circuit from Mammoth Hot Springs to the West Entrance, knew that the remaining approximately 20 miles between Tower Falls and the terminus of the other end of the road near the mouth of Alum Creek, would be a costly project. Despite much of the stretch being a natural roadway, the abysmal Tower Creek Canyon, the ascent of Mount Washburn via Rowland's Pass, the extensive need of rockwork, culverts, and timber cutting, grading, and bridging along the route led Norris to calculate the need for an additional $10,000 to the regular annual appropriation to cover the cost of the road. The amount would not allow for any other construction projects elsewhere in the park.[77]

Concluding remarks in his annual report for 1881, which was to be his final report, indicated that Norris could visualize a time when appropriations for the construction of roads, bridle paths, and trails, would not be perpetual.[78] While his prophecy proved to be incorrect, Norris is credited with providing more than two-thirds of the existing circuit, or Grand Loop system. He was responsible for the construction of 104 miles of the 140-mile system.[79]

Patrick Conger of Iowa replaced Philetus Norris as superintendent, serving from March 1, 1882, until September 9, 1884. His tenure, characterized as weak and inefficient, ". . . brought the Park to the lowest ebb of its fortunes, and drew forth the severe condemnation of visitors and public officials alike."[80]

The Conger period is important in Park history, for it precipitated needed reforms. Conger accomplished little in new road construction. His efforts were mainly in the improvement of existing roads, including the old Madison River route, which Norris bypassed after he constructed the road over the Madison Plateau.[81]

Conger did construct a three-mile section of road along the bank of the Yellowstone River near the falls and canyon. Finding the construction costly, just as Norris had predicted, Conger provided the tourists with safer and more comfortable access to the wonders. Another of Conger's accomplishments was the summer headquarters. Built near the Fire Hole Basin, it provided convenient and commodious housing for road crews in the vicinity.[82]

During 1882, a substantial Bridge over the Gardner, some 12 miles from Mammoth Hot Springs, was built in two weeks. The bridge had abutments built well out into the river on both sides. The center pier and the abutments were constructed of log in a V-shaped configuration, pinned at the corners, and filled with rock above the high water mark. The 96-foot-long bridge was covered with hewn logs 5-inches thick.[83] Conger supervised the construction of additional footbridges and rebuilt a bridge over the Gardner River that had been destroyed by a large fire near the Mammoth Hot Springs area.[84]

In 1883, a large hotel opened at Mammoth Hot Springs and the Northern Pacific Railroad built a branch line from Livingston, Montana, through the valley of the Yellowstone to a point within eight miles from the headquarters at Mammoth Hot Springs. Stage service was offered from the train station to the park. The improved accessibility of the park was concurrent with management and supervision of road and bridge construction being turned over to the U.S. Army Corps of Engineers under the secretary of war.

Baronett Bridge over Yellowstone River - 1879
Courtesy Yellowstone National Park Archives

C. J. "Yellowstone Jack" Baronett built the first bridge over the Yellowstone River in 1871
Courtesy Yellowstone National Park Archives

Philetus W. Norris, Second Superintendent of Yellowstone National Park, 1878
Courtesy Yellowstone National Park Archives

P.W. Norris Party Entering Upper Firehole Basin August 30, 1878
Courtesy Yellowstone National Park Archives

ENDNOTES

1. William F. Raynolds, *Report on the Exploration of the Yellowstone and Missouri Rivers in 1859-60.* Senate Executive Documents 77, 40th Congress (1868), 11.

2. Kenneth J. Baldwin, *Enchanted Enclosure: The Army Engineers and Yellowstone National Park, A Documentary History* (Washington: Historical Division, Office of the Chief of Engineers, United States Army, 1976), 1.

3. This document, Part I. of the Historic Resource Study, only addresses the construction of the planned road system within Yellowstone National Park. Another document, Part III. of the Historic Resource Study, The History of the Administration of Yellowstone National Park, will address the exploration of this area and the creation of the Park.

4. Nathanial P. Langford, *Report of the Superintendent of the Yellowstone National Park for the year 1872, Annual Report of the Secretary of the Interior for 1872* (Washington, D.C.: Government Printing Office, 1873), 2-3.

5. Nathanial P. Langford was a member of the famous 1870 Washburn Expedition which has been credited for suggesting that the wonders in this region be set aside as a national park. The nineteen men group spent 40 days exploring in the park and are responsible for naming more than 20 natural features.

6. Langford, "Report of the Superintendent of the Yellowstone National Park for the year 1872," *Annual Report of the Secretary of the Interior for 1872,* 2-3 and 7. The proposed circuit would go from the Lower Geyser Basin eastward to Lake Yellowstone then northward at its outlet along the Yellowstone River to the Yellowstone Falls, past Mount Washburn to Tower Falls, then on to the Hot Springs on Gardner River and in as near a direct line as possible to the northern boundary of the park. From the Mammoth Hot Spring area the circuit should go south, then "a direct line across the park to the Lower Geyser Basin." He also planned a road from the lower approach to the Geyser Basin to a junction below the outlet at Lower Yellowstone.

7. Bob Randolph O'Brien. "The Yellowstone National Park Road System: Past, Present, and Future." (Ph.D. diss. University of Washington, 1964).

8. Henry J. Norton, *Wonderland Illustrated: or Horseback Rides Through the Yellowstone National Park* (Virginia City: no publisher, 1873).

9. *Mrs. George F. Cowan Reminiscence of Pioneer Life.* O'Brien, "Yellowstone Road System."

10. Edwin Stanley, *Rambles in Wonderland, or a Trip Through the Yellowstone National Park* (Nashville, Tenn. Publishing House of the Methodist Episcopal Church, South, 1889), 50.

11. Lorraine and Orrin Bonney, *Battle Drums and Geysers: The Life and Journals of Lt. Gustavas Doane, Soldier and Explorer of the Yellowstone and Snake River Regions* (Chicago: The Swallow Press, 1970), 464.

12. Langford, 23.

13. Nathanial Langford to Secretary of the Interior Columbus Delano, 20 May 1872. Yellowstone National Park Archives, Yellowstone National Park.

14. Albert L. Rose, "The Highway from the Railroad to the Automobile," *Highways In Our National Life: A Symposium* (New York: Arno Press, 1972).

14. Albert L. Rose, "The Highway from the Railroad to the Automobile," *Highways In Our National Life: A Symposium* (New York: Arno Press, 1972).

15. Louis Crampton, *Early History of Yellowstone National Park And Its Relation to National Park Policies* (Washington D. C.: Government Printing Office, 1932), 37.

16. Langford to Secretary of the Interior Delano 7 November 1873. Yellowstone National Park Archives, Yellowstone National Park.

17. Crampton, *Early History of Yellowstone National Park And Its Relation to National Park Policies*, 39.

18. William A. Jones, *Report Upon the Reconnaissance of Northwestern Wyoming Including Yellowstone National Park Made In the Summer of 1873* (Washington D.C.: Government Printing Office, 1875), 58.

19. F.V. Hayden to Secretary of the Interior Delano, 14 November 1873. Yellowstone National Park Archives, Yellowstone National Park.

20. Langford to Secretary of the Interior Delano, 6 February 1874. Yellowstone National Park Archives, Yellowstone National Park.

21. Secretary of War William Belknap to Secretary of the Interior Delano, 4 March 1874. Yellowstone National Park Archives, Yellowstone National Park.

22. William Ludlow, *Report of a Reconnaissance From Carroll, Montana, on the Upper Missouri to the Yellowstone National Park, and Return, Made in Summer of 1875* (Washington D.C.: Government Printing Office, 1875), 36-37.

23. Crampton, 41.

24. O'Brien, 52-54.

25. Philetus W. Norris, *Report to the Secretary of the Interior, Upon the Yellowstone National Park for the Year 1877* (Washington, D.C.: Government Printing Office, 1877), 840.

26. Aubrey L. Haines, *The Yellowstone Story, A History of Our First National Park, Vol. I* (Boulder: Yellowstone Library and Museums Association in Cooperation with Colorado Associated University Press, 1977), 217.

27. Norris, *Report to the Secretary of the Interior, Upon the Yellowstone National Park for the Year 1877*, 837.

28. Norris, 843-844.

29. Ibid., 845. See Aubrey Haines. *The Yellowstone Story, Vol. I, Chapter 8*, "Warfare in Wonderland."

30. Ibid., 841.

31. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior* (Washington D.C.: Government Printing Office, 1878), 979.

32. Philetus Norris to Secretary of the Interior Carl Schurz, 26 June 1878. Yellowstone National Park Archives, Yellowstone National Park.

33. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior, 979-980.*

34. M.M. Quaife, ed., *"Yellowstone Kelly" The Memoirs of Luther S. Kelly* (New Haven: Yale University Press, 1926), 222-224.

35. Norris, 1878, 980-981.

36. Ibid., 984.

37. Ibid., 983.

38. Ibid., 983-984.

39. Ibid., 984.

40. Ibid., 986. The east fork of the Yellowstone River is now called the Lamar River.

41. Ibid., 986.

42. Philetus W. Norris, *Report Upon the Yellowstone National Park for The Year 1879* (Washington: Government Printing Office, 1880), 3.

43. Norris. *Report Upon the Yellowstone National Park for The Year 1879,* 3-4. The three existing routes were ". . . first a very rough and difficult one, over two dangerous - now bridged - near the forks, and past a cascade and two cataracts upon the east branch to the forks of the Yellowstone - distance, 20 miles, second, over my road of last year up the dry pass between the hot springs terraces down Sepulchre Mountain to the geysers - distance, 60 miles, and third, by the old road, over the mountain spurs and rugged canons [sic], 6 miles to the Yellowstone River, and through its second canon and Bozeman's Pass over the Gallatin Range to Fort Ellis and Bozeman - distance, 80 miles." 4.

44. Norris, 5.

45. Ibid., 6.

46. Norris found evidence of Truman Evarts, Ferdinand Hayden, and others ". . . amid the dense snow covered, storm-twisted, knotted, and gnarled thickets of the continental divide . . ." He also found an odometer left by Captain Jones and Professor Comstock during their 1873 expedition, Norris 1879, 6.

47. Ibid., 6-7.

48. Ibid., 17 and 22.

49. Ibid., 17.

50. Ibid., 7.

51. Ibid., 7.

52. Ibid., 10. Currently some of the other secondary roads are older routes but Bunsen Peak was planned as an interpretive or secondary road.

53. Philetus W. Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880* (Washington: Government Printing Office, 1881), 34.

54. Norris. *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880,* 34.

55. Norris, 34.

56. Ibid., 34.

57. The new west entrance route left the Madison River at Riverside, proceeded over the Madison Plateau, joining the Firehole River near Nez Perce Creek. The reference to Riverside is different to the Riverside found just inside of the West Entrance to the park. During the 1880s, the Riverside mentioned in the text was approximately four miles inside the park near the site of a later soldier station. Thus, the Norris road went south from that point, not near the West Entrance.

58. Ibid., *1880, 9.*

59. Ibid., pp. 9-10.

60. Ibid., 5.

61. Ibid., 38.

62. Ibid., 23. Norris said that the Natural Bridge " . . . was once the brink of a cataract nearly one hundred feet over a ledge of peculiarly hard, variegated trachyte up here to the vertical access the stream. Directly across this ledge, countless layers of erosion have formed first a shallow trough like channel; then, or simultaneously with this channel, a vertical orifice, several feet long by one foot wide, between the strata, some two feet from the brink . . . . The chasm is fully spanned by the bridge, which, by measurements, I found to be twenty-nine feet log, and including the above mentioned vertical orifice, ten feet height above the top of the arch, and forty-one feet to the bedrock of the chasm, which, at this point is a rapidly deepening cascade."

63. Norris, *1880, 13.*

64. Ibid., 14-15.

65. Ibid., 14.

66. John Ponsford to Secretary of the Interior, 6 September 1880. Yellowstone National Park Archives, Yellowstone National Park.

67. Norris. *1880, 25.*

68. Ibid., 14-15.

69. Ibid., 4.

70. Philetus W. Norris, *Fifth Annual Report of the Superintendent of the Yellowstone National Park, September 1881* (Washington D.C.: Government Printing Office, 1881).

71. Norris, *Fifth Annual Report of the Superintendent of the Yellowstone National Park, September 1881,* 18.

72. Norris, 19.

73. Ibid., 22. See Appendix A for Synopsis of Roads, Bridle-Paths, and Trails In the Yellowstone National Park.

74. Ibid., 70.

75. Ibid., 69-70. One bridge at the head of the Upper Falls of the east fork at the Gardner River; one bridge over the main Blacktrail Creek; one bridge over Elk Creek near the Dry Canyon; three bridges in the valley at the east fork of the Firehole; two bridges on Alum Creek; two bridges upon Sage Creek; two bridges upon Hot Spring Creek. (all on new route or the Shoshone bridlepath to Lake Yellowstone.)

Two footbridges crossed the Firehole Rivers near the forks and two crossed the Firehole in the Upper Geyser Basin.

76. C.J. Baronett to Secretary of the Interior T.J. Kirkwood, 6 October 1881. Yellowstone National Park Archives, Yellowstone National Park.

77. Norris, *1881, 18.*

78. Ibid., 73.

79. Ibid., 73.

80. Hiram Chittenden, *The Yellowstone National Park* (Cincinnati: Robert Clark Company, 1895), 131-132.

81. P.H. Conger, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior by P.H. Conger, Superintendent, for the Year 1882* (Washington, D.C.: Government Printing Office 1882), 4.

82. Conger, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior by P. H. Conger, Superintendent for the Year 1882,* 6.

83. Conger, 5.

84. Ibid., 9.

CHAPTER II

THE GENESIS OF NATIONAL PARK ROAD STANDARDS 1883-1890

> *The region embraced in the national park from its high rugged and mountainous character, presents in varied forms and combinations almost every obstacle that nature ever offered to the construction and maintenance of roads. There are steep mountains and dense forest, rocks, streams, canons, and marshes, a moist climate, and heavy snows, besides the peculiar hot spring formations which are very extensive and afford the worst road material I ever met with.*
>
> *Lt. Dan Kingman, U. S. Army Corps of Enigneers*

As a result of depredations on the natural features, the wanton killing of game and poor and sometimes corrupt administration in general, members of Congress and other interested citizens requested that the administration of the Park be turned over to the military. On March 3, 1883, just 11 years and 2 days after the creation of Yellowstone National Park, the first phase of military presence began in the Nation's first park. The Army Corps of Engineers arrived to take charge of the construction and improvements to the Park's road system. Three years later, the U. S. Cavalry would join the Engineers and assume the role of administrating the Park. The Sundry Civil Appropriation Act allowed $40,000 for the protection, preservation, and improvements of the Park, of which $29,000 would be used for the improvement and construction of roads and bridle trails. The balance of $11,000 would cover the fixed salaries as established by the Act. The superintendent was to receive $2,000 and each of his ten assistants was to receive $900.[85]

On August 13, 1883, 1st Lt. Dan C. Kingman, U.S. Army Corps of Engineers, escorted by 1 sergeant and 10 privates of the 6th Infantry, arrived at the Mammoth Hot Springs headquarters. The party, which departed Omaha, Nebraska, by rail on the 28th of July, came by pack horse from Beaver Canyon, Idaho, over the Targhee Pass and down the Madison Valley. Ironically, Lieutenant Kingman's commanding officer of the Department of the Platte, Maj., Gen. O. O. Howard, was the same officer who had pursued the Nez Perce Indians through the park in 1877 and had been credited with some of the initial road work over the Mary Mountain route.

Kingman, a future chief engineer of the U.S. Army, described the conditions of the park roads as "very bad, barely passable even in good weather and the bridges constructed were covered with small poles, and then even long stretches of corduroy to weary and vex the people who were obliged to travel over them."[86] He found the bridle paths were passable by horseback.

The Army officer did not place blame for the road conditions on his predecessors, but used the limited appropriations as an excuse. However, it became very evident that during the first decade of the park, where roads were concerned, quantity not quality had been the order of the day. The existing 160 miles of roads enabled the tourists to visit the main points of interest, but as a result of minimal funding and engineering experience, the roads tended to be very hilly, crooked, and cluttered with tree stumps. Trees had been cleared only enough to provide the passage of a single wagon. Improper drainage systems often left water in the middle of the road. Kingman found the sidehill cuttings "temporary in character" and generally "supported on the outside by logs and brush."[87]

Since the Park was well into its tourist season, Kingman's immediate plans were to repair the existing roads and not construct new ones. Superintendent Conger provided Kingman with enough supplies and horse teams for 15 to 20 men. The shortness of the time available prevented any contract work during 1883 and only day labor was employed. Kingman was surprised to find sufficient numbers of men of "ordinary intelligence, but somewhat fickle and restless."[88] Thus, he very quickly was able to assemble more parties, each under the supervision of a foreman.[89]

Lieutenant Kingman purchased a 30-horsepower portable steam sawmill with a 58-inch saw. The sawmill, delivered by railroad to the end of the Northern Pacific branch at Cinnabar, was positioned near Mammoth Hot Springs. Kingman's crews used burned trees from the 1882 fire in the Mammoth area. Assessing that the trees were still usable for timber for bridges and culverts, he had the crews cut 3-inch planks and dimensional lumber before worms or decay set in.

Before 1883 ended, Kingman had progressed on road repairs, but more importantly, he developed a philosophy of landscape values, which many years later would be expressed by the National Park Service's Branch of Landscape Architecture. Recognizing the difficulties, and in some cases, what seemed to be insurmountable problems, Kingman recommended to the Secretary of War and to the Secretary of the Interior that only good roads be built in the Yellowstone.[90] He felt that they should "have something of the solid, durable and substantial quality that usually characterized the works constructed by the national government."[91]

In establishing the first park road standards, Kingman recommended:

> an 18 feet an 18 feet width road, well rounded up in the center, and provided with suitable side ditches and cross culverts; that all trees be removed for a width of 30 feet; that on side hill cuttings the fill be retained by a dry stone wall, and that an ample ditch be placed on the up hill side at least a rod from the road to catch the snow water and convey it to the natural water courses, and that where there are meadows or marshes that cannot be drained and must be crossed, the corduroy be replaced by a good plank road. That all culverts be of stone or 3-inch plank, and that all bridges be well constructed of good sawed lumber.[92]

Kingman expressed further concern for the appearance and quality of the park:

> . . . if it ever becomes the resort of fashion, if its forests are stripped to rear mammoth hotels, if the race course, the drinking saloon and gambling table invade it; if its vallies[sic] are scarred by rail-roads, and its hills pierced by tunnels, if its purity and quiet are destroyed and broken by the noise and smoke of the locomotive, if in short a sort of Coney Island is established there, then it will cease to belong to the whole people and will be unworthy of the care and protection of the national government.[93]

From August 1883 to the end of the construction season, Kingman's crews repaired existing roads. Finding the most heavily traveled road, the Mammoth Hot Springs to the Fire Hole Basin, in the worst condition, the largest work crews reported there until heavy snows of 18 to 30 inches during the middle of October prevented continuing. This 40-mile stretch, with the exception of a 3-mile portion in the Gibbon Canyon, was widened, straightened, stones and stumps removed, and slopes reduced. Frequently spaced turnouts and a new ford was built. The existing bridges were repaired and the corduroy sections were covered with sod and earth. Work on this section cost approximately $6,300 or $170 per mile.

The work on the four-mile section of road between Gardiner and Mammoth Hot Springs cost approximately $50 or $12.50 per mile. The crews only filled the ruts and removed stumps from this section. Kingman decided that the north entrance route, which was the most heavily used entrance, was hampered by a steep hill that had to be negotiated before arriving on the plateau at Mammoth Hot Springs. The existing road had steep inclines, which often made it impossible for wagons to ascend in wet weather. Kingman recommended abandoning the route and pursuing a new one following the West Fork of the Gardner River and joining the old road about four miles from the starting point.

Kingman knew that this route, with its exceptional obstacles, would be expensive to construct and estimated that it would cost approximately $2,000 per mile, which is more than double what it would cost in other areas of the Park. During 1883, he spent $5,740 and estimated an additional $3,000 would be needed to complete the 11-mile section. Before the crews stopped for the winter, a excellent road had been constructed up to the point of the rock work. Kingman hoped to complete the entire project before the first visitors arrived the following spring.[94]

Between the Fire Hole and the Upper Geyser Basin, a 10-mile road section, Kingman built a new bridge across the West Fork of the Fire Hole River, several small bridges and stretches of corduroy sections were repaired; ruts were filled in, all for the sum of about $850 or $85 per mile. From the Fire Hole River to the Yellowstone Falls, small bridges and corduroy sections were repaired and the general maintenance of removing stumps, trees, and rocks was accomplished for approximately $75 per mile for the 28 miles. Culvert and ditch repair was completed on the Clark's Fork Road for about $12.[95]

At the end of his first year, Lieutenant Kingman sent a request for an appropriation of $110,000 for the fiscal year June 30, 1884, to June 30, 1885.[96] Kingman recognized that in selected portions of Yellowstone, the existing roads would be relocated and/or abandoned. He urged an additional sum to purchase the Baronett Bridge, as he agreed with the previous superintendents that a toll bridge should not be allowed in a national park.

Kingman felt that miners in the Clark's Fork mining area could hardly be asked to improve the road to the eastern boundary, since it was entirely within the Park. Nevertheless, the miners received all their mail, supplies, machinery, and tools over this route. Thus, Kingman sought additional funds to improve the very bad road from Yancey's to the eastern boundary near Cooke City.[97]

While Rufus Hatch, the president of Yellowstone Park Improvement Company, concurred with Lieutenant Kingman on the condition of the roads in 1883, he noted that "The conveyance of Tourists by stage coach through the Park was conducted without a single accident, notwithstanding the rugged and in many places dangerous character of the Roads . . . ."[98] In Hatch's letter to Secretary of the Interior Henry M. Teller, he urged a "sufficient appropriation" for the roads as the visitors who make the long journey to park should not be deprived of visits to the places of interest because of the roads. He announced the company would upgrade the stage and saddle horse service in the park; he hoped the roads would also be upgraded.[99]

Lieutenant Kingman remained popular with the civilian superintendents, and in December 1885, Superintendent D. W. Wear wrote to the secretary of the interior requesting that Kingman be permanently assigned to Yellowstone National Park.[100] Kingman was steadily making progress with the construction of new roads and bridges and the improvement of the older roads. Since the fall of 1883 and prior to the beginning of the construction season of 1885, Kingman had used 200,000 feet of lumber in bridge construction.[101]

Three routes, the Mammoth Hot Springs to Gardiner, via West Fork of the Gardner River, (known today as Glen Creek), Norris Geyser Basin northwards toward Beaver Lake, and the Upper Fire Hole River to the Upper Geyser Basin, received most of the attention in 1885. Several major bridges were completed, one over the Gardner River and two over the Gibbon River.

The 4 1/2-mile Mammoth Hot Springs to Gardiner road, via Golden Gate and the West Fork of the Gardner River was completed in June 1885. Even though started in September 1883, construction time was only 7 months. Some 1,275 pounds of explosives were used and more than 1,300 shots in drilled holes were fired. As a result, 14,000 cubic yards of solid rock were excavated in addition to a large amount of broken and crushed rock. This dangerous section of road was completed without any loss of life or injury. The completion of this section reduced the route by 1-1/3 miles and travel time to many areas in the park from 2 hours to half-a-day depending on the type of wagon and load. The reduced ascent of 250 feet to Swan Lake plateau enabled loaded wagons traveling in opposite directions to now pass with relative ease. The near vertical stone walls of the canyon prevented excavation of a roadway so that a 228-foot wooden trestle carried the roadway. Lieutenant Kingman noted in his report for 1885 that the "natural stone monument at the end of the trestle" marked what "visitors have called the Golden Gate."[102]

In the Fire Hole River to Upper Geyser Basin route, Kingman constructed a new road, as the old, poorly located road would be very costly to improve. The "unnecessarily long" old road crossed a "kind of geyser swamp" in some places and crossed soils of a "black obsidian sand" in others.[103] As the road neared the Upper Geyser Basin, the alignments of the old and new roads were almost the same. The new route, which cost a total of $6,042.53, reduced the three to four hours travel time from the Marshall Hotel at the Forks of the Fire Hole River to the Upper Geyser Basin to one hour. Kingman described it as "well built" and said that the bridges and culverts had "substantial character." He further described it as "sensibly level, and as the roadbed is mostly composed of gravel that packs well, it is a very pleasant road to drive over."[104]

The first trestle bridge built in the Park crossed the Fire Hole River above Hell's Half Acre. Kingman felt that this bridge was well suited to the unusual conditions of the locality, "enormous quantity of hot water that this river received it never carried any ice, and as its discharge is remarkably uniform (there is hardly a difference of a foot between high and low water) it bears little or no drift wood." The 100-foot-long trestle bridge, costing $400, was covered with 4-inch hewed planks.[105]

Kingman established a road camp near the Norris Geyser Basin in order to begin work on the new road between Norris Geyser Basin and Beaver Lake where it would connect with the old road at the head of the lake. The poorly located old road ran in an easterly direction south of Beaver Lake, before entering the woods near Lake of the Woods, then the road climbed the very steep Green Creek Hill, crossing the Continental Divide at the junction of the rivers near Norris Junction. Due to excessive snow depths and heavy timber covering, the snow concealed the road well into May. The poor subsurface drainage caused by the heavy clay soils and the "saucer-like shape" of the pass produced "horrible conditions" for travelers. Kingman noted that it was not uncommon "to see a team lying in the mud, tangled in their harness and floundering about in almost in unextricable [*sic*] confusion while the drivers looked on in despair."[106] Consequently, Kingman sought a new route that would provide more exposure to the sun, better drainage, and better soil conditions. The seven miles of new road, completed by the middle of October, cost $6269.80.

Before the close of the 1885 season, the crews replaced "a long and rather unsafe structure built of poles" with a "single span King-post truss of 30-feet" combined with a causeway, over the Gibbon River near the Norris Geyser Basin.[107]

In his final report for 1885, Kingman concluded that the use of day labor and the government's purchase of their own supplies was preferable and more economical than hiring a contractor. On October 23, the Army officer left the construction and road responsibilities with a hired watchman. The watchman's primary duty was to inspect the Mammoth Hot Springs to Gardiner road, making sure that it was open for travel during the winter. Only once during the winter of 1885-1886 did he have a closure. A small landslide, which obstructed travel for a short period, had to be cleared by hired laborers at a cost of $15.39.[108]

In Lieutenant Kingman's proposals and request for appropriations for the next season's work, he added a new category, the maintenance of existing roads. With the completion of 30 miles of new road added to approximately 30 miles more of road that was "good naturally," he intended to set up a new organization of road section crews. These crews, under the supervision of "competent roadmasters," would be responsible for an 8-or 10-mile section. Their duties would be to keep the roads clear of stones, keep the surface smooth, keep the ditches and culverts open, and try to prevent ruts from forming. Kingman felt this method would maintain the good roads in an acceptable condition at a minimum cost.[109]

In order for Kingman's new maintenance function to succeed, rules and regulations needed to be imposed regarding the different types of vehicles using the Park. In addition to the coaches and carriages used for touring parties, many different types and sizes of wagons traveled on the Park roads. Kingman's major concern was the damage caused by the different sizes of tires and heavy loads.[110]

In May 1886, an order was issued requiring all wagons hauling heavy freight over the Park roads to have a minimum of four-inch tires.[111] While this order caused some inconvenience to the major concessioner, the Yellowstone Park Association, the president, Charles Gibson, wrote to the commanding officer, Capt. Moses Harris that "Individually I approve of the wide tire order."[112]

Once again, $5,000 for the purchase of the Baronett Bridge over the Yellowstone was requested. Although Kingman used the amount that the previous Superintendents had suggested, he believed it exceeded the bridge's worth, having made comparisons of the costs of recently constructed bridges. He reported that another privately built bridge had been constructed over the East Fork of the Yellowstone during the winter of 1884-1885. Even though this unsightly and unsafe bridge was not a toll bridge, it should not have been built without the permission and supervision of the engineers working in the Park.

Kingman had more than a personal interest in the welfare of the Park. He recognized the role that Yellowstone had for scientists, as well as for travelers:

> I talked with none among the thousands who visited it, who did not appreciate the wisdom that dedicated the National Park to its present uses, or who doubted that the Park was destined for a great and valuable future. It is not too much to say that if the Park can be preserved as it now is, subject only to such slight changes as are necessary to secure good roads and trails through it, and proper hotels to insure the comfort of visitors, it will become in time a health and pleasure resort unequaled in the whole world. Its maintenance is of more than national importance,

it is an object of direct personal interest, now and in the time to come--to travelers and scientists the world over.[113]

Capt. Clinton Sears, who replaced Dan Kingman as officer in charge of construction of roads and bridges in May of 1887, reported that the very heavy snows during the winter of 1886-87 had left the roads in poor condition, but by June 20, they were in very good condition. The high spring runoffs caused damage to some bridges and washed out some roads. Changes to the Gardner River's main channel undermined the south abutment pier of the main bridge, but E.J. Lamartine, the overseer, built a brush and gravel dam and revetment to steer the water into the old channel. The road near the lower Gardner Bridge had to be cleared of debris, the road crowned, retaining walls rebuilt, and the bridge replanked. The wooden trestle through the Golden Gate was strengthened by the placement of new timber supports and road-bearer cross beams. A log and pole temporary bridge had to be placed over Obsidian Creek at the ford due to the unusually high runoff.

During 1887, Sears proposed to complete the 12 miles of road between Norris Basin and the Grand Canyon of the Yellowstone, build a new 7-mile road from Swan Lake Flats to Beaver Lake, build a new road between Norris Basin and Gibbon Canyon, which would complete the 6-mile gap, and build a new road of approximately 10 miles, between Gibbon Canyon and the Firehole Basin. Captain Sears adhered to Captain Kingman's philosophy of building "thoroughly good roads and bridges, . . . rather than to attempt to secure a greater mileage of inferior roads. . . . The National Park is a great national trust, which should be carefully guarded and preserved, while, at the same time, made readily, safely, and cheaply accessible throughout its extent."[114]

Sears, who was replaced by Maj. Charles J. Allen in April 1888, proposed an ambitious schedule for 1888,[115] but due to lack of sufficient appropriations, little was accomplished that year. However, a new five-mile road was built from the Norris Hotel across the Gibbon Meadows connecting with the road into Gibbon Canyon, a seven-mile stretch from Obsidian Cliff northward, and the Norris Basin to Grand Canyon Road was finished.[116]

The mild winter of 1888-89 and the early spring weather enabled the road crews to begin improvement work about the middle of March in the Mammoth Hot Springs area and out in the park by April 15. Lt. William E. Craighill resumed command of the road construction and improvement work in the park in April. Using part of $25,000 appropriated in October 1888, Craighill purchased a 12-horsepower portable Nagle engine and a Brownell pony sawmill for $1,267.82. The equipment was delivered by rail to Cinnabar. The portability of the equipment reduced the cost of sawing the lumber for bridges and culverts.

Testing of the Park's white pine and red fir in a laboratory at the University of Minnesota revealed that the transverse strength for a cross section of 1-by 1-inch, and for a bearing of 12 inches, between points of support, power applied midway between the points, averaged 509 pounds for the white pine and 498 pounds for the red fir. The ultimate resistance per square inch to compression in the direction of the fiber, using tests upon blocks 7 inches long and 2-

inches square, averaged 4,189 pounds for white pine and 4,973 for red fir. The preferred type of timber was red fir, which was more dense and durable and not subject to as much checking and other imperfections as was white pine. Red fir was found in the park at elevations below 6,500 feet. White pine was found all over the park.[117]

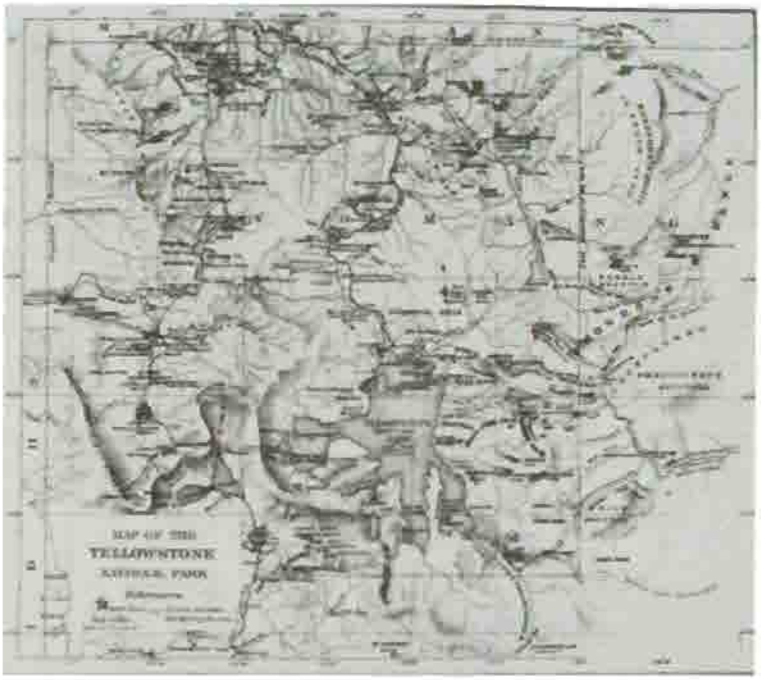
By 1889, 21 bridges had been built, including four which were considered substantial and which would meet the needs for a number of years to come. However, Lieutenant Craighill felt that eventually, as appropriations warranted, they all should be replaced with iron or stone structures.

A King and Queen post-truss with a through span of 40 feet was built over the Gardner River at the south end of Swan Lake Flats. It had a trestle span of 20 feet, a roadway width of 14 feet, and a height above low water of 6 1/2 feet. An 86-foot-long trestle bridge with a 13-foot 8-inch-width roadway between guard rails, and 5 1/2-foot height above low water, was built over the Gibbon River in the canyon. The engineers felt that a trestle bridge could be safely built because the river, which has many hot springs in its bed, would not experience ice build up. A 115-foot trestle, with a 14-foot-width roadway and 30 foot height above low water at the middle point, was built over a stream near the Yellowstone Falls. Another bridge was built near the Yellowstone Falls over Cascade Creek. This was a King and Queen post-truss, with a trestle approach of 30 feet. The span of the truss was 40 feet and the height above low water was 20 feet.[118]

By October 1889, 16 miles of new road had been built: between the Gardner River and Mammoth Hot Springs Hotel--.8 mile; in Swan Lake Flats--.9 mile; in Gibbon Canyon--2.7 miles; at the Grand Canyon--1.2 miles; on the Firehole River above the Upper Geyser Basin--3.5 miles; and on the shore of Yellowstone Lake--7.4 miles. In the improvement and construction of new roads, a mixture of gravel was added to the dark colored clay, which was found in many locales along the route of the roads. It packed well when moist. As a result of little rainfall during the summer, the roads often had several inches of fine powder or dust, which was a great nuisance to the visitors. Lieutenant Craighill recommended that the roads be covered with broken stones to help alleviate the problem.

Several construction methods changed during 1889. The 18-foot width remained the standard for level and straight sections of the road. However, widths on sharp curves were increased from 10 to 50 percent, to enable the safe passage of vehicles. The sidehill cuts, increased from 2 to 6 feet, allowed room for any accumulation to be trapped on the inner side of the road instead of reducing the width of the roadway. Dry stone walls were laid up steep hillsides. Fortunately, stone of good quality was readily available in most cases. However, Craighill found the stone in the Grand Canyon of the Yellowstone soft and unworthy as a building material. The engineering officer made an effort not to scar the landscape with unsightly borrow pits or leaving great piles of felled timber. The routine was to burn the piles if the timber could not be disposed of in any other manner.[119]

Most of the work during 1890 was in the Gibbon Canyon area and near the hotel at the Grand Canyon of the Yellowstone. Both of these projects required the construction of many retaining walls. Word reached the park in 1890 that any new road work appropriation would have a rider attached that would require the work to be done by contract. The Acting Superintendent Capt. F. A. Boutelle of the 1st Cavalry, stated in his annual report that ". . . the person who advocated that proviso must have done so very thoughtlessly, or have been ignorant of the situation." With such a short construction season and the nature of the emergency situations due to weather and topography, the use of contractors could delay the opening of the park until July. Captain Boutelle suggested that if this contract procedure should go into effect, a system for the use of day laborers needed to be included.[120]



Yellowstone National Park - 1883
Courtesy Yellowstone National Park Archives

Lt. Dan Kingman, United States Corps of Engineer and
Lt. R. C. Stivers, 9th Infantry, 1885
Courtesy Yellowstone National Park Archives

United States Army Corps of Engineers at Mammoth Hot Springs, 1880s
Courtesy Yellowstone National Park Archives

Captain Kingman (2nd from Right) In Camp at Mammoth Hot Springs, 1886
Photograph F. J. Haynes

85. Secretary of the Interior, H.M. Teller to Superintendent P.H. Conger, 14 July 1883. Yellowstone National Park Archives, Yellowstone National Park.

86. Kingman did not file any reports with the Chief of Engineers, but a later Army Corps of Engineer officer, Captain Clinton B. Sears did include Kingman's notes on road improvements and construction in his report to the Chief of Engineers. See "Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887," in *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Two Houses of Congress in Four Volumes* (Washington D. C.: Government Printing Office, 1887).

87. Ibid., 2-3.
Existing roads in August 1883:

> A road from western boundary to the fork of the Fire Hole River about 20 miles long.
> A road from the last named point to Mammoth Hot Spring-about 40 miles.
> A road from the Mammoth Hot Spring to the mouth of the Gardner River, about 4 miles.
> A road from the Mammoth Hot Spring eastward via Baronetts' Bridge towards the Clark's Fork mines, about 50 miles.
> A road from the forks of the Fire Hole River to the Upper Geyser Basin, about 10 miles.
> A road from the same point to the Falls of the Yellowstone River about 28 miles.
> And a branch from this road to the outlet of Yellowstone Lake about 8 miles.

88. Ibid., 6.

89. Ibid., 6.
Information regarding the road crews of 1883:

The teams ranged from 12 to 20 men under the supervision of a foreman, and each team was provided with a cook.

Pay scale: Common Laborer - $40 a month; Skilled Laborer- $50-$60 a month; Cook (according to size of party) $45-$50 a month; Foreman (according to their responsibility and knowledge required) - $50-$75 a month

Board was furnished. Daily ration for one man: fresh meat, or: 1 1/2 lbs., bacon or ham; 3/4 lb flour; 1 lb lard; 1/10 lb., potatoes; or 2 lbs onions or canned vegetables; 1 lb coffee roasted; or 2 ozs tea; 2/3 oz beans; or 3 ozs oatmeal or rice; 3 ozs canned fruits; or 1/2 lb dried fruit; 1/4 lb butter; or 3 ozs syrup; 1 gill pickles; or cheese 3 ozs condensed milk; 1/5 can baking powder; 7/100 lb salt; 01/100 lb soap; 4/100 lb candles; 2/100 lb vinegar 1/100 gallon pepper and matches. Portions were based upon the average cost of 80 cents a day for rations.

90. Ibid., 10.

91. Ibid., 10-11.

92. Ibid., 11.

93. Ibid., 27.

94. Ibid., 11-12. This route, though heavily timbered and covered in many places with rock and loose boulders, offered no serious obstacles to the construction of a road until the head of the canon was reached. Here for about a thousand feet, the rock walls approached each other and were nearly vertical, and the little stream in the canyon had a fall of 30 or 40 feet. Fortunately, however, the rock was of a columnar structure and there existed a natural bench, partly concealed by the talus, at about the right height, and which, by a little blasting and filling, will make an admirable road bed. 1-2.

95. Ibid., 10-11.

96. Road work projects for 1884-1885.

> 1. Repair and improvement of existing road from Mammoth Hot Springs to boundary of park toward the terminus of the park branch of the Northern Pacific Railroad about 5 miles . . . $5,000.
> 2. Complete improvements of road from the Mammoth Hot Spring to Fire Hole Basin, 36 miles . . . $25,000.
> 3. Improvement of road from Fire Hole to Canon and Falls of Yellowstone, 28 miles . . . $2,500.
> 4. Improvement of road from Fire Hole Basin to upper Geyser, 10 miles, . . . $8,000.
> 5. Improvements of branch above route to outlet of Yellowstone Lake . . . $7,000.
> 6. For repairs and improvements of the road from Mammoth Hot Springs to Yancy's, 18 miles . . . $1,500.
> 7. For constructing a new road from Yellowstone Falls via the east trail over Mt. Washburn to Yancy's, 20 miles . . . $25,000.

97. Kingman notes 1883, 23-4.

98. Rufus Hatch to Secretary of the Interior H. M. Teller, 1 December 1883. Yellowstone National Park Archives, Yellowstone National Park.

99. Ibid.

100. Superintendent D.W. Wear to Secretary of the Interior Teller, 3 December 1885. Yellowstone National Park Archives, Yellowstone National Park.

101. Lt. Dan Kingman to Secretary of Interior Teller, 25 March 1885. Yellowstone National Park Archives, Yellowstone National Park.

102. Lee H. Whittlesey, *Yellowstone Place Names,* states that, Lt. Dan Kingman, Oscar Swanson, or Ed Lamartine (the road bosses in charge of the project) probably named the canyon when they were building the first stagecoach road through Glen Creek in 1883-1884. The canyon could also have been named by park tour operator G.C. Henderson, who reported on the construction project in 1884:

> To avoid the terrible hill on the only possible route from Mammoth Hot Springs to the upper districts of the park, the government has begun a road along the west fork of the Gardner River (Glen Creek) . . . When complete, this new route - the Golden Gate - will present an easy round and one that will be accessible fully two weeks earlier than that over the mountain [present day Snow Pass] up which the road now leads. *(Livingston Enterprise, August 6, 1884.)* Lee H. Whittlesey, *Yellowstone Place Names* (Helena, Montana: Montana Historical Society Press, 1988).

103. Kingman notes, 1885.

104. Ibid.

105. Ibid.

106. Ibid.

107. Ibid.

108. Ibid.

109. Ibid.

110. Ibid., - Kingman's proposed regulations:

> 1. That all wagons used for the transportation of freight within the limits of the National Park shall be equipped with tires not less than 3 inches wide, and that such wagons be allowed to carry a net load of less than 3,000 pounds.
> 2. That for the net load of 3,000 pounds and less than 4,000 pounds, wagons shall be provided with four-inch tires.
> 3. That for all loads of 4,000 pounds net and upwards, they shall use 5-inch tires.
> 4. That it be made the duty of the Superintendent and his assistants to strictly enforce the rules.

111. Acting Secretary of Interior, H.S. Muldrow, to Superintendent, Yellowstone National Park, 25 May 1886. Yellowstone National Park Archives, Yellowstone National Park.

112. Charles Gibson to Captain Moses Harris, 23 August 1886. Yellowstone National Park Archives, Yellowstone National Park.

113. Kingman notes, 1885.

114. *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Two Houses of Congress in Four Volumes* (Washington, D.C.: Government Printing Office, 1887), Appendix AAA, "Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887," 3138-3139.

The traveled wagon roads in the Park in 1887 were as follows:

1. A road from the town of Gardiner, on the northern border of the Park, to the Upper Geyser Basin, a distance of about 50 miles. The graded portions of this road are in extent as follows: From Gardiner, via Mammoth Hot Springs, to near Swan Lake, about 10 miles. From Willow Park to the Norris Geyser Basin about 10 miles. From Gibbon Meadows to the head of Gibbon Canon[*sic*] about 6 miles. From the Lower Geyser Basin to the Upper Geyser Basin, 9 3/4 miles. The portion of this road not yet graded is in fair condition and perfectly safe for travel, a considerable amount of labor having been expended upon it yearly for repairs.

2. A road from the Norris Geyser Basin via the Grand Canon[*sic*] and Falls of the Yellowstone to Lake Outlet, about 27 miles. This road is graded for a distance of about 8 miles from the Norris Basin. The remainder of the road is in fair condition at this date. The portion of the road between the Falls and the lake is not ordinarily in condition for travel before about the middle of July, the altitude being such as to prevent the early melting of the snow.

3. A road diverging from the road to the Lake in Hayden Valley, about 8 miles from the Falls and extending to the Lower Geyser Basin, via Mary's Lake and Nez Perce Creek. The distance from the Falls of the Yellowstone to the Lower Geyser Basin by this route is about 32 miles. The road is ungraded, but in fair condition, being an excellent natural road with the exception of a somewhat precipitous descent from the plateau between the waters of the Madison and Yellowstone, on its western slope. This road from its altitude is seldom open for travel before the middle of July.

4. A road from the Lower Geyser Basin to the western border of the Park about 20 miles. This road extends beyond the Park limits to Beaver Canon[*sic*] Station, a stage line from that point bringing visitors to the Park at the Lower Geyser Basin. This is a fair mountain road and safe for travel.

5. A road diverging from the main Park road near Mammoth Hot Springs and extending via the canon[*sic*] of the East Gardner River, Baronett's Bridge, and Soda Creek, to the northeastern corner of the Park, about 55 miles, and to Cooke City, some 5 miles farther on. This road, over which all supplies for the mining camp of Cooke City are freighted, is through a rough and hilly country and throughout the greater portion of its extent is unimproved. Some slight grades have been made where it was absolutely necessary, and a few crude bridges constructed. The road has been chiefly built and kept in repair by private enterprise and is by far the worst road in the Park, being well nigh impassable a large portion of the year. Toll is very properly charged at Baronett's Bridge, as it could not otherwise be kept in repair by private means. The bridge across the Lamar River is in a very dilapidated condition and will probably not last more than a year or two longer. It would seem to be eminently proper that this road, within the Park limits, should be taken in charge by the Government, the Baronett's Bridge claim extinguished, and the road kept in proper and safe condition for travel.

115. *Sears Report, 1887, 3140.*

1. build a new road from Upper Geyser Basin to mouth of Yellowstone River via the west arm of the Lake

2. improve and complete the rough 14 mile road from Lake Yellowstone along the river to Grand Canyon

3. build a new 20 mile road from Grand Canyon to Yancy's

4. improve and complete an 18 mile road from Yancy's to Mammoth Hot Springs

116. Capt. Moses Harris, *Annual Report of the Superintendent of Yellowstone National Park for the Year 1888* (Washington D.C.: Government Printing Office, 1888), 7 and 12.

117. *Report of the Secretary of War Being Part of The Messages and Documents Communicated to The Houses of Congress and The Beginning of The First Session of The Fiftieth Congress in 4 Volumes, Volume II - in four parts, Part IV* (Washington, D.C.: Government Printing Office, 1889), "Annual Report of Major Charles J. Allen, Corps of Engineers, Officer in Charge, for the Fiscal Year Ending June 30, 1889," 2857-2859.

118. *"Annual Report, 1889," 2863.* Bridges in the park by 1889:

1. Three spans of 33 feet over Gardner River. No truss.
2. Three spans of 32 feet over Gardner River King post.
3. One span of 28 feet, a coulee. No truss.
4. Trestle of 224 feet. Kingman's Pass. [Golden Gate]
5. One span of 14 feet over West Gardner. No truss.

6. One span of 12 feet over a slough. No truss.
7. Two spans of 40 feet and 20 feet over Gardner River. King and Queen truss.
8. One span of 32 feet over Obsidian Creek. King post.
9. One span of 16 feet over Obsidian Creek. No truss.
10. One span of 32 feet over Obsidian Creek. King post.
11. One span of 34 feet over Gibbon. King post.
12. One span of 20 feet over slough at Norris. No truss.
13. Two spans of 40 feet over Gibbon. Queen post.
14. Trestle 75 feet long over Gibbon River. Queen post.
15. One span of 38 feet over Firehole River. No truss.
16. Trestle of 66 feet over Firehole River.
17. Two spans of 36 feet over Firehole River. No truss.
18. One span of 24 feet over Gibbon River. No truss.
19. One span of 20 feet over Gibbon River. No truss.
20. Trestle 115 feet long near Yellowstone Falls.
21. One span of 40 feet over Cascade Creek. King and Queen post.

Number of culverts built.. 100
Linear feet of parapets and railings................................ 1,000

119. Ibid., 2,862-2,863.

120. Captain F. A. Boutelle, *Report of the Superintendent of Yellowstone National Park* (Washington: Government Printing Office, 1890), 8 and 9.

CHAPTER III

THE CHITTENDEN ERA 1891-1905

> *The first difficulty arises from the wretched nature of the material through which the roads pass. Unquestionably there is no other spot of equal area on the face of the earth where there is such a remarkable variety of substances, and such curious combinations, in the composition of the soil . . .. He may expect to encounter in any single mile of road construction all the varities of work which he would find in building a turnpike from Portland in Maine to Portland in Oregon.*
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> *Lieutenant Hiram Chittenden, U.S. Army Corps of Engineers, 1894*

Lt. Hiram Chittenden who took over the responsibility of the road improvement and construction from Lieutenant Craighill in 1891, immediately took up the work being done on the West Thumb and Old Faithful route and on the road from the Grand Canyon to West Thumb, via the Lake Hotel area. The acting superintendent noted that Chittenden was "zealous, untiring, and remarkably efficient . . .."[121]

Because the 1891 appropriation was awarded so late in the year, Lieutenant Chittenden had two years worth of appropriations totaling $120,000 to use during the late spring and summer of 1892. All of the existing roads were put into good condition, including the 52-mile road from the Grand Canyon to the Upper Geyser Basin, via Yellowstone Lake, which opened during the fall of 1891. The road had not settled properly before the snow fell, and was thus very badly washed out and very muddy. While many of that day thought the Canyon to Old Faithful road via Lake was one of the "most picturesque drives in the park," Chittenden urged the rebuilding of "the worst, most tedious, and least interesting drives in the park," the road from the Gibbon Falls to the Lower Geyser Basin.[122]

In 1892, the Acting Superintendent Capt. George S. Anderson, recommended to the secretary of interior that the road construction appropriation be under the control of the park superintendent, a cavalry officer, not the supervising Army Corps of Engineers officer. In response to this suggestion, Lieutenant Chittenden and Lieutenant Scott made light of the proposal:

> He who builds a road occupies a peculiar position. Of necessity he is in the eyes and nose and mouth of every one who passes that way. He fills the first with admiration (or tries to), the second with dust, and the third with a miscellaneous assortment of praise and blame. If there is any one thing that every citizen of the United States feels perfectly competent to do, it is to build a road. And hence, when it catches an engineer--who thinks he alone knows it all--building one, the public takes an inning. This is as it should be. In the present case the officers of one branch of the public service are doing their duty as well as they can, while the public and the officers of coordinate branches sit in judgment and make them smart for every flaw. This also is as it should be. We welcome it and will take

> our medicine right along. We will cheerfully wear our brothers as a hair shirt and go with our duty. The officers of the Corps of Engineers seek neither place nor duty. They go where put, stay put, and cheerfully perform their duties as put, as best they may. They are neither pinks of perfection nor angels of radiant light. The under-signed makes mistakes, and is glad of it. To err is to be human, to be perfect, a mugwump.[123]

Other recommendations by Captain Anderson were for the construction of a road from Cinnabar to Cooke City and from the Upper Basin to the south boundary of the park on the Snake River.[124]

Acting Superintendent Anderson reflected his denial of control of the appropriations in his Annual Report for 1893 stating "Of the roads I can say little, as I have no voice in their construction or maintenance." However, Anderson kept his admiration for Lieutenant Chittenden and expressed his unhappiness with Lieutenant Chittenden's transfer in the early spring of 1893, "The unfortunate relief of Lieutenant Chittenden last spring has been a most serious blow to road building here. He was greatly interested in his work, tireless in his attention to it, and ably equipped for it."[125]

Insufficiency of funds and their distribution plagued the road construction projects during 1893 and 1894. By early spring, all of the previous year's monies were exhausted and ongoing repair work was done by the soldiers or by the transportation company employees. In 1893, timber clearing was completed on the West Thumb to Lewis Lake Road, a new road was laid out and begun along the Gibbon River to avoid the Canyon Creek Hill, work continued on the road that passed near the Upper Falls, and a road near the Grand Canyon at Inspiration Point was opened.[126] During 1894, the acting superintendent reported very little road work except for the near completion of a bridge over a dry ravine near Canyon.[127]

Shortly after Captain Anderson submitted his 1894 annual report, an order came from the secretary of war advising Anderson of the long awaited transfer of funds and management to the acting superintendent. With little time left in the 1894 construction season, the crews were able to complete an arch bridge near the Upper Falls, did some repair work, and built a new road between Gardiner and Mammoth Hot Springs, 1 1/2 miles from headquarters. The new road avoided the steep grades of the old road. Activity during the 1895 season increased over the previous construction season. Several new roads, one from the brink of the Grand Canyon to Inspiration Point, via a point over the Lower Falls, one from just south of Alum Creek around Sulphur Mountain, joining the old road near Antelope Creek, one from Lake Hotel to the Natural Bridge, and one beginning at a point on the old road near Gibbon Canyon south across the flats toward the Firehole and also connecting with the road down the Madison River. A bridge over the Firehole, south of Excelsior Geyser, and a bridge over the Gibbon near the mouth of the canyon at an old ford, were completed.[128] In Anderson's report he outlined proposed plans but called upon the secretary of the interior to press for more liberal appropriations. Anderson suggested that a sum of $100,000 per year, for three years, would allow the road system to be brought up to a standard where the travelers would not be bothered by excessive dust or mud and the funds necessary for annual repair and maintenance would be decreased.[129]

Despite a fairly light winter, heavy snow fell throughout the Park. The crews spent much time shoveling out the roads and travelers did not reach the Upper Geyser Basin and the Lake area until June 20th. By August, a new road from the last crossing of the Gibbon River and down the Firehole River to Nez Perce Creek had been built. A bridge, over the only crossing of the Madison River was built as part of roadwork toward Riverside. Roadwork continued toward the south entrance, including the construction of a bridge over the lower crossing of the Snake River. By the season's close, five miles at the southern end of the project had been graded and were in good condition. Anderson's assessment of the condition of the south, west, and east approach roads was that the south road was open, but needed extensive work; the west road, nearly completed, was in very good condition; and the east road, from Cooke City to Soda Butte, would be graded by the end of the 1896 season. The road from Cooke City into the Park, which had suddenly become very popular with camping parties entering from Wyoming, was now considered the worst of all of the roads.

The road crews spent time reducing the steep grades on many sections of the old road and all of the nonfunctioning culverts and unsafe bridges were replaced throughout the Park. Anderson engaged Mr. McHenry, the chief engineer of the Northern Pacific Railway, to develop plans for an iron bridge across the Yellowstone River above the Upper Falls. Determined that the visitors should be able to view the Grand Canyon from the eastern bank, Anderson decided that if the cost were not excessive, he would have an attractive iron bridge built.[130]

In his appeal for sufficient funds, the acting superintendent presented a comparative case of Yellowstone with the state of Connecticut. He explained that the $30,000 appropriation the Park had received for the past few years was not adequate for keeping the roads in good repair, for surveying and construction of new roads. He wrote "There is not an impoverished community occupying a similar area within the limits of the United States that does not yearly devote more money to the single work of road repairs."[131] Anderson believed that he could have first-class roads with the expenditure of approximately $1,000 per mile or $200,000 for the entire park. Also included in his request for funds was an amount of $5,000 to settle the longtime claim of "Yellowstone Jack" Baronett for his bridge. A proposal had been made to extract the $5,000 for the claim from the current funds for park improvement and protection. Anderson replied that acquisition of the decayed structure could never be conceived to be a work of "improvement".[132]

Captain Anderson was replaced as the acting superintendent in June 1897 by Col. S.B.M. Young, of the Third Cavalry. In addition to the task of opening and maintaining the existing roads, platforms or sidings were built for tourists to use to get out of coaches or other vehicles at different points of interest on the regularly traveled route. Also, seven new bridges were built,[133] new roads located, and assistant army engineer and his crew determined the altitude at each milepost over the Continental Divide between Norris and West Thumb, thus completing the marking of all sections of the entire park.[134] Colonel Young shared the opinions of his predecessors, " . . . the thorough repairs of the main traveled roads being of more importance than the opening of new roads."[135]

During 1897, the public pushed for a commission to establish the new road locations which would insure that the public had access to all of the wonders and grand scenery of the park. The commission, composed of an Army Corps of Engineer officer, a private citizen, and a member of the U.S.Geological Survey, were to advise the acting superintendent of their suggestions.[136]

By the end of 1897, 10,825 tourists had visited the Park with almost half using the transportation concessionaires, half, private conveyance and 235 people, by either foot or bicycle. The increasing number of visitors made more demands on the road system, so Young desired "a generous appropriation by Congress" to maintain the present roads, and hopefully macadamize a major portion, build strong revetments to protect the roads, and build permanent stone guardrails at dangerous points.[137]

As usual, inadequate funds were forthcoming and Young, who was transferred before the end of 1897, left a balance of $66.01 for his successor, Capt. James B. Erwin of the 4th Cavalry. With this amount, Erwin was faced with keeping the Gardiner to Mammoth Hot Springs road open during the winter, opening and repairing 170 miles of park roads to visitors by June 1, and protecting the game in Yellowstone from poachers throughout the winter months. In his report to the Secretary of the Interior, Erwin appealed for adequate appropriation:

> I have not the data available to make the comparisons but I doubt if there is any road in the country which is traveled so much by the public, demanding a good road, which costs so little per mile. Here is also seen the impossibility of yielding to the demands of the tourists for more new roads leading to places of interest and beauty reached now only by trails, and not to be carried over twice some portions of the route now used. The amount now appropriated is the smallest amount with which the protection and present road condition in the park can be maintained, and if Congress intends to ratify and make good its dedication of the park to the people of the United States as a pleasuring ground for its benefit and enjoyment, it should yield to the demands of the people and make additional appropriation for the construction of new roads, which will add to their pleasure and benefit by opening new and wonderful phenomena and scenery.[138]

In 1899, the road construction and improvement program responsibilities returned to the Army Corps of Engineers and fortunately under the direction of by then, Capt. Hiram Chittenden. After receiving his orders to take charge of the engineering work in Yellowstone, Chittenden immediately used his previous two years' experience in the park to formulate a plan for the completion of the 300-mile road system. His knowledge of past inadequate appropriations and the untimely schedule for distribution of funds, prompted him to press for a one-time appropriation of $300,000, which he felt would be sufficient to complete the Park's road system. This project would cover the completion of the Belt Line (Grand Loop), the construction of the other needed roads and bridges on the Belt Line and the approaches to the Park, a new office, other necessary buildings, construction plant, equipment and supplies, and maintenance and repairs of existing roads for the 1899 season. Chittenden envisioned the need for two separate types of appropriations; one for construction and one for maintenance.[139] Chittenden pointed out that the only time real progress was made on the system was in 1891 when two appropriations for a combined total of $120,000 were used to construct 60 miles of road.

Despite an organized approach to the road work, Yellowstone only received $89,465 for 1899 and 1900. For the first time, the appropriation included a qualifying clause which earmarked $20,000 of the funds for the construction of a road from Yellowstone Lake to the eastern boundary of the forest reserve in the Shoshone Valley. Without receiving his requested appropriation of $300,000, combined with the addition of 50 miles plus of the new road construction, Chittenden did not complete his ambitious plan for 1899; but he began to tackle major projects. He began the multiyear reconstruction of the Golden Gate viaduct, and he began the locational survey and preliminary work on the East Entrance Road (Yellowstone Lake to forest reserve). In addition to construction projects, Chittenden purchased various types of construction equipment and vehicles.[140]

At last in March 1901, Congress made a reasonable appropriation of $113,000 immediately available to Chittenden. Allowed more flexibility to use the money where needed, Chittenden felt that the he was able to get 20 percent more work done, dollar for dollar. By the end of the year, the engineers had begun a road from near Yancey's to Soda Butte and to Tower Falls. Chittenden preferred to call the Soda Butte road (which is part of the Yellowstone River to Cooke City Road) a side road and not an approach road, since there were no plans for it to be used as an approach to Yellowstone.[141] The road through the Gardner Canyon was shifted to the left bank of the river to eliminate a dangerous section. Work continued on the east and south approach roads and construction extended into the Teton Forest Reserve.[142] In addition to general repairs and a few minor projects, Chittenden experimented with the use of sprinkling on a 4-mile stretch of road from above Golden Gate to Swan Lake Flats, to eliminate the ongoing dust nuisance. Chittenden considered this section as "by far the best in the Park, and it is the only section that can strictly be called a completed road."[143]

In estimating his funding needs for 1902-03, Captain Chittenden figured $25,000 in the annual repairs necessary for about 250 miles of road in the Park and the forest reserve. He also faced the overwhelming problem of the road's surface and resulting dust and/or mud. Having three years' experience of seeing the impact caused by the increased visitation on the road surfacing and having completed his experiment with sprinkling, Chittenden put this problem as a high priority. He felt that the resolution was to metal the entire roadbed, using crushed rock or another similarly good material. His goal was to make the surfaces so hard that it would be difficult for ruts to form. This method, Chittenden thought, would reduce the maintenance problem by three-quarters and sprinkling the roads would eliminate any remaining dust. The estimated cost for covering the 18-foot width with an average thickness of 6 inches of crushed rock or gravel was approximately $2,000 per mile or $300,000 total for the necessary principal roads. As an interim measure and a more realistic goal, Chittenden considered finishing only half of the road surface of the most urgent road sections (about 60 miles). Hence for the season beginning in 1903, Captain Chittenden submitted a request for $250,000 for road projects.[144]

While maintenance had been performed on the road system in Yellowstone National Park for a number of years, Capt. Hiram Chittenden can be attributed with giving it a major place in the budget and in the daily operations of the Park. Soon after his return to Yellowstone National Park in 1899, he called for the separation of appropriations into two parts, with one being used strictly for maintenance.

In a speech before the International Good Roads Congress in 1901, Captain Chittenden described the unusual conditions of building and maintaining a road in this very diverse area. The physical conditions of Yellowstone presented the engineers with tough challenges:

> The torrential waters of the streams and their susceptibility to springtime flooding had to be reckoned with; the climate of the park falls between two extremes, frequent and heavy rain in the spring and later in the summer, lack of rain causes the road surface to completely dry out and then the travelers suffer from excessive dust; the composition of the soils and rocks in the park "present a greater variety, in all probability, than any other region of like extent upon the face of the globe" (it ranges from the granites to the very softest material of the geyser formations). Chittenden felt that on the whole the material found in the park was "inferior character" for road work. Most of the rock was of volcanic origin and not hard enough to withstand the wagon wheels, the soft geyser formation material was considered worthless, and the soil found over much of the park, contained crystals of black rock, resembling obsidian, which had no adhesive power and was easily cut through by the wagon wheels.[145]

Chittenden explained to the International Good Roads Congress that the roads were principally designed for tourist traffic and secondarily, for use in freight haulage. The main Belt Line's (Grand Loop) limiting gradient was 8 percent, but on the forest reserve to Yellowstone Lake Road, a 10-percent gradient had to be used in places to surmount natural obstacles. A 10-percent gradient was also used in other areas where light vehicles were mainly used. In order to deal with long ascents and help wagon drivers with the strain of holding the brakes on for long periods, level sections were added approximately every half mile. For the most part, curves were designed for more than a 100-foot radius. However in some cases, the radius had to be 50 feet.

The 18-foot road width was flanked by 6-foot ditches or slopes. The normal clearing or right-of-way had been 30 feet. Chittenden found that in some cases more clearing needed to be done on the south side of east and west routes, to allow more sun in to aid in melting the accumulated snow. The ditches proved to be adequate for drainage, and until that point, no blind drains or other methods had been used. In some cases, Chittenden built stone road beds or used corduroy, which was submerged under water, to prevent decay. Because of the dry period and the dust problem during part of the season, the engineers tried to retain moisture and thus did not like to drain the water from the ground.

Chittenden announced to the group that the road system required an enormous number of culverts. Up to that time (1901), most culverts had been built of wood, but he was systematically replacing them with vitrified-clay or iron pipe. The wooden bridges with rock-filled wooden abutments and piers, were being replaced by steel constructed bridges with solid concrete abutments or tubular piers.

Captain Chittenden pointed out that his most serious and pressing problem was road surfacing and the resultant dust and he explained to the gathering his plan for coping with it. Reiterating the problems with the locally available materials, he cited his plan to macadamize theroads in areas where he found good quality, rock or where the hauling distance was not prohibitive. He found that a particular "pinkish" color formation produced an acceptable surfacing material.

In addition to trying to macadamize as much of the system as possible, Chittenden initiated an extensive sprinkling program. Prior to his one year experiment on the Swan Lake Flats section south of Mammoth Hot Springs, Chittenden investigated the use of oiling the roads during visits to San Francisco and Bakersfield, California, where this method was considered a complete success. Despite the variables in weather, and soil conditions and the high cost of transportation, Chittenden felt it might be worth a trial. Chittenden envisioned one oiling per season and he thought that during the wet season, the oil would probably cause the water to run off the roads, thus reducing the mud problems.

In his talk, Chittenden explained that the obvious problem of snow, was not as great as one would think since the visitor season was quite short, June 1 to September 30. The main snow-related problem was the spring runoff. In most years, the snow on the main circuit melted by June 1. However, shoveling was resorted to if necessary and the construction of snowsheds was being considered for roads kept open during the winter.

Mileposts and information signs, giving traveler information and identifying objects of interest, had been placed on the main roads; but Chittenden felt it was time to "perfect and embellish" the road system. This highly placed priority would "greatly enhance the beauty and value of the roads." The engineer proposed to clear all dead and downed timber for the distance of 100 feet and to thin the living trees to allow grass to grow among them and to encourage the game that frequented the area. He planned to rebuild the retaining walls with fine masonry and position strong guardrails at the most precarious points; the slopes and cuts would be thoughtfully aligned, and where possible, small water courses would be carried along the routes. Chittenden felt that, "In these and other ways the roads will themselves be made one of the interesting features of this most interesting region."[146]

In Chittenden's closing remarks at the meeting, he emphasized that the completion of a good road system in the Park would probably reduce the ongoing pressures from others to permit railroads or electric railways within the Park. The efforts to introduce the railroads were usually based upon the complaints of disgruntled travelers. The Army engineer relayed to the group a philosophical goal that guided his plans in the Park:

> It is not the policy of the Government to permit any undue extension of the road system of the Yellowstone National Park. On the other hand, it is intended to restrict the roads to the absolute necessities of making the more important features accessible. But while it is not proposed to build any roads not actually needed, nor to change in any unnecessary way the original face of the country, it is proposed to make such roads as have to be built as perfect as any mountain roads in the world. . . . It is the purpose of the Government to maintain these reservations as far as possible in their original condition, unchanged by the hand of man.[147]

One aspect of maintenance that Chittenden knew needed serious consideration was supplying and positioning the necessary number of men in the appropriate locations for work. In 1901, the government provided housing and subsistence, for which the workers were paid 40 cents a day. All of the working parties lived in a road camp.

During 1902, work continued on previous years' projects, including the Gardner Canyon Road, the East approach road, the South approach road, the Bunsen Peak Road, reconstructing the Golden Gate, and general repairs and maintenance. The tourists and Captain Chittenden considered the 1901 sprinkling experiment successful. Besides significant reduction in dust, the treatment seemed to discourage the deterioration of the road surface.

The major drawback to the experiment was the poor water supply throughout the Park, which resulted in the construction of six large wooden tanks for filling the sprinkler.[148] Overhead flow was provided into three of the tanks. A platform on the rear of the sprinkler held a two-handled diaphragm force pump. Two men could fill a 750-gallon capacity sprinkler in 15 minutes from a direct connection near the bottom of the tank, which forced the water in. An 18-foot-long, 3-inch hose connected the pump to the tank. The sprinkler's front axle was built 12 inches shorter than the rear axle, allowing the machine to double as a road roller. Generally, the sprinklers ran early in the morning and late in the evening. The choice not to apply water during the sunnier, and in many cases, windier part of the day, resulted in a much lower evaporation rate. Chittenden believed that if a unit could cover 5 miles, the cost for 75 days would be approximately $125 per mile.[149]

During 1903 and 1904, several of Captain Chittenden's major contributions to Yellowstone National Park were initiated and completed: the Engineers Building, the Yellowstone River Bridge, North Entrance Arch, and the Mount Washburn Road. A number of buildings including the United States Engineering Office, a commissary and storehouse, a machine shop with quarters above, two storage sheds, a stable and a bunk house were built. The stone and concrete Engineers Office, was heated by hot water and was wired for telephones and electricity.[150]

Captain Chittenden felt that the heavily traveled highly visible northern entrance at Gardiner, Montana, deserved an impressive entrance gate. The Northern Pacific Railway's train station, designed by Robert Reamer, had been completed adjacent to the boundary on the western edge of the Gardiner and a new route into the Park was scheduled for construction. Chittenden called Reamer "an architect of great originality and particularly skillful in adapting his work to natural surroundings."[151] Chittenden felt that with the completion of the new rustic design train station, the timing was right to further improve the north entrance with a compatible entrance arch. The railroad and the wagon roads ended in two loops, with the train station placed in between. One side of the station was used to unload the passengers and the other side, for the conveyance of carriages. On the carriage driveway side, an artificial pond was constructed.Approximately 30 feet above the train station grounds, Chittenden constructed the entrance arch.

> The gate consists of two square stone towers with a batter of one in thirty, the bottom dimension being 13 feet 3 inches square. The clear space between the towers at the ground is 19 feet 8 inches. It is closed over by an arch, the crown of which is 30 feet above the ground. This arch curtain is 5 feet thick and is built up to the same height as the towers. The entire structure is 50 feet high and is capped with a concrete roof, roughly shingled with the chippings from the cut stone used in arch. The character of the masonry is entirely original. It consists of columnar basalt taken from a quarry nearby in approximately hexagonal prisms. Stones have been used just as found with the least possible dressing, retaining their natural weather worn condition. The points of the prisms project beyond the plan of the face, to the whole structure a novel appearance in a masonry work. The two base courses are roughly cut, as, of course, are the stones in both the small and the large arch openings. The cutting of this stone was a very difficult matter, owing to the extremely hard quality of the rock.
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> The side of the structure which faces the station is ornamented with three tablets. The largest is 3 feet 10 inches by 20 feet 8 inches, and bears the inscription: "FOR THE BENEFIT AND ENJOYMENT OF THE PEOPLE," an extract from the Act creating the Park. The smaller tablet on the left tower is inscribed, "YELLOWSTONE NATIONAL PARK," that on the right, "CREATED BY ACT OF CONGRESS MARCH 1, 1872." These tablets were molded entirely of concrete. The forms for the letters were manufactured by the Stillwater Manufacturing Company of Stillwater, Minnesota, and were cut out in with great accuracy. They were made so as to give a depressed letter in the concrete and with a triangular cross section so as to be easily removed after the concrete was set. They were nailed upon a suitable frame which was placed in position to close a recess left for the purpose in the masonry. For the larger tablet this space was 18 inches deep, that is 18 inches from the face back into the wall. The concrete used was in the proportions 1 - 2 - 4. A mortar facing was put in at the same time, sufficiently thick to cover the letters. The concrete rested directly upon the masonry below it. As such as the space was filled and before the concrete had set, the course of stones above was laid upon it, so that their weight pressed into

> the block making it perfectly laid. The forming was held in position by means of rods laid in the wall.
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> Extending from the center of the arch in both directions for a distance of about 50 feet are two wing walls 12 feet high, terminating in square towers about 14 feet high. From the tower, walls 8 foot high, extend along each branch of the loop to the Park boundary.[152]

The corner stone for the North Entrance Arch (also known as Gardiner Arch) was laid in a ceremony attended by President Theodore Roosevelt on April 24, 1903, and the first visitors passed through the arch on September 1, 1903.[153] A fence was built to protect the newly landscaped pond area from cattle. Grass was sown and shrubbery planted in the entrance gate park, which was irrigated from the Gardner River. During the spring of 1904, the pond had to be dredged to remove the silt that had poured down from the surrounding hills with the snow water. Trees were planted along the new road across from the Gardiner flats.[154]

During 1903-1904, the road received additional work. Since it was the most heavily traveled road, its width was increased to 25 feet and its gradients reduced to 8 percent. The entire road was surfaced with gravel or macadam. Material taken from the steep bluff, 1/2 mile from the entrance gate, was used to surface the first 2-1/2 miles from Gardiner. All culverts were replaced with vitrified clay pipe or cast iron, and four steel bridges with concrete abutments were built.[155]

Nine important bridges were constructed in the Park during 1903. The most impressive was the Melan Arch Bridge over the Yellowstone River, above the Upper Falls. The steel and concrete bridge was completed with great difficulty, however, Chittenden felt that this location merited an artistic design because of its prominent location in the Park. For many years, the idea of a bridge in this location had been contemplated, but lack of funds prevented its construction. Chittenden spent considerable time on the site selection. Not wanting to introduce an artificial structure at the most desirable and obvious site, the brink of the Upper Falls where the gap narrows to 50 feet, Chittenden chose a 120-foot span between two jutting rocks, about 1/2-mile above the Upper Falls at the rapids. Despite the volcanic rhyolite rock being of inferior quality for construction, Chittenden stated, ". . .still from the fact that it has resisted for an indefinite geological period the action of the river, it must have considerable stability."[156]

Including dangerous rapids just below, Chittenden had many obstacles to overcome. One of the most serious was the construction of the framework and related framing. All of the rough material was cut locally, but the finer lumber came from the Pacific Northwest. Using a small dynamo, borrowed from the hotel company and connected to the rock-crusher engine and a temporary plant to provide artificial light, the crews were able to complete the concrete work by working around the clock.[157]

Due to the position the bridge had in the public's eye and its unique difficulties, the owners of the Melan arch patent relinquished all royalty payments. Some of the material for this bridge as well as material for the others built that year came from the American Bridge Company.[158]

Work continued on the Mount Washburn Road during 1903, with 10 miles of well-graded road being finished. The section of the road lying under an overhanging cliff near Tower Falls proved to be a difficult section. Working through the winter, this very scenic section was completed. Additional new sections were completed on both sides of Dunraven Pass and a new road replaced a dangerous section near Ox Bow Creek between Tower Falls and Mammoth Hot Springs. The Crescent Hill Canyon Road was widened.

The sprinkling program expanded to include the road from Gardiner to Norris Junction. Sixteen sprinklers were used on approximately 55 miles of roads.[159]

The following year, 1905, was the last full year that Maj. Hiram Chittenden directed the improvements in the Park, before being transferred to Mount Rainier National Park in Washington, to supervise road construction projects there. During his last year, sprinkling had been extended to over 100 miles of park roads. The installation of gravity tanks in various locations on the Belt Line reduced the expense of the extra labor involved in manual pumping. Many road reconstruction projects were underway -- widening, resurfacing, cutting down the hills and filling the hollows, and realignments.

One of the most important road projects was completion on the Mount Washburn Road between Tower Falls and the Grand Canyon of the Yellowstone. Chittenden found that the presence of solid rock on most sections of the road made construction very difficult and slow. The road's width ranged from 18 to 20 feet. Other projects involved most of the other sections of the park.[160] Many bridges were built and/or reconstructed during this time. Most of the existing wooden bridges were redecked.[161]

Prior to his departure for Mount Rainier, Major Chittenden summarized the status of the road system and made recommendations for future work in his report to the chief engineer. He stated that all roads that had ever been proposed had been built, a few roads would need minor realignments, the sprinkling program had been completed to the expected level, the dust problem had been largely resolved, and the east and south approach roads would be adequate unless rail facilities were brought closer to the Park in those directions. Chittenden felt that Yellowstone had a good road system in spite of the volume of traffic almost doubling since the turn of the century. However, Chittenden warned that if traffic increased in like proportions in the near future, "a new situation is created, which must be met in the near future."[162]

General recommendations included: widening the 180 miles of Belt Line roads to a width of at least 25 feet; building guard walls where steep sidehill slopes occurred; building the new guard walls in mortar and rebuilding the existing ones in the same manner; clearing dead and downed timber for a width of 100 feet from the roadway as a precaution against fire and as a scenic improvement; continue replacing wooden bridges with steel or concrete bridges; continue replacing wooden culverts with vitrified clay-pipe culverts; possibly modifying the ditches to meet the requests of the stage companies, who wanted at least one side of the road available for possible meeting of runaway coaches or other needs; bringing the western approach road up to the standard of the Belt Line; and continuing maintenance and development.

Chittenden warned that the road surfacing problem remained a cause of concern. He explained that in the past four years, nine-tenths of the Belt Line had been surfaced. Machine crushed rock, hand broken stone and gravel were all used. Chittenden recommended the use of crushed rock for both the foundation and the surfacing material, with subdrainage if necessary. He stated that good gravel, also an excellent material, was easier on horses than rock. Major Chittenden estimated that the cost of surfacing and widening the roads, the construction and reconstruction of the guard walls, building and maintaining the side roads, plus 10 percent contingencies would total $2,023,065. Thus far, the average cost per mile in Yellowstone National Park amounted to approximately $3,000 per mile, compared to the average cost in the Eastern United States of $5,000 to $8,000 per mile. Chittenden's projected estimate would raise the parkwide average to approximately $8,700 per mile. He felt that considering the remoteness of the location, the short construction season, the high transportation costs, the unusual geological conditions, this higher amount was still reasonable. Major Chittenden believed that the future work, spread over 10 years, would result in the park road system rivaling any of the best roads in Europe. Chittenden pointed out that as the Park grew in importance, the demands on the roads would increase. He outlined specific projects that needed attention:

> MAMMOTH HOT SPRINGS to NORRIS--great care should be taken in widening the road through the "Hoodoos" to prevent the destruction of unusual rock formations. "It will be better to let the right of way have an irregular alignment--being narrower in some places than in others--than to sacrifice this peculiar formation in order to get a uniform width throughout. . . .it would be better to require all teams to come to a walk there than to remedy the defect by blasting out those picturesque rocks."[163] Forested areas at Apollinaris Springs, a point 8 1/2 miles from headquarters, Crystal Springs, and at mileposts 13, 14, and 17 miles out should be cut back on the east side about 30 feet to expose the snow to the sun. However, if these forests contained fine specimens of trees, the stands should be preserved. The Apollinaris Springs, Kepler Cascade, Mud Geyser and other coach-unloading platforms should be rebuilt and extended to a length of 100 feet.
>
> NORRIS TO FOUNTAIN--the route of the road from Fountain Hotel to Firehole Lake and the Great Fountain Geyser should be changed with great care given in the hot springs vicinity. The wooden bridge at Riverside Geyser should be replaced with an ornamental bridge. The new bridge should be moved downstream a few hundred yards to remove the unnecessary twist in the road.

UPPER BASIN TO THUMB--great care should be given in widening this section of road to prevent ruining the attractive landscape features--the clumps of willow shrubs. "Wherever the openings in the shrubbery permit, the roads should be given extra width, with narrow stretches between the clumps of willows."[164]

LAKE HOTEL TO CANYON--an 18-inch pipe culvert and an embankment should replace the small bridge over the dry ravine 4 1/2 miles below Lake Hotel. Concrete culverts should replace the bridge over Sulphur Creek and the one over a stream to the south of Otter Creek. Eighteen-inch pipe culverts should replace two short bridges on the sidehill grade above the second milepost from the Grand Canyon. The Alum and Otter creek bridges should be rebuilt with shorter spans.

CANYON TO TOWER FALLS--earthen embankments and pipe culverts should replace most of the temporary bridges on this route. In some cases, wooden cribs should support the lower side of the embankments. Chittenden believed that these timber cribs when filled with rocks would last for twenty to thirty years. The Major suggested a possible change to the road location from about 1-1/4 miles south of Dunraven Pass to the top of the ridge, where the climb from the hotel at Canyon ends. The original intent was to build on a near level line, however, the surveyor who was told to run a constant grade between the two points, became leery after seeing that a swampy area lay in his path. Without permission he ran the line above the swamp resulting in a rise and fall of 70 feet on the line. Chittenden did not feel that the difference was that great but, he wrote ". . . nevertheless, the location is not what was intended and not what it ought to be."[165]

TOWER FALLS TO MAMMOTH HOT SPRINGS--if the maintenance to the existing road, which he felt should never have been built in 1898, became excessive due to landslides, a lower route should be constructed.

NORRIS TO CANYON--Chittenden felt that this, the route of worst road in the Park had been ill chosen. However, consideration of the amount of work that had gone into it, and the "fixed termini" discouraged the planning of a new route. Almost the entire route was on native rock; it's character was such that it disintegrated quickly. He felt that the repeated ups and downs gave the road an unattractive appearance. Although the steep grades on Blanding Hill and a steep hill on the slope next to the Grand Canyon had been reduced, he called for the remaining hills and hollows to be evened.

SOUTHERN APPROACH--Chittenden recommended that instead of the road terminating at the mouth of the Buffalo Fork in Snake River, a road should be built at the foot of Jackson Lake then over the Teton Pass to the forest reserve boundary. This would give access to southeastern Idaho.

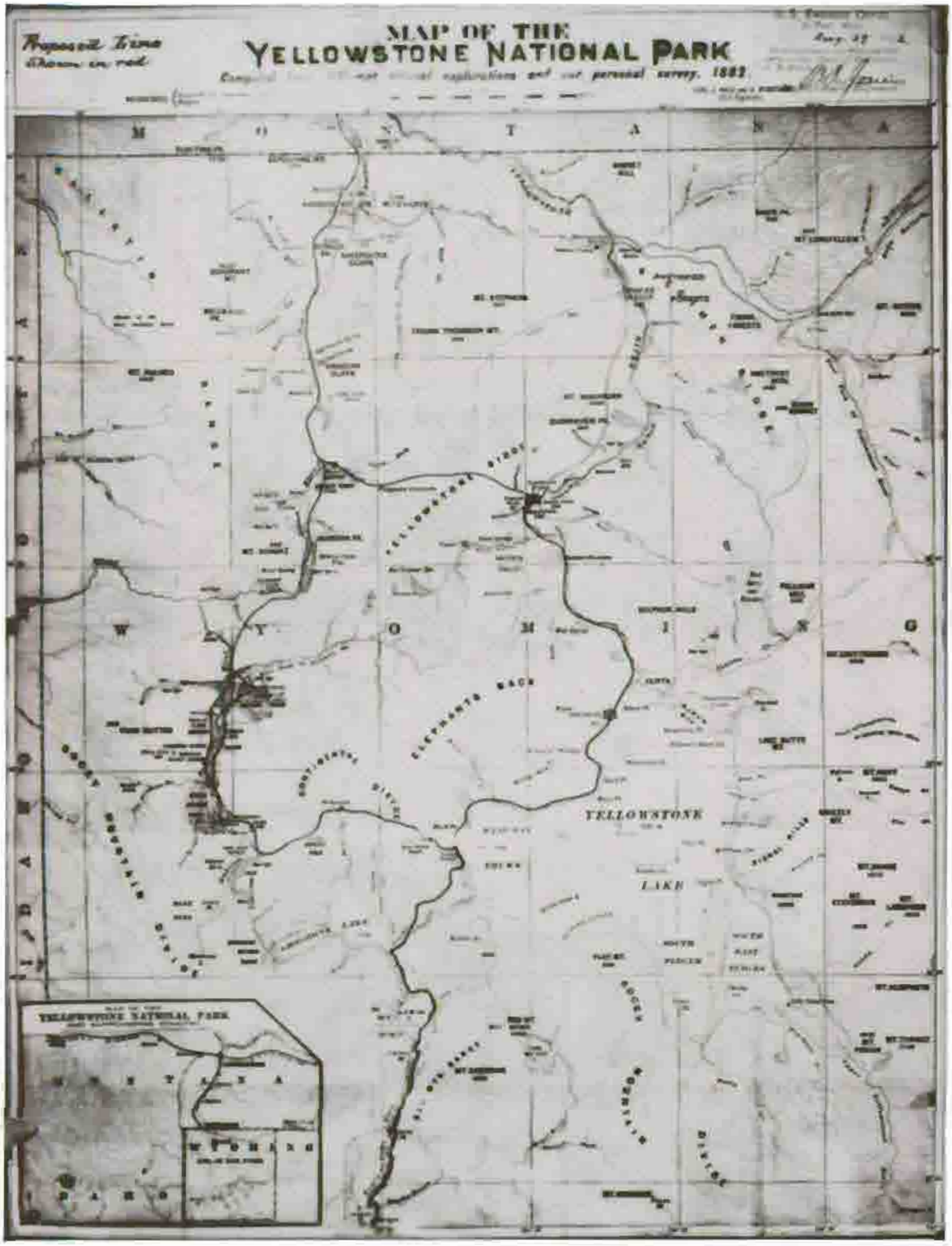
> WESTERN APPROACH--due to the proposed construction of a new railroad station and the proposed hotel to be built at Riverside, a short section of road had to be relocated. Chittenden suggested that "While the ground would probably admit a single tangent over the entire relocation, it is recommended that whoever lays out the road adopt a sinuous line, so as to shorten the view ahead and enhance the interest to travelers."[166]

Major Chittenden believed that the sprinkling program served three important purposes. The primary purpose was to the eliminate the problem of dust; secondarily, the sprinkling aided in the maintenance of the roads, as prolonged droughts caused rapid deterioration of the surfaces; and since most of the manmade fires were in close vicinity of the roads, the repeated passing of the sprinkling wagons assisted in spotting the fires soon after their inception.

Chittenden proposed the construction of road camps for crews of 13 to 15 men including a cook. Besides bunkhouses and mess halls, the camps should have buildings in which to store forage. In order to avoid damaging the roads by hauling forage during the spring when they were soft, Chittenden felt the forage should be stored during the fall. His idea was for two crews to work from one camp, with each crew responsible for about five miles of road. The road camps would be situated approximately 8 to 10 miles apart. Chittenden felt that if this scheme were carried out, the Park would have a systematic method for general maintenance, sprinkling, and development of the road system.

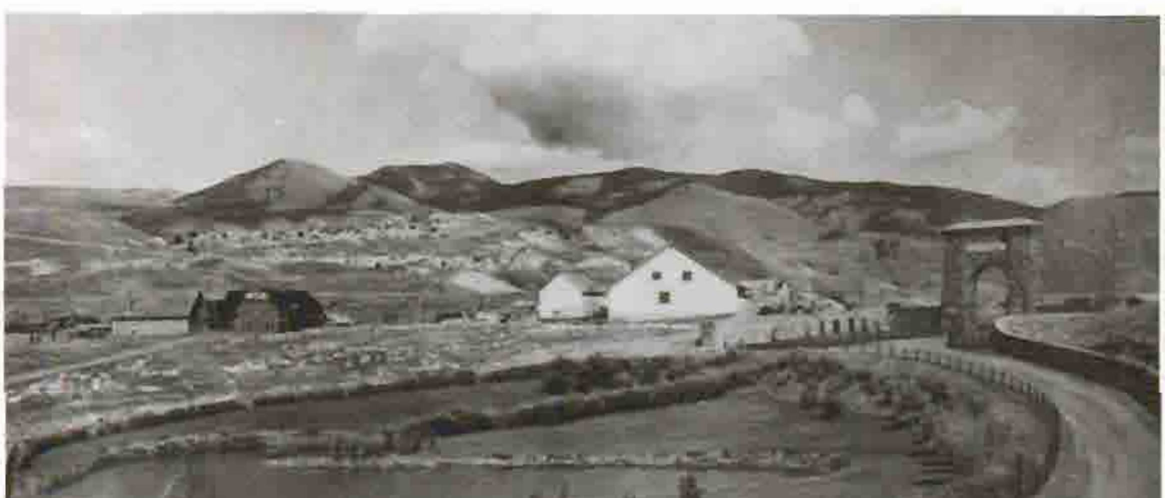
Chittenden called for Yellowstone National Park to be made a separate district within the Army Corps of Engineers because he felt that the amount of work required in Yellowstone was hampered by the additional duties assigned for projects outside the park boundaries. He recommended that all work be continued with the use of hired labor. His experience with contractors had always been unsuccessful, thus he suggested that the hiring of teams be done in the open market at a fixed rate schedule. In 1905, the hiring of teams was the only type of contract labor remaining.[167]

Chittenden warned the chief engineer that the proposals by the people of Bozeman and Red Lodge, Montana, for two new roads into the Park were objectionable to him. He believed that Yellowstone had enough roads and that the four existing approach roads met the needs of the public. The two roads proposed by the citizens of the two communities would be "of local importance mainly, and as such are not justified as public measures." Chittenden estimated that both roads, which would have to cross high country, would only be available for travel for an average of two months a year. He figured the Red Lodge to Cooke City Road would cost approximately $80,000 plus maintenance, and the Bozeman road through the northwest part of the Park would cost approximately $50,000 plus maintenance. Chittenden wrote, "It would be bad policy to increase that burden unless there is positive public necessity for it. It will be a great deal better to develop and perfect the present system of roads than to extend it unduly."[168]

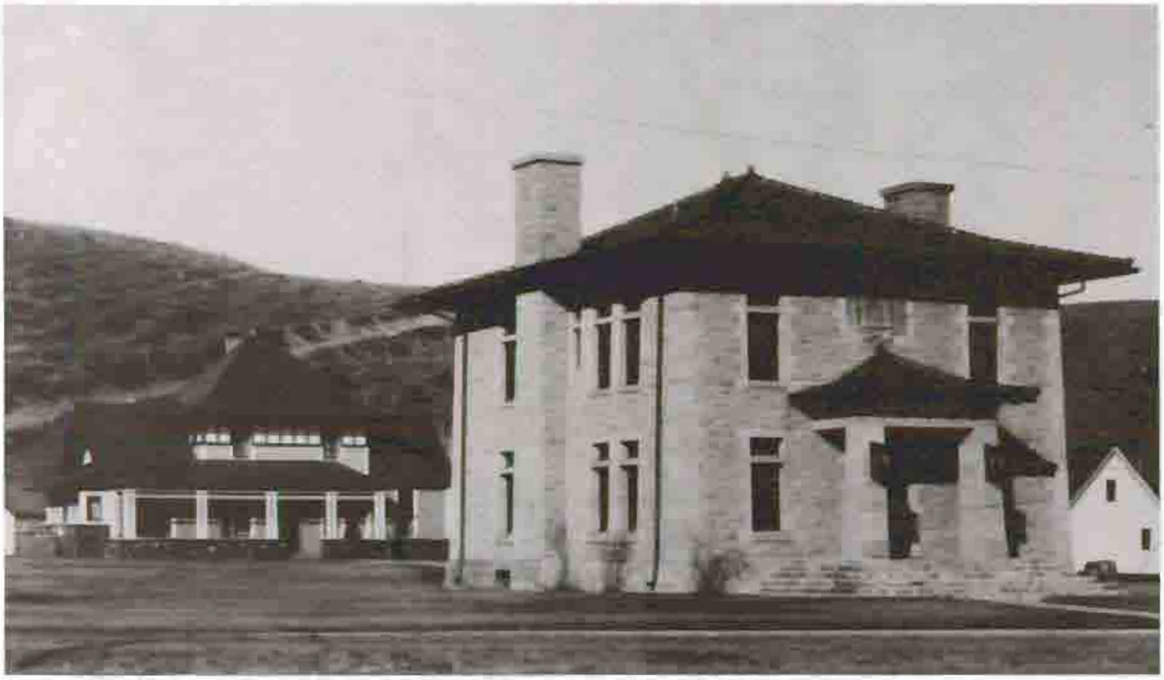


Yellowstone National Park - 1892
Courtesy Yellowstone National Park Archives

Hiram Chittenden, U.S. Army Corps of Engineers
Courtesy Yellowstone National Park Archives



Gardiner, Montana, 1904
Courtesy Yellowstone National Park Archives



U.S. Army Corps of Engineers Office - Chittenden Residence in Background, 1905
Courtesy Yellowstone National Park Archives

Road Crews on Mt. Washburn, 1903
Courtesy Yellowstone National Park Archives

Chittenden Bridge

Golden Gate Viaduct, late 1880s
Courtesy Yellowstone National Park Archives

Stage Coach and Dust on Park Road, ca. 1900
Courtesy Yellowstone National Park Archives

Lewis River Bridge, 1905
Courtesy Yellowstone National Park Archives

Middle Gardner River Bridge, Early 1900s
Courtesy Yellowstone National Park Archives

Middle Gardner River Bridge on Hill Road to Gardiner Montana, Early 1900s
Courtesy Yellowstone National Park Archives

ENDNOTES

121. Capt. George S. Anderson, *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1891* (Washington, D.C.: Government Printing Office, 1891), 6.

122. Capt. George S. Anderson, *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1892* (Washington, D.C.: Government Printing Office, 1892), 3 and 5.

123. Maj. W. A. Jones, Corps of Engineers, *"7th Indorsement U.S. Engineer Office, Saint Paul, Minnesota, November 14, 1892."*

124. Anderson, *1892, 11.*

125. Capt. George S. Anderson, *Annual Report of the Superintendent of Yellowstone National Park to the Secretary of the Interior, 1893* (Washington, D.C.: Government Printing Office, 1893), 8.

126. Anderson, 1893.

127. Capt. George S. Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1894* (Washington, D.C.: Government Printing Office, 1894), 8.

128. Capt. George S. Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1895* (Washington, D.C.: Government Printing Office, 1895), 8.

129. Anderson, 1895, 11.

130. Capt. George S. Anderson, *Report of the Officer in Charge of Construction and Maintenance of Roads, Etc., in the Yellowstone National Park to the Secretary of War, 1896* (Washington, D.C.: Government Printing Office, 1896), 5.

131. Anderson, *1896, 8.*

132. Ibid., 11.

133. Col. S. B. M. Young, 3rd Cavalry, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1897* (Washington D.C.: Government Printing Office, 1897), 4. Bridges built in 1897: (1) Trout Creek, (2) Firehole River at Riverside Geyser, (3) over ravine near West Thumb, (4) Gibbon River in Virginia Meadows, (5) Green Creek, (6) footbridge over Firehole River near Biscuit Basin, and (7) over east branch of Gardner River above Undine Falls.

134. Col. S. B. M. Young to the Quartermaster General, 13 August 1897. Yellowstone National Park Archives, Yellowstone National Park.

135. Ibid.

136. Young, *Report of Acting Superintendent, 1897, 24.* There is little historical documentation relating to this commission.

137. Ibid., 22 and 34.

138. Capt. James B. Erwin, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1898* (Washington, D.C.: Government Printing Office, 1898).

139. Hiram Chittenden, *"Roads in Yellowstone National Park,"* - Senate, 226, 50th Congress, 1st Session. Acting Secretary of War Transmitting in Response to Resolution of the Senate of March 12, 1900, Letter from Chief of Engineers, U.S.A., Together with the Copies of Originals of All Reports Relating to the Present Condition and Appropriate Plans for the Development of the System of Roads in the Yellowstone National Park. The monies would cover:

1.	New road in Gardner Canyon, including three steel bridges	$10,000
2.	Road through Golden Gate Canyon, including new steel bridge to replace wooden bridge around cliff, and widening road along cliff, the latter all solid rock	15,000
3.	Raising (sic) 3 miles of road in Gibbon Canyon and cutting out 1 mile of dangerous grades; also opening 4 miles of new road down the Gibbon to connect with the western approach	16,000
4.	Completion of 8 miles of road near Fountain Hotel	8,000
5.	Completion of southern approach along Snake River 20 miles	20,000
6.	New road from West Thumb to Natural Bridge, cutting out present line around Lake Shore, 8 miles	16,000
7.	Surfacing new road from Lake Hotel to Grand Canyon, 15 miles	6,000
8.	New bridge across the Yellowstone, near the falls	20,000
9.	New road down right bank of Grand Canyon, 3 miles	6,000
10.	New road near Grand Canyon to cut out dangerous hills	5,000
11.	New road, Canyon to Norris, 10 miles	20,000
12.	New road, Grand Canyon via Tower Falls to Mammoth Hot Springs, 36 miles	72,000
13.	New bridge over Yellowstone near Tower Falls	10,000
14.	New bridge over Lamar River	5,000
15.	Completion of east approach, 15 miles	15,000
16.	New plant	5,000
17.	New office and other buildings	5,000
18.	Current repairs and maintenance for season of 1900	10,000
19.	New bridges at various points, six needed at once	12,000
20.	Office, Transportation, and miscellaneous expenses	10,000
21.	There should also be added for clearing out and rendering more easily passable the numerous trails throughout the park, which are essential to its proper police and protection	5,000
	TOTAL	300,000

Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sergeant Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers, Appendixes FFF and JJJ *of the Annual Report of the Chief of Engineers for 1901* (Washington, D.C.: Government Printing Office, 1901).

140. Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sergeant Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes FFF, III, and JJJ *of the Annual Report of the Chief of Engineers for 1901,*

3778-3780. Additions to the plant were two and 1 single-seated surrey for inspections uses, 1 boom derrick with complete fittings, 1 hoisting engine, 2 dump carts, 2 hovelcarts, 1 pile-driving outfit, 6 wheel scrapers, and 63 tents.

141. Ibid., 3,784 and 3,787-3,788.

142. Chittenden to Brigadier General G.L. Gillespie, Chief of Engineers, U.S. Army, 7 December 1901, 1-2. Yellowstone National Park Archives, Yellowstone National Park.

143. Ibid., 10.

144. Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes FFF, III, and JJJ *of the Annual Report of the Chief of Engineers for* 1901, 73.

145. Chittenden, *The Government Road System of the Yellowstone National Park, U.S. Department of Agriculture Public Road Inquiries - Bulletin No. 21. Proceedings of the International Good Roads Congress held at Buffalo, New York, September 16-21, 1901* (Washington, D.C.: Government Printing Office, 1901), 73.

146. Ibid.

147. Ibid.

148. Hiram Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes FFF and III *of the Annual Report of the Chief of Engineers for* 1902 (Washington, D.C.: Government Printing Office, 1902), 3,037 and 3,038.

Approximate location of the six wooden tanks:

1. one from the Fort Yellowstone water supply,
2. one from the overflow from the hot springs under Jupiter Terrace,
3. one about 1 1/2 miles up the hill, from a small spring near the road,
4. one a half of a mile farther, one from another small spring on the roadside,
5. one from a large spring 3/4 of a mile farther on, but about 500 feet from the road and considerably below it,
6. one from Glenn Creek above Golden Gate.

149. Ibid., 3,038.

150. Hiram Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for* 1903 (Washington, D.C.: Government Printing Office, 1903), 2888-2889. The Engineers Office is adjacent to the Mammoth Hot Springs Hotel and across the esplanade from the Albright Visitor Center.

151. "Technical Report Upon the Improvement of Yellowstone National Park, 1904, 50." This document does not list an author, however, it is presumed to have been written by Captain Hiram Chittenden U.S. Army Corps of Engineers.

152. Ibid., 50-53.

153. Hiram Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden Captain, Corps of Engineers,* Appendixes FFF and KKK *of the Annual Report of the Chief of Engineers for* 1904 (Washington, D.C.: Government Printing Office, 1904), 4,171, for 1903 2,889.

154. Ibid.

155. Ibid.

156. *"Technical Report . . . 1904," 58.*

157. After considerable controversy the bridge was removed in 1962.

158. Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes FFF, KKK, and JJJ *of the Annual Report of the Chief of Engineers for* 1903, 2893, for 1904, 4174.

Other bridges built with material from American Bridge Company:

Yellowstone River Bridge near Yancy's
Gardner River Bridge near Mammoth Hot Springs
Gardner River Bridge near 7th Milepost south of Mammoth Hot Springs
Firehole River Bridge 1/2 mile above Excelsior Geyser
Gibbon River Bridge near 6th Milepost south of Norris
Cascade Creek Bridge near Grand Canyon of the Yellowstone River

159. Ibid., 1903, 2289, 1904, 4171.

160. Hiram Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park in the Charge Of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for* 1905 (Washington, D.C.:Government Printing Office, 1905), 2809 and 2810.

161. Ibid., 1905: The following bridges have been built:

> The 5-spanded steel-arch bridge over the Middle Gardner River, the erection of which was in progress at the date of the last annual report, was finally completed.
> The steel truss over the same river at the 7-mile post between Mammoth Hot Springs and Norris was also constructed.

Steel-truss bridges were built over Nez Perce Creek near the Fountain Hotel, and over the Firehole River, above Excelsior Geyser. A fine steel-arch bridge was erected over Tower Creek, where the road crosses a short distance above Tower Falls.

Several wooden bridges were also built, the principal ones being the following:

A large crib structure without trusses over the Lamar River on the Cooke City road.
Bridges over the Big and Little Blacktail creeks on the road between Mammoth Hot Springs and Tower Falls.
Reconstruction of the bridge over the Gibbon River at Norris.
Reconstruction of two bridges over the Firehole River, one on the old road from the Lower Basin to Excelsior Geyser, and the other just above the upper Geyser Basin.
Relocation and reconstruction of bridges over Trout and Antelope creeks.
Construction of a new bridge over Grinnell Creek on the East road and the construction of a viaduct, by which the road down the mountain on the east side of Sylvan Pass is made to pass over itself, in order to secure the necessary reduction of gradient.
Numerous small bridges have been built or reconstructed and most of the existing wooden bridges have been redecked.

1906: The following bridges had been built:

The wooden bridges over Gibbon River near Norris, the Firehole River on the old freight road near the Fountain Hotel, and over the same stream above the Upper Geyser Basin were reconstructed.
A 150-foot wooden viaduct was built at the east end of Sylvan Pass on the East road.
A new wooden bridge was erected over Grinnel Creek on the east road.
All of the old bridges and culverts on the East road were inspected and necessary repairs made.
An attractive footbridge of rustic design was constructed over the small stream between the Castle Geyser and Old Faithful Inn.
Many vitrified clay-pipe culverts were laid during the season, but the work of replacing the old wooden culverts with clay pipe was not extended as far as desireable, owing to lack of funds.

162. Chittenden, *"Annual Report of the Chief of Engineers for 1905," 2,816.*

163. Ibid.

164. Ibid., 2,817.

165. Ibid., 2,818.

166. Ibid., 2,820.

167. Ibid., 2,810-2,821.

168. Ibid., 2,821.

CHAPTER IV

DISSENSION BETWEEN CORPS AND INFANTRY 1906-1911

As a free citizen, I have a right to criticize
my government, and I think I can see many ways
in which the Park administration might be better;
but, in all justice, a great work has been done
here. The road system is worthy of unstinted
praise. All the roads are good, well graded,
well kept, and many of them are macadamized.
Throughout the summer the main roads are sprinkled,
so that there is no dust -- that plague of regular staging.
Summit of the World Trip Through Yellowstone Park, 1909
- F. Dumont Smith

1st Lt. Ernest D. Peek, who assumed Major Chittenden's position during the spring of 1906, faced a shortage of funds due to a very late passage of the appropriation bill on June 30th. With a small balance of funds from 1905, he was able to open the roads to the public on June 1, but he had to dismiss the road crews on June 23rd because lack of money. Thus, lack of sprinkling and maintenance left the system in a poor state--excessive dust and deteriorating roads. The Cooke City Road suffered many slides during the year and the Tower to Mammoth Hot Springs road, which Chittenden felt needed to be relocated became very dangerous due to numerous landslides. Much of the retaining wall was lost. Peek estimated that at least one mile of the road needed to be reconstructed. The transportation companies complained that the road was too dangerous for four-line teams to pass. Examination of the situation revealed that to put the road in a safe condition, it should be widened and in some places, 20 feet of solid rock would have to be cut through, thus resulting in a very costly project. Peek concluded that the lower route chosen by Chittenden would be a better alternative. However, lack of funds prevented any action in 1906. Since most of the 1902 plans had been accomplished, smaller appropriations were provided. It had been six years since the park received such a small appropriation: $55,000.[169] In March of the following year, $75,000 was appropriated.

Included in the March 1907 appropriation, was $1,000 to be spent for a survey of a road to Bozeman through the northwest corner of the Park. The proposed route would begin at a point seven miles south of Mammoth Hot Springs on the Norris road and would exit the Park at a point where the Gallatin River crossed the boundary. Another survey was made for a lower route between Tower Falls and Canyon. 1st Lieutenant Peek suggested that the visit to the summit of Mount Washburn, which in those days could only begin in July, would be more pleasurable if an observatory could be built. Showing the same sensitivity to the environment as Major Kingman and Major Chittenden had before him, Peek called for the building to "be built of stone as far as possible in order to harmonize with the surroundings."[170] He estimated that by using the local stone, the building should cost no more than $5,000. He thought that the one-story building should have plate glass on all sides and contain a men's and woman's "dressing room". Peek thought that Mount Washburn would receive more visitation if the visitors were shielded from the continual high winds.[171]

By the middle of the 1907 season, Peek had supervised the repair of many of the wooden bridges, the replacement of some bridges with culverts, and the construction of one small bridge on the Upper Basin to West Thumb road.[172] Peek continued clearing timber along the roadsides. He tried an experiment of burning the fallen and dead timber in the following areas: on the ground adjacent to the Gardiner-Mammoth Hot Springs road, around the formations and other selected points around the headquarters, on the road from Norris to the Fountain Hotel and 1 1/2 miles beyond, from Riverside Geyser for 1 1/2 miles to the Upper Geyser Basin Hotel, between the road and the lake for 2 1/2 miles from West Thumb toward Lake Hotel and then on both sides of the road for 2 miles beyond the Lake Hotel toward Canyon.

Near Yancey's, the crews built a side road 3/4-mile long, to the Petrified Tree. The hillside around the stumps had to be blasted out. Because of the threat of vandalism, an iron picket fence was purchased to protect the tree.

More of Chittenden's suggestions were fulfilled by Peek, including the improvement to the loading platforms at Apollinaris Spring, Kepler Cascades, Mud Geyser and at the Upper Falls. He established a number of road camps for the crews, including permanent camps with floor and framed tents near Obsidian Cliff and Canyon Junction. A permanent camp was started south of Canyon on the Lake road, and one was set up at Beryl Springs. Three very rough houses were finished on the Continental Divide between West Thumb and the Upper Geyser Basin. Barns were built at two of houses and the timber cut for the third house's barn.[173]

General repairs were completed over much of the road system and the approach roads through the forest reserves. A great deal of work had to be done on the Gardiner to Mammoth Hot Springs road, due to slides and the undermining of the existing dry walls. During the autumn of 1906, a huge dry slide came down near the first Gardner bridge. Throughout the winter and spring, more sliding occurred including a slide 1-1/2 miles down the road from where the big slide had occurred. In addition to slide problems, the threat of the road washing out caused great concern. Large boulders fell into the Gardner River and at least 20 breaks in the dry wall occurred about 1-1/2 miles from Gardiner. Peek agreed with Chittenden's suggestion that all drywall in the park be replaced with walls laid in mortar. He also made repairs to dry wall near Gibbon Falls, Kepler Cascades, and at the Upper Falls.[174]

In Peek's 1908 request for funding, he pointed out that the amount the park had received for the two previous years had not been sufficient to maintain a safe and good road system. He included in his estimate the funds necessary to purchase three bridges; two for Gibbon River crossings and one for Herron Creek on the West Thumb-Upper Geyser Basin Road.[175]

This time the appropriation was $65,000 and Peek again tried to maintain the existing system by rebuilding bridges and replacing some with culverts. He was slowly replacing gravity fill tanks at the sprinkling stations. Peek did not agree with the arguments being advanced that the transportation companies should be assessed for the sprinkling of the roads. He was satisfied that the sprinkling served the dual purposes of eliminating dust as a nuisance and preventing the road from being blown away.[176]

In 1907, 600 enameled signs were purchased and of the 500 that were set in place during that year, all of them weathered well and seemed to be indestructible. In addition to the enameled signs, glass enclosed interpretive signs were set in place at Mammoth Hot Springs for the Soda Springs and at Apollinaris Springs. These signs provided information on the medicinal value and the analysis of the spring.[177]

Peek expanded the number of road camps to include ones at Excelsior Geyser, Upper Geyser Basin, West Thumb, Lake and Trout Creek. The third barn, which was started in 1907, was completed at Spring Creek on the Continental Divide road. Peek found that having these accommodations greatly increased productivity, since before the road camps were built, the crews had to sleep on the ground. Before the summer of 1908 was over, Peek planned to build a barn at Beaver Lake and one at Trout Creek. He planned to use locally cut hay at the cost of $7 and $8 a ton, as opposed to hauling in hay at a cost of $18 to $25 a ton. Peek also saved money by having mangers built at Beaver Lake, Beryl Springs, Excelsior Geyser, Upper Basin, West Thumb, Lake, Trout Creek, Canyon, and two other places on the Lake to Canyon Road. These mangers prevented the needless waste caused by feeding on the ground.

The excessively heavy rains during the spring of 1908, prompted restrictions on the amount of freight being hauled, and in some cases, on the destinations to which it was being hauled. Unfortunately, damage had been done on some sections before the restrictions were empowered. A 3,500-pound limitation was placed on hauling on the Canyon, Lake, and West Thumb roads. A 5,000 pound limitation was placed on the Mammoth Hot Springs to Norris road and on to the Upper Geyser Basin. A 5,500 pound limit was placed on hauling on the Gardiner to headquarters road.[178]

Two surveys were completed for the possible wagon road to Bozeman through the northwest part of the Park. Neither of the two routes received a recommendation from the superintendent or from the engineering officer "principally for the reason that the burden of maintaining the necessary existing roads and of properly guarding the park is now very great, and that the proposed new road would add materially to this burden without any corresponding benefit to the general public."[179]

Lieutenant Peek, who left Yellowstone in October 1908, was replaced for a very short period of time by 1st Lt. Arthur Williams. Then in the spring of 1909, 1st Lt. Wildurr Willing took charge. Willing continued the routine maintenance activities, but the unusually heavy snow during the previous winter and spring again caused sliding on the Gardiner to Mammoth Hot Springs road. The small stream on the hill above the road seemed to have been the culprit for several years. Sluicing and diversion of the stream came to no avail, and it seemed to again be the cause of problems in 1909. The crews had to remove 500 yards of earth, which had slid onto the road. During the spring of 1909, the retaining wall at the bend of the Gardner River near this point was replaced. However, the high water in early June washed out the newly built section, in addition to a piece of the old wall. One of the problems was that the water at that point had quite a fall and struck the retaining wall at right angles. In this case, the road had been saved by the previous construction of log and sand bag revetments held by iron bars. Willing called for the relocation of the road or the construction of a massive masonry or concrete wall.[180]

Willing thought that Yellowstone should be opened to visitors no sooner than June 10th or 15th. He felt this way not only because of the extra expense required for clearing the snow, but because the snow clearance itself created a natural channel for water, which helped to destroy the roads. This was only compounded by heavy freight wagons having to haul in supplies to the hotels over the wet roads.

By the end of June, the engineers' facilities had been expanded to include a new cottage at Mammoth Hot Springs, and a warehouse and a barn at Beaver Lake.[181]

In July of 1909, the engineering officer in charge of road improvements and construction was again placed under the direction of the superintendent of the Park.[182] Almost immediately the transportation concessioner, Monida & Yellowstone Stage Company met with Superintendent Maj. H. C. Benson regarding the lack of sprinkling of the roads. Much of the 1909 appropriation of $65,000 was spent in opening the roads and a large share was committed to the south and east approach roads. The stage company complained that while the approach roads should receive "some attention," they are not the main tourist roads. In a letter to the General Passenger Agent of the Union Pacific Railroad, F. J. Haynes reported that since the engineering officers did not initiate their sprinkling until late in the season, the visitors experienced considerable dust during June and July. He also told of his wishes of a new cutoff from the Gardner River to Yellowstone [West Yellowstone], which would shorten the drive from the headquarters to Yellowstone by 12 miles and open up 25 miles of new and interesting scenery along the east side of the Gallatin Range. Since four-fifths of the route was through open country, Haynes estimated that the construction cost would be about $25,000. He was hoping funds for the cutoff would be in the 1910 appropriation. Haynes, who had already secured the support from H. W. Child of the Yellowstone Park Transportation Company and A. W. Miles of the Wylie Camping Company, requested support from the Union Pacific Railroad, since their business came through the west entrance at Yellowstone.[183]

In September, 1909, Captain Willing completed an inspection of some of the bridges in the Park and estimates for replacement of those deemed necessary. Many of the existing bridges, built of pine, were constructed in the 1890's and were considered unsafe. It was felt that the life of pine at that altitude, with its contact with earth and moisture, was less than 12 to 15 years. Willing planned to replace four of the bridges with steel structures during 1910 and others as funds became available. The inspection revealed that the Herron Creek Bridge and the bridge

5 5/8 miles from Norris over the Gibbon River had deteriorated to the point that the props under the floor beams needed constant observation until replacements were installed. The deteriorated condition of the Madison River Bridge warranted the restriction that teams crossed it no faster than at a walk.[184]

Plans were drawn for a reinforced concrete bridge to be constructed over the Firehole River near Riverside Geyser. Since this is one of the most visited areas in the Park, the superintendent felt that it was necessary that it be of aesthetic design.[185]

During the spring of 1910, dissension between the Acting Superintendent Major Benson and Captain Willing occurred over the sprinkling program. The congressional record of March 11, 1910, stated that "a recommendation has been made that none of the appropriation for the roads in the Yellowstone National Park may be applied to sprinkling."[186] Without Major Benson's knowledge, Captain Willing had inserted a clause in the appropriation bill eliminating the sprinkling program. It was exactly the opposite direction from which Major Benson intended to go, as he had instructed Captain Willing to expand the sprinkling program. This transaction prompted Major Benson to request to the secretary of the interior that the authority for distribution of the appropriation be transferred to the secretary of interior from the secretary of war. The Yellowstone Park Transportation Company president, H. W. Child, became very upset, and in a letter to Major Benson, stated that he planned to take the matter up with the secretary of interior, the secretary of war, and Senator Carter. He explained that ". . . . the transportation company really represented the Government in handling the tourists in the Park and the dust does not affect the drivers or the owners of the transportation company but it does very materially affect the twenty-five or thirty thousand people who go through the park."[187] Major Benson was concerned for the good reputation that Yellowstone had gained regarding the condition of its road system. In a letter to the secretary of interior, he wrote, "Such a suggestion (the elimination of sprinkling) would make travel in the Yellowstone Park -- which now is spoken of over the entire world as most pleasant -- the worst in the world." He described Captain Willing as ". . . not a practical man and (he) does but little supervising."[188]

During the summer of 1910, the United States Reclamation Service sought permission from the Superintendent to travel over a short stretch of the old Falls River trail in the southwestern part of the Park. As part of the construction of the Jackson Lake Dam, the Reclamation Service wanted to construct a wagon road from Ashton, Idaho, to Moran, Wyoming. Because of heavily timbered area, their employees needed to pass over this two-mile stretch until their road was completed. In a return letter enclosing the rules and regulations of the Park, Major Benson gave his permission.[189]

The summer of 1911 began with a new officer, Capt. C. H. Knight, replacing Captain Willing and a new Acting Superintendent Lt.Col. Lloyd M. Brett, replacing Major Benson. Captain Knight carried on with routine work in the park and forest reserves. Because of cost, a steel arch bridge was proposed for the Firehole River near Riverside Geyser, instead of the well designed concrete bridge that had been planned. A new bridge crossing the Pacific Creek was built during the summer of 1910. In the late fall of 1910 and in May of 1911, a concrete retaining wall 487 feet long was started and completed at the bad point on the Gardiner to Mammoth Hot Springs road. This was the first concrete retaining wall revetment, built in the Park. The engineers felt that the next major replacement of retaining wall should be the 1,000-foot-long dry, rubble walls along other sections of the Gardiner road and also along the Gibbon River.[190]

During the summers of 1910 and 1911, a road was constructed along the Gallatin River from Taylor's Fork to Yellowstone [West Yellowstone] by Gallatin County. The road passed into Yellowstone for about 14 miles near the Park's western border. Permission was granted to the road contractors, Moore and Moore of Eldridge, Montana, to build a small log cabin within the Park. The site, which was to be out of view from the road, would be selected by the non-commissioned officer stationed at the Gallatin Station. Under certain restrictions the contractor was allowed to cut logs to be used in the cabin's construction and also for bridges on the park section of the road. As part of the agreement, upon completion of the road, the cabin, which was used for storage of tools and equipment, would be turned over to the Army. After the completion of the road in October, the county commissioners appealed to Lieutenant Colonel Brett for permission to allow automobiles to pass on the new road.[191] The commissioners stated that "We cannot see where there would be any objection for the reason that our road does not connect with any road entering the park until the town of Yellowstone is reached."[192] Lieutenant Colonel Brett replied that no permits for passage of automobiles had ever been granted, but he would forward the appeal to the secretary of interior.[193]

169. Ernest D. Peek, *Annual Report of the Chief of Engineers for 1906* (Washington, D.C.: Government Printing Office, 1906), 2,256 and 2,258.

Appropriations for

1900.........................	$ 55,000
1901.........................	113,000
1902.........................	250,000
1903.........................	250,000
1904.........................	133,000
1905.........................	55,000

170. Peek, *Annual Report of the Chief of Engineers for* 1906, 2,257.

171. Peek, 2,257.

172. Ernest Peek, *Annual Report of the Chief of Engineers for 1907* (Washington, D.C.: Government Printing Office, 1907), 2,463.

> A new wooden abutment was built at the bridge over the Firehole River on the Fountain-Upper Basin road.
> New decking was laid on the bridge 2 miles from the Thumb on the Upper Basin road; also on the bridge one-half mile from Norris on the Canyon road, and on the East Gardner Bridge on the Mammoth Hot Springs-Tower Falls route. New railings were placed on the bridge at Canyon Junction. Minor repairs were made on many of the other wooden bridges.
> The bridge across Sulphur Creek was replaced by a fill 100 feet long and 14 feet deep. An iron culvert 3 feet in diameter was laid to carry the water.
> A bridge 20 feet long, 2 1/2 miles from the Canyon on the Lake road, was replaced by a culvert and the necessary fill made.
> Tile culverts were laid at 1 1/2 miles on the Gardiner-Springs road, at 10 1/2 miles on the Springs-Norris, at 7 7/8 miles on the Norris-Fountain, at 6 3/4 miles on the Upper Basin-Thumb, and in addition thereto a small bridge was put in at 9 1/2 miles on the same road. Three culverts were also laid on the Canyon-Inspiration Point road.

173. Peek, *Annual Report of the Chief of Engineers for* 1907, 2,821.

174. Peek, 2,466 and 2,467.

175. Ibid., 2,468.

176. Ernest Peek, *Annual Report of the Chief of Engineers for 1908* (Washington, D. C.: Government Printing Office, 1908), 2,544 and 2,545.

> New decking was laid on two bridges across the Firehole River, one crossing being near the Riverside Geyser and the other on the Upper Basin-Thumb road at the junction with Spring Creek.
> A small additional bridge was put in on the flat near De Lacy Creek.
> The bridge across Alum Creek, some 120-feet long, was replaced by a fill and a 30-inch culvert.
> The 25-foot bridge at Obsidian Cliff and the 15-foot bridge at Apollinaris were each replaced by

grade and it was also straightened. A fill of a foot was also made at Apollinaris. Four 12-inch culverts were put in on the West road, and one 12-inch culvert at 9 1/2 miles on the Norris-Fountain road, all of corrugated sheet iron, riveted together. Such culverts are far superior to tile, as they are lighter, more easily laid, and more satisfactory. They are riveted bands, 2 feet long, made into a single length as required, so that there is no trouble from the separation of sections, which often happens in tile culverts, and which very often is the cause of the earth being washed away at the joints and making holes in the road. These iron culverts do not require more than an inch of earth to cover them, and they can therefore be used where tile is not feasible. Tiles, as a rule, require 18 inches of covering to make them safe against breakage.

177. Peek, *Annual Report of the Chief of Engineers for 1908, 2,545.*

178. Peek, 2,549.

179. Ibid., 2,549. For additional information see chapter on proposed roads.

180. 1st Lt. Wildurr Willing and Maj. C. W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park, Appendices GGG and HHH* (Washington D.C.: Government Printing Office, 1909), 2,510 and 2,511.

181. Willing and Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park, Appendices GGG and HHH,* 1909, 2,513.

182. Maj. H.C. Benson, Fifth Cavalry, Acting Superintendent Yellowstone National Park to Mr. H.W. Child, President, Yellowstone Park Transportation Company, 18 April 1910. Yellowstone National Park Archives, Yellowstone National Park.

183. Secretary of War, J.M. Dickinson, to Secretary of the Interior, 26 April 1909. Yellowstone National Park Archives, Yellowstone National Park.

184. F.J. Haynes, President of Monida and Yellowstone Stage Company to R.L. Lomax, General Passenger Agent, Union Pacific Railroad, 14 April 1909. Yellowstone National Park Archives, Yellowstone National Park.

185. *"Report of Inspection of Bridges in the Yellowstone National Park, made September 24, 25, and 26, 1909,"* with recommendations by request of Capt. Wildurr Willing, Corps of Engineers, U.S.A.

186. Capt. Wildurr Willing and Maj. C. W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park* (Washington, D.C.: Government Printing Office, 1910), 2736.

187. Maj. H.P. Benson, Acting Superintendent Yellowstone National Park to Secretary of Interior R. Ballinger, 18 April 1910. Maj. H.C. Benson, Fifth Cavalry, Acting Superintendent Yellowstone National Park to H.W. Child, President, Yellowstone Park Transportation Company, 18 April 1910. Major Benson received a telegram from the Superintendent of Yosemite National Park requesting drawings and specifications of the road water tanks. Yellowstone National Park Archives, Yellowstone National Park.

188. Child to Benson, 20 April 1910. Yellowstone National Park Archives, Yellowstone National Park.

189. Benson to Ballinger, 18 April 1910. Yellowstone National Park Archives, Yellowstone National Park.

190. Mr. F.T. Crowe, Superintendent of Construction, United States Reclamation Service to R. Ballinger, 11 June 1910. Benson to Crowe 18 June 1910. Yellowstone National Park Archives, Yellowstone National Park.

191. Capt. C. H. Knight, Maj. J. B. Cavanaugh and Maj. Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park, Appendices HHH and III* (Washington, D.C.: Government Printing Office, 1912), 3,031-3,032.

192. Acting Superintendent to James Moore and Will Moore, 17 October 1910. Yellowstone National Park Archives, Yellowstone National Park.

193. W.H. Davis, Chairman Board of Commissioners, Gallatin County, Montana, to Col. L. M. Brett, Acting Superintendent Yellowstone National Park, 14 October 1911. Yellowstone National Park Archives, Yellowstone National Park.

CHAPTER V

FROM WAGONS TO AUTOS 1912-1918

> *The 150 miles of road which the average park motor tour embraces are far superior to the dirt and macadam highways found generally in the West.*
>
> *Motoring Through Wonderland 1915*
>
> *-Chester Davis*

The question of the entrance of the automobile on the Park roads took on serious debate and examination by the Army, the Department of Interior, the transportation concessionaires, and the public in general. At the 1911 National Parks Conference held at the Canyon Hotel in Yellowstone National Park, the issue of automobiles in parks was discussed in a session called "Transportation in the Yellowstone National Park," facilitated F.J. Haynes, President of Monida & Yellowstone Stage Co. All three major transportation concessionaires in Yellowstone opposed the entrance of automobiles, but did support the idea of constructing a parallel road for automobiles. Haynes suggested the alternative of a self-propelled gasoline passenger rail which would provide access to all of the points of interest, connecting with the existing northern and western rail terminals. The cars, which would be equipped to handle all of the freight for Government and hotel needs, would eliminate the need for freight hauling over the existing road system. Haynes further stated that the Yellowstone Transportation Company and the Wylie Permanent Camping Company would be willing to "finance, construct, equip, and operate this proposed means of transportation" if it received approval from the Department of Interior.[194]

A lively discussion followed the talk in which the general feeling was not all-out opposition to the entry of automobiles on park roads, but that specific parks may not be as conducive to automobiles use as others. In fact, automobile roads were encouraged in some parks such as Glacier and Crater Lake. The following spring, the United States Senate called for an estimate of the cost of constructing new roads, or reconstructing the present system to accommodate the entry of automobiles and motorcycles without interfering with the existing method of transportation; vehicles drawn by horses or other animals.

Capt. C.H. Knight responded in May of 1912 with a lengthy document outlining the historical development and the existing condition of the road system, the improvements required to bring the road to a standard that would allow automobile traffic alongside the animal drawn vehicles, and a plan for a new road system that would only accommodate automobiles. The document covered in great detail the advantages and disadvantages of automobile traffic. The question was not whether or not to permit automobiles in Yellowstone National Park, but how they would be accommodated. The final analysis by the Army engineers was that the existing road system should be reconstructed to meet the needs of automobile traffic.

The three major transportation concessionaires, however, pushed for a separate road system for automobiles. They felt that the 2,000 horses used in the Park would never adjust to the automobiles, as they were on the open range for almost 8 months out of a year. Introduction of the automobile would cause runaways and accidents. The concessionaires were also worried about the investment they had in horses and equipment, and they were concerned about the hazards and delays that the two different forms of transportation would cause.

The Army included the solicited views of the transportation concessionaires in the report to the Senate. The Army's recommendation, however, called for the reconstruction of the existing road system at an approximate cost of $2,265,000. This single road system would accommodate automobiles, motorcycles, and animal-drawn vehicles.[195]

At the same time that Captain Knight was sending his report to Washington, road crews were fighting the almost annual Gardiner to Mammoth Hot Springs road landslides. During the middle of May, the soldiers kept the road open, but the warm days and the spring rains caused the Gardner River to rise. Fearing that the rising water would wash away the retaining walls and portions of the road, Lieutenant Colonel Brett requested approval to spend $500 on the repair of the old wagon road from the headquarters to Gardiner. The engineers felt the visitors would have no trouble reaching Mammoth Hot Springs if they used light vehicles. This wagon road was not one of the roads on which appropriated money was to be spent.[196]

The 4-1/2 miles of wagon road had been impassable for vehicles and it was considered unsafe for pack and saddle horses. A new 25-foot timber span bridge, with a 12-foot approach on each end, replaced an old wooden bridge on the route. Several other smaller bridges and 11 culverts were constructed of wood. Some sections were recorduroyed and boulders were removed by either blasting or excavation. The 4-1/2 miles of wagon road was widened and graded.[197]

The appropriations for 1912 and 1913 were increased appreciably over those of the previous six years, with the park receiving $177,33.34 and $200,000 respectively. The number of miles of sprinkling had increased to 100 with the plans for experimenting with road oiling during the 1914 fiscal year. Oil and water tanks were built at Mammoth Hot Springs for later use throughout the park. A 30-foot timber truss-bridge was built over Alum Creek and a number of other bridges were redecked and painted. Numerous bridges were replaced by culverts and many wooden culverts were replaced with metal ones. A new 650-foot retaining wall made of stone set in mortar was constructed on the Gardiner to Mammoth Hot Springs road. Additional stone replacement work was done through the Gibbon Canyon area and near the Virginia Cascades, on the Norris to Canyon road. A new 26 -by- 34-foot barn was completed at the Trout Creek road camp, a log storehouse was built at the east entrance, a log cabin/storehouse was built at the Lake sprinkler camp, and a 25 -by- 130-foot wagon shed with storage loft was finished at Mammoth Hot Springs. The location of the house at Mammoth Hot Springs was changed; plumbing fixtures were added to the outhouse at Mammoth Hot Springs; and the bunk house at headquarters got running water and washing fixtures. The Mud Geyser platform was rebuilt.[198]

The secretary of interior permitted automobiles to travel on the newly built road between Bozeman and Yellowstone [West Yellowstone] in 1913. However, the road was not in condition for automobile travel until 1914. The 17.86 miles of road that lay within the Park had forty seven bridges on it.[199] In January of 1914, the Gallatin County Commissioners appealed to Congressman John K. Evans for Government funds for the improvement of the 17 miles of the West Gallatin Road. As justification for the request, they claimed that the Park used the road for transporting supplies from the rail station at Yellowstone [West Yellowstone] to the Gallatin Soldier Station, that Yellowstone authorities used the road for other purposes in line with routine Park business, and that tourists used the road on their way to the West Entrance of the Park. The Gallatin County officials stated that they had already spent a total of $47,500 on the road, including $10,000 on the park section. They now estimated that they needed an additional $45,000 for improvements to the 17.8 miles of road, or about $2,500 per mile.[200]

The Army's response to Gallatin County's appeal was to not recommend funding for either improvements or maintenance. The Army said that the soldiers used the road "to some extent by park patrols, but it is not an absolute necessity." Most of the supply trains used the trails from Fort Yellowstone since the trail route was approximately 45 miles shorter than the road via the West Entrance. Since completion of the road, new trails had been built, some of which used the road. The Gallatin Soldier Station reported that only twenty-four parties (113 people) had used the road during the summer season of 1913. The Army felt that the cost of maintenance and improvements to the road could not be justified by the benefits gained. The Army's estimate for the annual maintenance requirements was approximately $3,000; they would not speculate on the cost of improvements, as the engineers had not inspected the road, but from their experience with similar roads, they felt it should have cost no more than $1,000 per mile.[201]

In June of 1914, Captain Knight, who was transferred to the Second Battalion of Engineers in Texas, was replaced by Maj. Amos Fries.[202] Up until the end of June, mostly routine maintenance was performed, with emphasis on upgrading the roads to make them safe for the passage of both animal-drawn and motorized vehicles. The road sprinkling covered 100 miles and some oiling was being tried. Three reinforced concrete bridges were built. One 40-foot reinforced-concrete arch bridge was built over the Firehole River near the Lone Star junction; a 40-foot span reinforced concrete bridge was built over the Gibbon River, 7 miles from Norris, and a 65-foot single-span, girder and slab constructed bridge was built over the Gibbon near the confluence with the Firehole River. A 40-foot steel arch bridge was built over the Gibbon near the Wylie Camp, 17 miles from the West Entrance; two 40-foot span wooden bridges were built over Pacific Creek, south of the Park in the forest reserve and a 10-foot reinforced concrete arch culvert was installed at Spring Creek.

Between the second and third mileposts on the Gardiner to Mammoth Hot Springs road, 120 feet of rubble-set-in-mortar retaining walls were constructed. The crews rebuilt retaining walls on the Mount Washburn Road, the Virginia Cascades section of the Canyon to Norris road, and in the Gibbon Canyon. The crews also built barns at the Gibbon Meadows and Grand Canyon road camps; cabins were built at the Beaver Lake and Grand Canyon road camps; and two "public-comfort houses" were built in the Norris Geyser Basin.[203]

In addition to the admittance of automobiles, in August of 1914, the acting superintendent sought unsuccessfully for permission to extend a spur of the Oregon Short Line Railroad into the park for 100 feet in order to facilitate the filling oil tanks that he wanted placed inside the Park.[204]

Major Fries instituted a new organizational plan for the road construction program by separating the Park into three divisions. Western Division under the supervision of William O. Fraesdorf, would cover the Gardiner to Yellowstone, the West Gallatin Montana Road, and from the junction of the Firehole and Madison River along the Firehole River to the Upper Geyser Basin. The Central Division, under O. R. Kroell, would cover from Tower Falls to the Snake River, from Canyon to Norris, and from West Thumb to the Upper Geyser Basin. The Eastern Division under R. D. Rader, would cover the road through the forest reserve to the road junction at Lake. In August of 1915, a new Northern Division was created under the supervision of Capt. John W. N. Schultz.

Another change Major Fries instituted was in the earth loosening and hauling procedures. He found that the most economical way to loosen the earth and gravel was by plow, employing scrapers to haul it; he found that the most desirable mixture for the road surface was a mixture of one third clay and two thirds sand. Major Fries instructed the crews to use material from the side of the roads for temporary repairs unless they were finished roads that were completely macadamized, in which case gravel or broken stone was to be used. He felt that the hauling of gravel or sand for long distances was about as "nonsensical as patching cotton clothes with fine silk."[205] His approach to filling ruts or chuck holes on macadamized roads was to first clean out the hole and scratch the surface to facilitate a bond with the new material. The fill material had to be screened gravel or rock bound with clay or stone dust so that after watering, the repair would wear as well as the macadamized road. Fries ordered the construction of ditches to be 3 1/2 feet on either side of the 18-foot wide standardized road. Hillside ditches were to have drains not more than 100 feet apart and they were to be as wide and deep as possible. Fries said that to a good road man, "A road without ditches looks as natural as a man's face without a nose." Fries called for the templates to be tried at certain sections of the road and for the road to be "brought to proper crown."

Fries who ran a "tight ship," felt "the best workman is the one that can do first class work at the lowest cost." He was very strict on the workmen's output, expecting that a day's work was eight hours, with no exceptions for going to or from work or for lunch.[206]

By the spring of 1915, other improvements to the facilities had been finished. Telephones had been installed at the engineers camps and at most of the other road camps scattered throughout the Park. A covered rack for the storage of reinforcement steel used in the concrete bridges and culverts, and a steel and concrete gasoline storage tank, with a capacity of one carload, were built at Mammoth Hot Springs. Two concrete tanks, each with a capacity of holding two carloads of oil, were built, one at Gardiner and one at Yellowstone, Montana.

Sprinkling continued on 112 miles of roads and oiling was tried on two sections of park roads. In 1915, the engineers planned to use a finish of 90 percent asphalt oil and broken stone. The least expensive of the two brands scheduled for use cost 2.1 cents per gallon at San Francisco, with a freight cost of 4.5 cents to Yellowstone, Montana, plus an additional 6 cents per gallon freight cost for 50 miles within the Park. Thus, in order to save some cost per mile, the Army continued to push for the construction of two lengths of rails or 66 feet of rails to be built adjacent to the rail station in Yellowstone, Montana, to just inside the Yellowstone boundary. Prior to receiving permission, the Army planned to build a pit just inside of the Yellowstone boundary. With certain restrictions, such as the restriction of the engine to come into the Park, the construction of an obstruction which would prevent cars from coming into the Park without Army supervision, and the understanding that the track could be removed at the Department of Interior's request, permission was granted in May 1915.[207]

Following earlier decisions, only concrete bridges were being built for use on the Belt Line and steel bridges with concrete floors were used in the forest reserves. Red spruce was the preferred material for abutment sills on the wooden bridges. For economic reasons, all of the concrete bridges were built by day labor. If a span of 10 feet or less were needed to be bridged, a culvert was installed. If more than 10 feet, it was spanned by a bridge.

Major Fries believed the practice of building bunk houses and barns at road camps was not practical. He felt that for them to be effective required placing them in locations that would offset the long commutes the crews had to make which were too costly. He preferred the use of 16 -by- 24-foot tents.[208]

On August 1, 1915, the first automobiles were allowed into the park producing both positive and negative effects. During the dry and dusty season, the heavy touring cars and light, high-speed trucks were harmful to the road surface. However, during the wet season, use of these vehicles had the opposite effect. Besides the cars being easier on the roads, their pneumatic tires had a decided ironing effect. The slower speed, heavier trucks with solid tires had a negative effect on the road, especially during the wet weather when their chained tires cut deep ruts into the surface. Thirteen trucks replaced most of the 6 and 8-horse teams, which were very detrimental to the Park roads because of their practice of following the same ruts.

A 5-ton White truck, purchased in 1915, greatly reduced the cost of hauling in the park. It immediately became the "workhorse of the park" by operating 16 hours a day, for use in plowing, grading, dragging, and hauling.[209] The Army engineers felt that in order to achieve a reasonable per-mile cost for construction and improvements, sufficient money should be spent on necessary equipment.[210]

With 3,445 automobiles entering the Park between June 15 and September 30, 1916, Yellowstone advanced into a new era of tourism. A couple of years earlier, the Park began planning for increased visitation due to World War I and the expositions in San Francisco and San Diego. The newly formed Park-to-Park Highway Association which met at the Canyon Hotel in Yellowstone, focused the attention of other such clubs and government officials on the opportunities of traveling to the national parks on a connecting system.

Regular routine maintenance and improvements were carried on during 1916. The major road problem was correcting the continual slide problem on the Gardiner-Mammoth Hot Springs road. Slides had occurred over a number of years, and in 1915 much work was done and the road was considered to be in good shape. However, during the summer and winter of 1915, slides reduced the road width to 10 feet and new slides developed several hundred yards closer to Gardiner. Slumping at the new slide caused the road to be closed several times during the fall of 1915 and four times during the spring of 1916. Blasting and grading prepared the road for the tourists in 1916, but the blasting and high water in spring caused the sections of retaining wall to give way and/or weaken.[211]

As a result of the increased automobile travel to the Park via the West Entrance, the Army engineers reversed their opinion regarding government funding for improvements to the 17.8 miles of the West Gallatin Road. In the 1916 Annual Report, Major Fries requested that the government assume the responsibility for the maintenance and repair of the 17.8-mile section.[212]

On August 25, 1916, the National Park Service was created, but the military would continue to have a presence in the Park until 1918. A civilian, Chester Lindsley, was appointed the "supervisor" and remained the administrator of the Park until Horace Albright was appointed superintendent on June 28, 1919. Many of the discharged cavalry soldiers remained in the Park either as rangers or in the maintenance department.

The following year, improvements to the approach roads and important realignments to the Belt Line were made. Robert McKay of the Buffalo Mining Company, who had mining interests in the Cooke City area, continued with improvements and repairs to the Cooke City road. During the previous year, McKay had made great improvements to the road by cutting out four hills with dangerous curves, accomplishing some realignment, providing light graveling to some sections, and building a 30-foot span bridge, with gravel-filled log cribbing approaches totally 100 feet across Pebble Creek.[213]

After more trouble with the slide area on the Gardiner and Mammoth Hot Springs road, the engineers finally decided that perhaps a relocation of the road across the river, which would be very expensive, or rebuilding the old freight road would be the answer.

The United States' entry into World War I in April, 1917, hastened the transfer of road responsibility to the newly created National Park Service. By July, when Colonel Fries was transferred to France and Capt. John Schultz assumed the responsibility of the road work. Over engineers over road damage and maintenance responsibilities. The concessionaires were operating under new contracts, which compelled "them to pay, as for consideration for their privileges, on a schedule of charges that will bring in, at the close of the season, a very large sum of money which will be used in administrating the park."[214] Prior to his leaving Yellowstone, Fries wrote to Horace Albright advising him of the problems stating, "The Transportation Company doesn't seem to appreciate that everything they have in the world came from the roads and that all the fortunes they expect to make in the future will come from the same place so that instead of cooperating and letting us have transportation at reasonable rates when we want to rush men to fix bad places often caused by their shoveling out the snow and then driving heavy cars continually in one track, they sting us the limit for every man and piece of material hauled for us."[215]

In October of 1917, Secretary of the Interior Franklin Lane inspected the road system in Yellowstone National Park. While visiting the Park, Lane made a number of suggestions for improvement, including a request for a painted white or whitewashed railing at a point 7.1 miles from West Thumb, construction of preferably stone guard rails at dangerous points between Chittenden Bridge on Upper Falls (heavy pole rails painted white would have been his alternative), and grading the slopes to the inside bank at a point where the road approached Dunraven Pass from Canyon. At Gibbon Canyon, he recognized a safety and a visual problem, with the growth of small trees since the road was built. He found the trees obstructed the view of the river and in turn made for dangerous driving. He also felt that the removal of a few trees at the Gibbon Falls would "afford a better view of the falls."[216]

A few months earlier, an assessment of the road conditions was compiled. However, funds were running out, so Captain Schultz advised Lindsley that some of that work would have to be completed the next season.[217]

As a result of the creation of an agency to administer all of the national parks and national monuments, many organizational changes would be made in Yellowstone. During 1917, more attention was given to road work by the newly created agency. In fact, prior to Secretary Lane's visit to Yellowstone, he had written a letter to the secretary of war proposing that the Department of Interior should take over the road work in both Yellowstone and Crater Lake National Parks. Horace Albright, assistant to the National Park Service Director Stephen Mather, shared similar feelings and in a letter to Franklin Lane wrote:

> I do not know what can be done about it now, but one thing is certain, we can not make the national parks the place for the engineers to get their road building education. We need trained road builders in the parks, not inexperienced West Point graduates who go there to learn this branch of engineering and control the thing at the same time. The Yellowstone now has the worst roads of any national park, except Rocky Mountain where we have nothing to do with the improvement work, and now is the time that we must do something.[218]

The last supervising Army Corps of Engineers officer in the park, Maj. George E. Verrill supervised the road work until June 30, 1918. Prior to his departure, routine maintenance and improvements were carried out. Crews worked continually trying to keep the Gardiner-Mammoth Hot Springs road open throughout the summer of 1917, but the spring thaw of 1918 caused extensive movement in the slide area and high water in June resulted in the complete destruction of a one-mile section of the road. The engineers were forced to abandon the road and make improvements on the old freight road until the main road could be reconstructed.

High water in June played havoc in a number of other locations in the Park. Road sections at the Snake River and Pilgrim Creek bridges in the southern part of the Park and in the forest reserve were damaged. Road sections and bridge approaches were damaged on the Cody Road. On the Cooke City Road, the Lamar River, the Pelican Creek, and the Soda Butte Creek bridges were washed away. Because this road was not heavily traveled by tourists, the Park did not initiate immediate repairs. Using some materials supplied by the engineers, private citizens from Cooke City built a cableway over the Lamar River to convey supplies and people.

By the time the Army left the Park, all of the significant wonders or scenic areas were accessible by motor-drawn vehicles and all of the entrances were open to travel. There were no serious problems on the 137-mile Grand Loop, other than a worn foundation and lack of original surfacing material. The entire system needed to be macadamized or graveled. As stated earlier, the north approach road had been washed out and the only entrance was via the old freight road which was muddy and slippery during wet weather. Of the 13-1/2 miles on the west approach road, 9-1/2 had been macadamized. Five of the 9-1/2 miles were considered in excellent condition, with a macadam surface covering an 18-foot width; the remainder had a macadamized width of 10 feet. All but 2 miles of the 23-mile south approach road had been widened and graded, and with the exception of the June high water damage, it was considered to be in good condition. For the past few years, the only work done on the forest reserve road was the 30-mile section just south of Yellowstone. Little work had been done on the section south of the Moran Post Office. The 26-mile East approach road was considered to be in fair to good condition, but the 28 miles through the forest reserve was heavily damaged by the high June water. Prior to that time, the road was considered to be in good condition. Other than the June damage, the Cooke City Road was considered to be in good condition. The Bunsen Peak, Artist Point and Inspiration Point roads were considered to be in good condition. The road through the Mammoth Hot Springs terraces was considered to be in poor condition for motor-drawn vehicles and fair condition for horse-drawn or foot traffic. The bridges were considered to be in good condition, with the exception of a wooden bridge over the Firehole (.6-mile southeast of Old Faithful Inn), a wooden bridge across the Gibbon at Norris, two wooden bridges near Canyon Hotel and a wooden bridge across the Blacktail Creek, plus a number of bridges in the forest reserve.[219] Stephen Mather viewed the later years of the Army Corps' direction of the road work as years with "entire lack of a comprehensive policy which considered the popular uses of the Park, and in later years, the failure to give any degree of permanency to the organization of the engineering force. Engineer officers were detailed to the park for short periods of time, then replaced by others, who often came with different ideas from their predecessors; there was constant altering, modifying, and changing of plans for improvement work and of methods of performing this work."[220] Mather thought the new combined management of Yellowstone under one department and one park supervisor or superintendent would eliminate the double, and in some cases, triplicate effort. For the past two years, the Park had a superintendent who reported to the secretary of interior, a district engineer who reported to the chief of engineers of the Army, and commanding officer of the troops, in charge of protection of the Park, who reported to the Western Military Department in San Francisco. During 1918, the assorted offices were combined and the former Engineers' Building became the park headquarters.[221]

In May of 1918, Secretary of the Interior Franklin Lane, issued a Statement of Policy in which road construction and improvements were specifically addressed:

> In the construction of roads, trails, buildings, and other improvements, particular attention must be devoted always to the harmonizing of these improvements with the landscape. This is a most important item in our program of development and requires the employment of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the aesthetic value of park lands. All improvements will be carried out in accordance with a preconceived plan developed with special reference to the preservation of the landscape, and comprehensive plans for future development of the national parks on an adequate scale will be prepared as funds are available for this purpose.[222]

The philosophy expressed by Franklin Lane is reminiscent of those expressed by Captains Kingman and Chittenden of the Army Corps of Engineers.

Mount Washburn Road, 1912
Courtesy Yellowstone National Park Archives

Completed Paved Road near West Entrance, United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Spring Creek Road Camp, September 1912
Courtesy Yellowstone National Park Archives

DeLacy Creek Road Camp, September 1912
Courtesy Yellowstone National Park Archives

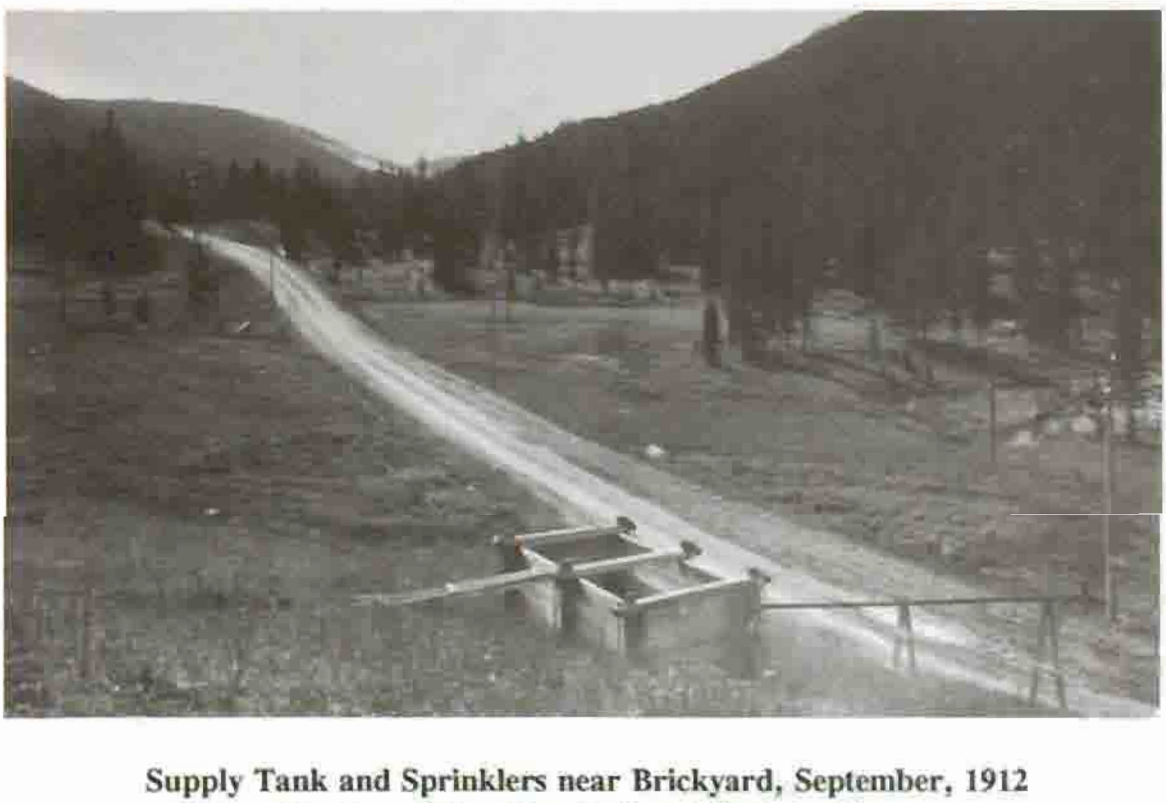
Enoch's Road Camp at Cub Creek, United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Trail Creek Road Camp, United States Army Corps of Engineers, 1913
Courtesy Yellowstone National Park Archives

Gravel Pit, 6 Miles from West Entrance, 1915
Courtesy Yellowstone National Park Archives

Gravel Screen, 9 Miles from Canyon,
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

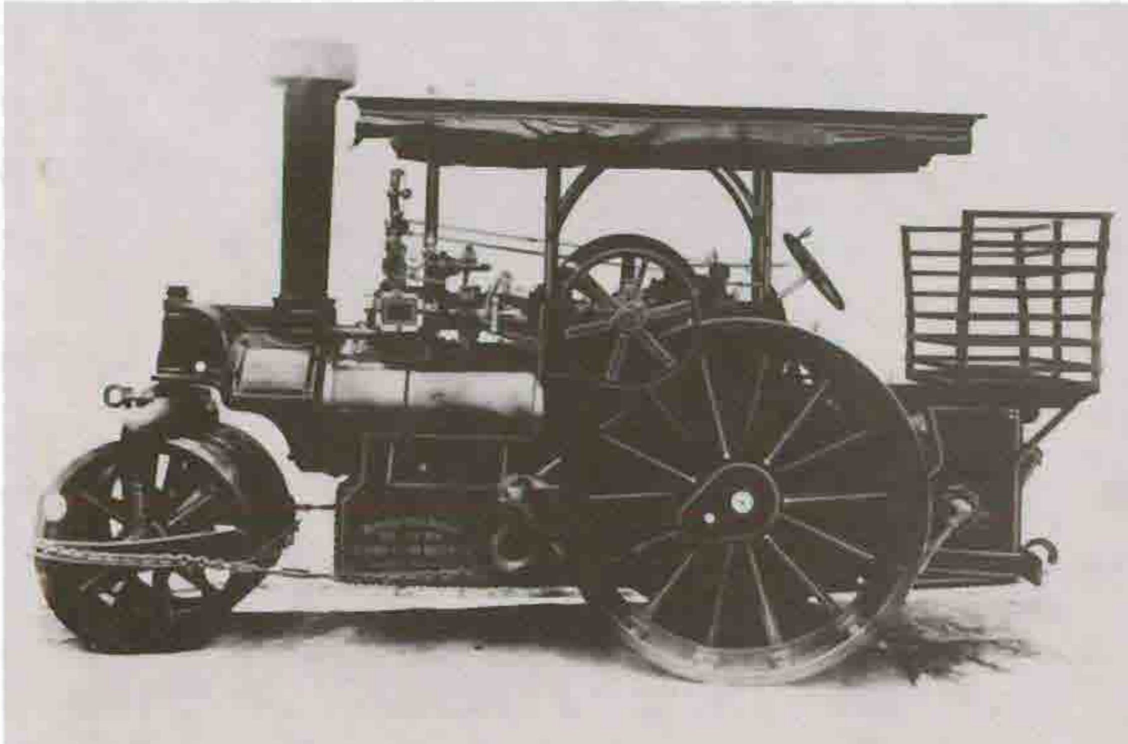
Otter Creek Gravel Pit, United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives



Supply Tank and Sprinklers near Brickyard, September, 1912
Courtesy Yellowstone National Park Archives

Oil Pit at West Yellowstone Camp, United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

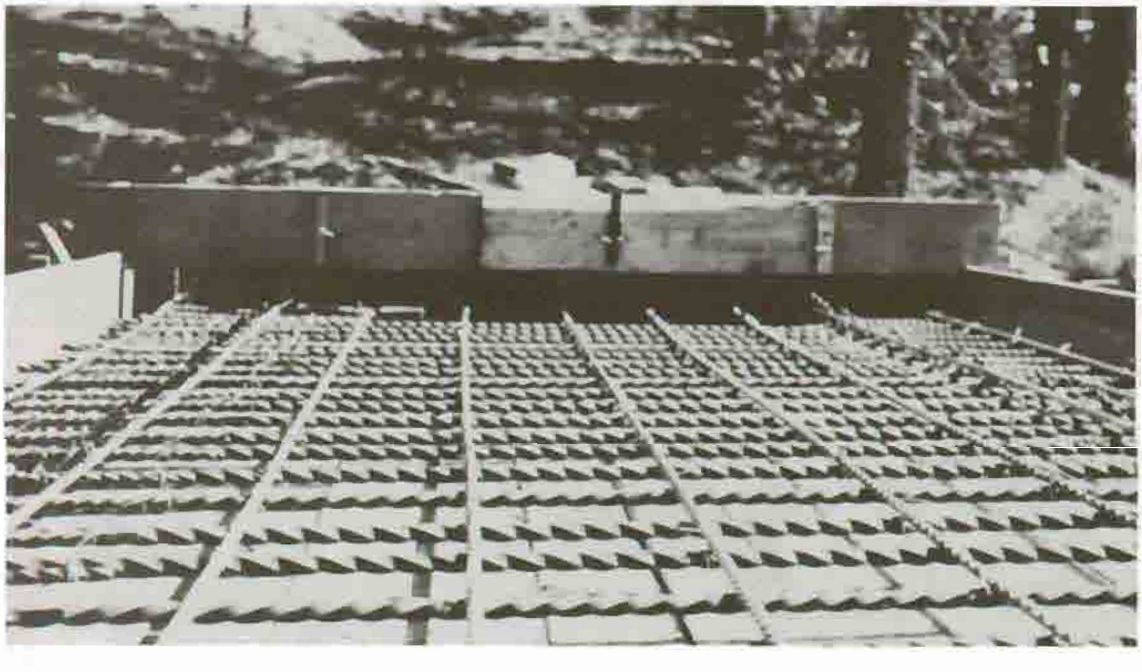
Oiling Road Two Miles from West Entrance, 1915
Courtesy Yellowstone National Park Archives



Steam Roller Purchased by Army Engineers in 1916 for West Yellowstone
Courtesy Yellowstone National Park Archives

Rock Crusher, September, 1914
Courtesy Yellowstone National Park Archives

Culvert and Ditch Construction on Cooke City Road,
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives



Culverts on Continental Divide Showing Steel Reinforcement, 1915
Courtesy Yellowstone National Park Archives

Barn, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Coal Shed and Barn, 1917,
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Shed, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Bunkhouse and Shops, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

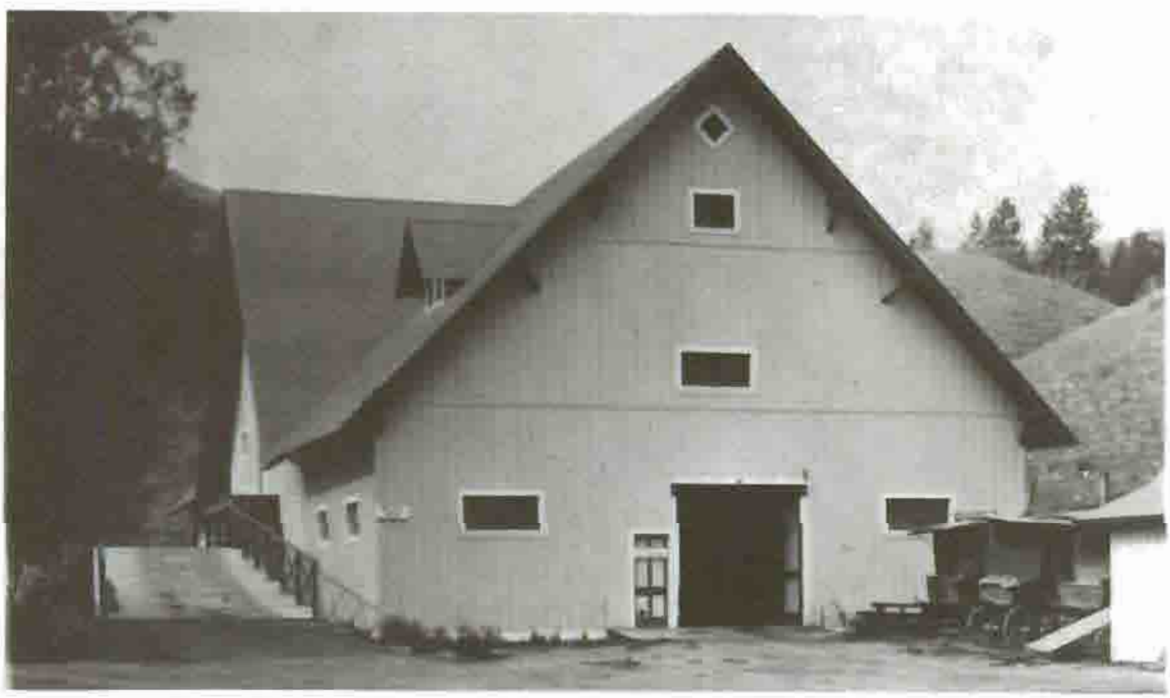
Cottage, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Old and New Engineers' Quarters at Mammoth
Courtesy Yellowstone National Park Archives

Engineering Department Barn, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

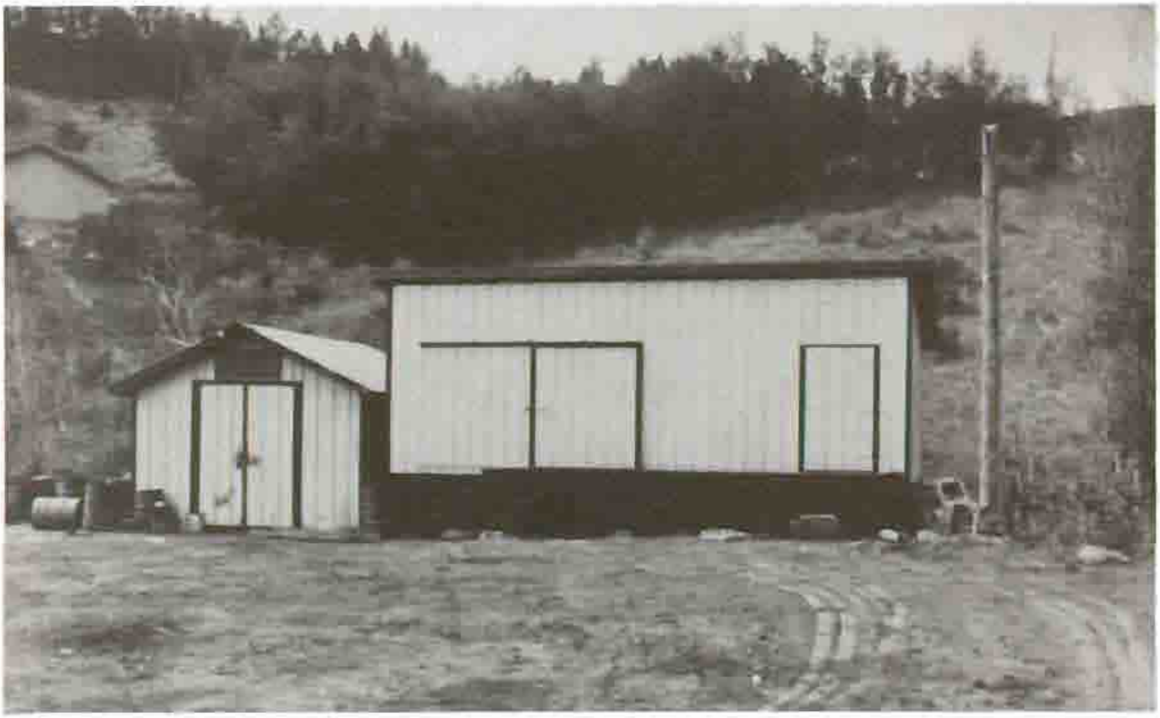
Wagon Shed, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Shed, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives



Garage, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Gasoline Tank House, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives



Auto Supply Building, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Storekeeper Building, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Mess Hall and Former Residence of Hiram Chittenden, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Commissary, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

Supervisor's Office, 1917
United States Army Corps of Engineers
Courtesy Yellowstone National Park Archives

194. J.F. Haynes, "Transportation in the Yellowstone National Park," *Proceedings of the National Park Conference held at the Yellowstone National Park September 11 and 12, 1911* (Washington, D.C.: Government Printing Office, 1912).

195. *New Roads in Yellowstone National Park,* Acting Secretary of War transmitting information in response to Senate Resolution of April 2, 1912, relative to the cost of construction of new roads in the Yellowstone National Park, Sixty-second Congress, Twenty-fourth Session Senate Document No. 871 (Washington, D.C.: Government Printing Office, 1912), 3, 14, 15, and 16.

196. Lt. Col. L. M. Brett to Secretary of the Interior 14 May 1912 and 20 May 1912. In addition to the problems caused by the natural conditions, the Yellowstone Transportation Company wagons hauling coal "shook the road at the dangerous and narrow part that a section of it fell into the river, leaving a roadway of only about 3 feet in width for a distance of 12 feet." Lt. Col. L. M. Brett to Mr. H. W. Child May 2, 1912. Yellowstone National Park Archives, Yellowstone National Park.

197. Brett to Secretary of Interior, 22 June 1912. Yellowstone National Park Archives, Yellowstone National Park.

198. Capt. C. H. Knight, Maj. J. B. Cavanaugh, and Maj. Jerry J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park,* Appendices EEE and FFF (Washington, D.C.: Government Printing Office, 1913), 3,268-3,270.

199. E.H. Schumacher, County Clerk of the Board of Commissioners, Gallatin County, Montana, to Maj. E. S. Wright, 12 March 1913. The District Engineers Office, Yellowstone National Park to Chief of Engineers, U. S. Army, 16 February 1914. Yellowstone National Park Archives, Yellowstone National Park.

200. Charles Waterman, Commissioners of Gallatin County, Montana, to Honorable John K. Evans. Schumacher to Lt. Col. L.M. Brett, 6 February 1914. Yellowstone National Park Archives, Yellowstone National Park.

201. District Engineer Officer, Yellowstone National Park to Chief of Engineers, U.S. Army, 16 February 1914. Yellowstone National Park Archives, Yellowstone National Park.

202. Special Orders No. 181, War Department, June 5, 1914.

203. Maj. Amos A. Fries and Maj. Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; and Report Upon Crater Lake National Park,* Appendices EEE and FFF (Washington: Government Printing Office, 1914), 3,393-3,395.

204. Acting Superintendent to Secretary of the Interior, 5 August 1914. Assistant Secretary of the Interior to Acting Superintendent, 6 August 1914. (telegram) Yellowstone National Park Archives, Yellowstone National Park.

205. Fries, *Yellowstone Park Road Work,* August 11, 1914.

206. Fries, *Yellowstone Park Road Work.* See Appendix for the "Rules and Regulations for the Work of the Engineering Department in Yellowstone National Park," May 4, 1915.

207. Fries to Secretary of the Interior, 10 May 1915. Stephen T. Mather, Assistant Secretary of the Interior to Col. L. M. Brett, 26 May 1915. Yellowstone National Park Archives, Yellowstone National Park.

208. Maj. Amos A. Fries, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park* (Washington, D.C.: Government Printing Office, 1915) 3,753-3,765.

209. Maj. Amos A. Fries, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park,* and *Report Upon Crater Lake National Park* (Washington, D.C.: Government Printing Office, 1916), 3,626-3,627.

210. Henry Breckenridge, Acting Secretary of War to Chairman of Committee on Appropriations, House of Representatives, 15 January 1916. Yellowstone National Park Archives, Yellowstone National Park.

211. Fries and Williams, *Report Upon . . . . Yellowstone National Park 1916, 3631.*

212. Ibid., 3,633.

213. Maj. Amos A. Fries and George Zimn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park for 1917* (Washington, D.C.: Government Printing Office, 1917), 3,633.

214. Horace Albright, Acting Director of the National Park Service to Major Fries, 7 May 1917. Yellowstone National Park Archives, Yellowstone National Park.

215. Fries to Albright, 14 July 1917. Yellowstone National Park Archives, Yellowstone National Park.

216. Chester Lindsley, Office of the Supervisor, Yellowstone National Park to Captain John Schulz, 9 October 1917. Yellowstone National Park Archives, Yellowstone National Park.

217. Road Improvements; July 1917:

> Road through Gardner Canyon narrow at points and subject to slide, which is very dangerous.
>
> Bridges between Mammoth and Gardiner are about 9" below road bed. Very hard on auto springs, both going onto and off of these bridges.
>
> Road over the Mammoth terraces unfit for auto traffic. Should be improved and made safe by June 20th.
>
> Road around Bunsen Peak unsafe for autos. Small expense to repair.
>
> On top of hill on main road two miles from Mammoth a number of very bad and hard rolls and bumps.
>
> Two serious holes more than half way across Swan Lake Flats.
>
> Road up Glen Creek toward Electric Peak could be made passable for quite a way at very little expense, to enable parties to get that far and then to walk to the mountain.
>
> Bridges at Upper Gardner River, Willow Creek and Gibbon River at Norris, below and above road levels.
>
> Road at Roaring Mountain in poor shape.

Deep holes at many of the sprinkling tank filling stations throughout the entire park.

Road Norris to Fountain down the Gibbon Canyon very rough, full of large chuck holes and broken culverts. Also contains one or two improvised log bridges where culverts have been washed out.

Wylie Gibbon Camp over mesa road to Firehole River, about four very bad chuck holes that could be filled with little expense. This road will be used all next summer and should be repaired.

On the flat 1 mile before Fountain Hotel road very rough.

Road to Firehole Lake, Great Fountain Geyser, impassable for automobiles. Repair automobile schedule routed this way. Should be fixed before June 20th. Small expense.

Very deep hole across entire road just before reaching Excelsior Geyser.

Road to Biscuit Basin and Morning Glory springs in no shape for automobiles. All travel is to be routed this way. Immediate necessity of being repaired.

Most of the platforms at points like Paint Pots, Excelsior Geyser, Keplers Cascades, etc., throughout the entire park are too high for automobile passengers to alight from their machines onto the platforms. They should be lowered to correspond to the platform at Apollinaris Spring.

Upper Basin to Thumb, seven to eight mile post, road very narrow and deep wash close to bank, so cars have to travel on the outside.

Number of very dangerous holes on the other side of Continental Divide, also after crossing the Divide and going down the hill toward the Thumb of Lake.

After crossing Divide between Thumb and Lake on the tip of the hill down to the five mile post, the road is very rocky and had severe holes. This is the place that the private machine tipped off the road last summer.

Lake to canyon road should be routed via Sulphur Mountain from Trout Creek. Sulphur Mountain is very interesting and should be shown to the passengers. This road is not more that a mile or so longer than the present road. There is an old road going this way which is in very good condition and could be traveled if one or two culverts are replaced. This take one farther into Hayden Valley, where elk are very often seen.

Bridge across Alum Creek a foot below the road bed and about 4 inches above the water level.

Road along the Yellowstone, between three and two mile post very narrow. Two or three very bad holes.

Road along the Yellowstone at the rapids and upper falls very narrow and dangerous. Heavy guard rail should be placed along there.

Approach to the concrete bridge from the opposite side of Yellowstone River in very bad condition. Dangerous for the operation to the camps next summer.

> Going from Canyon toward Dunraven Pass along the hillside half a mile before reaching the entrance of Dunraven pass, the road should be graded to slope toward the bank and logs should be imbedded along the outer edge of the entire road from this point for about a mile.
>
> Road over top of Mt. Washburn should be cleared of rocks, small and large. It is very difficult for a large car to go up there at the present time and extremely hard on tires, as the road is practically covered for miles at a time with sharp stones which have blown onto it.
>
> The last three miles before reaching Tower Falls the road is very rough and narrow and worn. Two or three severe chuck holes.
>
> More than half way up the long hill from the Tower Falls Soldier Station to the top of the cut, there are several very bad holes and bumps.
>
> Road down Blacktail Creek back of Mount Everts could be fixed with little expense, for the benefit of fishing parties.

This list provides a very good overview of the conditions of the road system in 1917.

Capt. John Schulz to Chester Lindsley, 11 October 1917. Yellowstone National Park Archives, Yellowstone National Park.

218. Horace Albright, Acting Director, National Park Service to Franklin Lane, Secretary of the Interior, 17 October 1917. Yellowstone National Park Archives, Yellowstone National Park.

219. Maj. G.E. Verrill and Col. George Zuin, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park* Appendices EEE and FFF (Washington, D.C.: Government Printing Office, 1918), 1977-80.

220. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1918* (Washington, D.C.: Government Printing Office, 1918), 39-40.

221. Ibid., 40.

222. Ibid., 273-274.

CHAPTER VI

THE NATIONAL PARK SERVICE BEGINS ENGINEERING PROGRAM 1918-1923

To one visiting our national parks and monuments, there are two features which stand out prominently--scenery and highways, or it would be better expressed to say that the one stands out prominently by its abundance and magnificence and that the other is called to the attention by its lack of everything that it should be, even to its very existence.

"National Park Roads Vitally Needed"
- *Western Highway Builder, 1922*

The transfer of the responsibility of the road engineering work in Yellowstone coincided with the early development of national programs directed by the two-year-old National Park Service, under the leadership of its director, Stephen Mather. Mather created a Landscape Engineering Office under the supervision of Charles P. Punchard, Jr., and a General Engineering Division under George Goodwin. The responsibility of the General Engineering Division was to develop plans for new roads and trails, gathering information relating to road and/or trail projects, presenting the information to the director of the National Park Service, the secretary of the interior, and finally to the Congress.

During Punchard's first year, he visited 13 national parks and national monuments, including Yellowstone. Mather praised Punchard by saying that he had the "ability and willingness to take a very practical view of the problems to be solved, and to attack them always with full appreciation of the limitations of the park appropriations and the relation of these problems to other features of improvement of the park system."[223] Punchard's national overview of needs and requests was very important at the time appropriations were distributed. Prior to the creation of the National Park Service, each park area operated independently under the overall guidance of the Department of the Interior.

In June of 1919, Mather appointed his assistant, Horace M. Albright, superintendent of Yellowstone. Chester Lindsley, who had directed the administrative functions of Yellowstone during the transition, stayed on as assistant superintendent. Upon Major Verrill's departure in 1918, Goodwin took charge of the road projects. Albright reported for duty on July 10, 1919, and for the next ten years, he would have a significant influence on the development of the Park.

According to Mather, the first important engineering project undertaken by the newly formed engineering division was the construction of a new road through the Gardner River Canyon. He felt that several of the bridges designed by the new division for the park system were very important, including the underpass bridge for Sylvan Pass, which replaced the notorious "corkscrew" bridge and the Marble Fork Bridge in Sequoia National Park.

Mather expected great advancements for Yellowstone in several areas. He foresaw unlimited opportunities for the park that had experienced the highest number of visitors to date, 62,261. Combined with the "See America First" campaign, the Park-to-Park Highway movement, and the end of the war, Yellowstone expected a continuing rise in visitation, especially the motoring tourist. Mather worried about the public's opinion that "it (park) has lost much charm, that it seems less wild. . . . they experience a longing for the stillness of the forests and peculiar fascination of the park in the stagecoach days."[224] He knew that:

> the automobile should revolutionize the park tour, just as it changed travel conditions everywhere and turned into memories cherished methods of seeing and doing things. However, the old atmosphere of the Yellowstone is still to be enjoyed, not perhaps on the roads, certainly only a few hundred yards distant, where the trails take their winding course through the forests."[225]

During Mather's tour of Yellowstone in September 1919, he found the road system in an "excellent state of repair," but with the predicted tremendous increase in motoring tourists, he recommended the widening of many road sections, reconstruction of bridges and culverts, and the construction of stone guard walls. He also recommended the completion of the Firehole cutoff and the restoration of the old road along Yellowstone Lake, from West Thumb to near the Lake Hotel. He suggested that the Gallatin Road be widened and that the section of the road, south of the park boundary from Grayling Creek to Yellowstone, Montana, be rerouted within the park boundaries. Mather felt the approach roads to the Park, including a portion of the road from Livingston, Montana, either be taken over by the Federal Government or at least the state should be given funding assistance.[226]

When Albright took over at Yellowstone, there were 278.8 miles of primary roads and 24.75 miles of secondary roads. The Park maintained 28 miles of the Shoshone National Forest Road and 30 miles of the Teton National Forest road.[227] Most of the 1919 road work consisted of routine maintenance and improvements. However, much time was lost during August when the road crews were pulled off to perform fire fighting activities. Additional time was spent moving camps, corrals, and equipment around.[228]

Consideration of landscape architecture was having a more pronounced effect in the Park after the National Park Service assumed the responsibility for road improvements and construction. In 1919, Punchard ordered vista cuts on the Upper Geyser Basin to West Thumb Road in order for Duck Lake to become visible for the passing tourists, and on the Mammoth Hot Springs to Tower Falls Road so that the Wraith Falls might be seen by tourists.[229]

In Albright's first report to the director of the National Park Service, he made 18 recommendations for improvement, or as he called them, "urgent needs" of the Park. Over half of the "urgent needs" were road related.

Congress failed to appropriate any funds for road construction for 1920 in any of the national parks, thus the engineering division used the year to prepare plans and specifications for many park projects. In Yellowstone, estimates were prepared and specifications for paving the roads were drawn. The General Engineering Office drew standard designs for rustic log bridges of 12 to 90-foot span lengths, for timber and corrugated metal culverts, both with and without head walls, and for concrete arch culverts. The office also wrote standard specifications for the purchase of all types of construction equipment and machinery.[230]

Between the autumns of 1919 and 1920, some 80,000 people visited the Park. With 50,000 visitors arriving in 13,502 automobiles, it was not surprising that by season's end, the roads were worn out in many sections. In Mather's report to the secretary of interior, he stated that the 1919 requests should be completed at an early date. He suggested that additional guard walls or stone parapets be constructed for visitor safety.[231]

With the discussion of a possible extension of the boundaries of Yellowstone National Park, Mather wanted to make it known to the secretary of the interior that if additional lands were added, he would not recommend the construction of any more roads. He felt that the Yellowstone was adequately serviced by the present 400-mile road system. His main concern was that the extension of roads would ruin the wilderness qualities and harm the wildlife habitat. He wrote:

> . . .it is my firm conviction that a part of the Yellowstone country should be maintained as a wilderness for the ever-increasing numbers of people who prefer to walk and ride over trails in a region abounding in wild life [sic]; also, I think a road around Lake Yellowstone or in the Upper Yellowstone and Thorofare country would mean the extinction of the moose. I am so sure that this view is correct that I would be glad to see an actual inhibition on new road building placed in the proposed extension bill, this proviso to declare that without the prior authority of Congress no new road project in this region should be undertaken.[232]

Albright revived Hiram Chittenden's successful method of using road section crews, which involved the placement of crews every few miles on the main roads. These crews were responsible for keeping a section in first class order.[233] The lack of funding, which prevented the hiring of men to clear the snow, prompted the master mechanic in the Park to devise a snowplow fashioned from 1/4-inch boiler steel sheets used in front of a 75-horsepower Holt caterpillar. With this new piece of equipment, the park was able to clear an 11-foot-wide path from headquarters via Grand Canyon to Yellowstone Lake before June 1.[234]

Most of Albright's recommendations for 1920 were the same as those for 1919, with the addition of a request that any park revenues be used for maintenance and improvements in Yellowstone.[235]

All of the national parks in the system needed expert advice on landscape architecture questions. Since the Landscape Engineering Division program area covered road and trail locations, vista cutting, placement of developed areas, suggested design of important structures or buildings, and general cleanup, Punchard's needs were eased by the hiring of Daniel Hull as assistant landscape engineer, in August of 1920. During 1920, an effort was initiated to harmonize and standardize all of the park signs. Yellowstone's master painter painted all of the metallic signs green and white, using red for warnings. All of the signs were affixed to posts instead of trees. These changes conformed to the new landscape division policy on signs.[236]

During 1921, many of the requests for road improvements were fulfilled and both Mather and Albright received high marks for the condition of the roads from the visiting public. One man who had visited Yellowstone for the past 38 years said that he had never seen the roads in such good order. Both Mather and Albright laid the credit to Chittenden's section crew approach.[237]

Major construction projects during 1921 were the widening projects over Dunraven Pass and at the Grand Canyon, construction of stone parapets between the Upper Falls and the Canyon Bridge. A new steel and concrete bridge was placed over the Gibbon River, near Norris. The Lamar River Bridge was reconstructed and a new foot bridge over the Firehole near Castle Geyser was built.

The sprinkling program now covered 107 miles of the road system. One hundred and forty-four supply tanks ranging from 600 to 3,000 gallons capacity supplied 2 motor-driven sprinklers, 2 two-horse sprinklers, and 15 four-horse sprinklers. Fourteen of the tanks were replaced with nonshrinkable redwood 1,600-gallon-capacity, tanks and one 3,000 gallon capacity nonshrinkable tank. Many of the wornout pipes were replaced; new flumes and ditches were built; and many of the supply tanks were relocated to improve the landscape.[238]

During 1921, wooden messhalls were built for the road camps at Tower Junction, Madison Junction, Excelsior Geyser and at Gibbon Meadows. Most of the building material came from the razed Yellowstone Western Stage Company buildings at West Yellowstone. Each of the 16 -by- 22-foot buildings contained a kitchen, dining room, and cook's bedroom. The roof extended six feet beyond the front wall to form a porch, which was enclosed by screening. The doors and windows also were screened.[239]

Other construction activities that kept the master painter busy during 1921 were building 600 signs (mostly small type for comfort stations, camping areas etc). In addition to the National Park Service built signs, some came from the Michigan firm, Hardesty Manufacturing, which had been awarded a contract for supplying all the national parks with signs.[240]

There was much activity for the improvement of park roads and on the Park-to-Park Highway movement on the national level. With the 1920 designation of the Park-to-Park Highway, Mather hoped that the pertinent states would seek Federal aid for improvements of those sections in each state. He pushed for legislation that would recognize the position the park roads and feeder roads had in the overall national road development policy. He asked for $500,000 a year for five years to enable the parks to meet the standards expected by the motoring public. He advised the secretary of the interior that there was "not a single paved road in the national park system at this time."[241] Another movement aimed toward enjoyment of the highways in the western states was the effort by Governor Olcott of Oregon to preserve strips of timber along the roads leading to parks or along major tourist routes.[242]

The general divisions of Landscape Engineering and the Civil Engineering worked closely on the designs for buildings, bridges, roads, and all physical improvements. Mather felt that the cooperation between the two groups offered "the greatest possible good from a scenic and economic standpoint in the expenditure of public moneys for our projects." During the summer of 1921, Maj. W. A. Welch, general manager of the Palisades Interstate Park along the Hudson River in New Jersey and New York, visited several western parks, including Yellowstone. This would not be the last time that one of the leading parkway builders from the East would give suggestions for improvements to Yellowstone.

In November of 1920, Charles Punchard died and his assistant, Daniel Hull, assumed his position as head of the Landscape Engineering Division. This change had positive effects on Yellowstone's appearance. Hull suggested to the superintendents that any new borrow pits, sprinkling stations, and telephone and electric service lines should be placed in the least noticeable positions. In the past, most of these services had been placed in the "easiest" location, without regard to the effect on their landscape.[243]

The secretary of the interior and Mather inspected a major portion of Yellowstone during the autumn of 1921. After this visit, Mather was more convinced and finally concurred with Superintendent Albright's view that, with the exception of a new road from the Upper Geyser Basin to the southwest corner of the Park, no new roads should be built.

After his visit, Mather once again expressed hope that the Federal Government would aid the states with sufficient funds through new road bills to enable them to improve the approach roads. The state of Montana felt that the National Park Service should at least be responsible for the first 20 miles leading out of the Park on the north and west sides, as the park was responsible, under congressional obligation, to maintain the south and east roads into Wyoming.[244] Also during 1921, the Yellowstone Park Transportation Company suffered its first automobile related fatality. Considering the numbers of people the company had moved by motor vehicle over the past four years, it was an exceptional record.[245]

In 1922, Yellowstone celebrated its 50th anniversary with 100,000 people visiting the Park. More than half of these visitors were motorists rather than rail passengers. Fewer than 20 accidents, with one fatality, occurred on the park roads for the season. Improvements during the year included graveling many parts of the loop system and construction of more guard rails on sections that skirted precipices and on dangerous curves. After three years of construction, the Dunraven Pass Road was completed and the Bunsen Peak Road was improved to a standard that enabled automobiles to travel over it. Several new bridges, both inside the Park and on the approach roads, were constructed including a 32-foot span, steel I-beam bridge with reinforced concrete walls and railings over Mormon Creek, a 20-foot span concrete I beam bridge over Goff Creek, a 12-foot reinforced concrete slab bridge over Newton Creek and a 12-foot reinforced concrete slab bridge over Pagoda Creek.[246]

The condition of roads across the National Park System began to receive more attention nationwide as the state and Federal roads programs outside the parks surpassed the road conditions within. This situation caused the park visitor to comment on the noticeable difference. The Federal Government had appropriated several million dollars for road work in the national forests, but none of the Federal Aid Road Acts ever included money for the National Park System. Each park received a small initial appropriation. By 1922, only two national parks had complete road systems, Yellowstone and Crater Lake and these still needed improvements to bring them to first-class standards.

Secretary of the Interior Albert B. Fall wrote to the director of the budget:

> It is my judgment that only by the adoption of an authorized road program can the anomalous situation of having well-built convenient roads leading to the national park boundaries, and then having inadequate or insufficient roads through the parks themselves, be cured, and just criticism of the national administration of the parks be avoided.[247]

Secretary Fall proposed a $7,296,000, three-year road budget for all the parks and monuments in the system. Unfortunately, the budget was rejected and Fall only received money for ongoing projects authorized by Congress. He feared that the popularity of the parks, as evidenced by the increase in visitation from 488,268, in 1917 to 1,217,490 in 1922, would suffer if the roads were not constructed or in better condition.[248]

In early 1923, a speech about the national parks roads was delivered before the United States Congress by Colorado Senator Lawrence Phipps, in which he recognized that World War I had changed the face of travel in the United States. Prior to the war, a large percentage of the American travel dollar was spent in viewing the European wonders and sites, but as a result of effective boosterism, such as the "See America First" campaign and organized motor clubs, combined with the tragic situation in many parts of wartorn Europe, more Americans began to travel within the country. He stated that nearly two-thirds of the visitors who came to the parks in motor vehicles brought their own camping equipment. He called upon his colleagues to question, "Then what about the roads--that prime necessity of motorists?" He explained that as of the beginning of 1923, about five miles of oiled macadam roads were in Yellowstone and a short section of paved road in the Grand Canyon, and that section financed by the railroad! Senator Phipps elaborated further on the road situation across the National Park system. Only Yellowstone and Crater Lake had completed road systems. No government money had been spent on the roads in Hawaii, Wind Cave, General Grant, Lafayette, Mount McKinley, and others. Of the 138 miles within Yosemite, the Federal Government had only built 8 miles, despite the collection over the years of $310,000 in entrance fees of $5.00.[249]

Senator Phipps understood the post-World War I United States Treasury's position of trying to save money in every sector. However, he felt the money paid by park visitors should be used to maintain or improve the roads. In his appeal for passage of the 3-year $7,500,000 appropriation Phipps urged:

> Senators, this matter of adequate roads for the parks is not a selfish, a local, or solely a western issue. The parks are widely scattered and the number of visitors affects travel in every State of the Union. But that, possibly, is incidental. The proposition is this: The Congress, representing the will of the Nation, has created these parks for the use, enjoyment, and benefit of all its people. This was extremely wise, as no investment could yield better returns in improving the health and quality of our citizenship, in promoting that unity of national feeling, that love of country, called patriotism. Having already taken this step, will the Congress now deny, to a large extent, the means whereby the parks may be used and enjoyed? We have given deserved recognition to the importance of other road work in all parts of the country. We have provided liberal Federal contributions for post roads, for farm-to-market roads, and for connecting links in a comprehensive program, national in its scope. We have also constructed needed highways in our national forests. That these appropriations were prudent and that work should continue, experience has already demonstrated. Now, Mr. President, there is one thing lacking. One well-nigh forgotten class of Government reservations should be connected up with the other highway chains already authorized. We must remember our national parks.[250]

During the summer of 1923, President Warren G. Harding and a party of 80, including the future president Herbert Hoover and future secretary of the interior Hubert Work, visited Yellowstone and a number of other western parks. President Harding was moved by the visitors to the Park and several times told Superintendent Albright that "Yellowstone revealed a cross section of the people of America." He was the third American president to visit the Park and the first to travel by automobile on the road system. During the visit, Director Mather discussed the park roads bill, to which President Harding replied, "Don't worry, I'm the boss." However, Harding's unfortunate death prior to his visit to Yosemite caused concern for the bill supporters. They felt they would have to begin again convincing the new president, Calvin Coolidge of its importance. Fortunately, Coolidge supported the bill, and in the spring of 1924, it was passed.[251]

Meanwhile during 1923, Mather was faced with the problems of insufficient monies for improvement or construction in the parks. Since the creation of Yellowstone, $3,042,300 had been appropriated for the roads in the system, with Yellowstone receiving $1,482,000 during the Army's presence in Yellowstone. Despite Mather's acknowledgement that Yellowstone's roads were better than any other park's, the excessive numbers of visitors caused rapid deterioration of the system and the fact that most of the money had been spent building wagon roads and not roads suitable for motor vehicles. Consequently, many of the roads were too narrow with too steep grades and the road base and surfaces were not adequate for motor vehicle travel.

Mather did not believe that:

> all our roads should be constructed on the most up-to-date road construction standards, but rather that each park road should be studied carefully with a view to its construction on grades and of material that will best suffice for its particular need; but all park roads should be full double width where possible to accommodate conveniently two-way travel. . . . We must guard against the intrusion of roads into sections that should forever be kept for quiet contemplation and accessible only by horseback or hiking.[252]

Mather was opposed to building the proposed new road across Bighorn Pass, along the Gallatin River, down Panther Creek joining the road from Mammoth Hot Springs to Norris. He felt strongly that, "We must keep a large area of Yellowstone in a state of untouched wildness if we are to be faithful to our trust as protectors of the wild life *[sic]* with which the park abounds."[253] However, the director did support the government rebuilding the northern approach road through Yankee Jim Canyon, which had been requested by Montana officials for some time.

During the 1923 season, which received a 40 percent increase over the previous season's visitation, general improvements of widening, surfacing, and sprinkling were carried out.[254] Construction of log and stone guardrails and walls were completed. Two small sections of new roads were built in order for visitors to be able to bypass the permanent camps at Lake and to connect the Mammoth permanent camp with the Buffalo Corral road. A 16 -by- 26-foot log mess house and a 16 -by- 30-foot log stable were built at the Lewis River road camp.[255]

By the end of 1923, the possibility that the proposed $7.5 million appropriation would pass was favorable, and this brought new planning demands upon the National Park Service. Acting Director Arno Cammerer felt the Engineering Office should be moved from Portland, Oregon, to Denver, Colorado, where a more centrally located office would make communications with the field and Washington more convenient. He felt the road construction responsibility for Yellowstone, Yosemite, Mount Rainier, and Crater Lake should be given to the superintendents of the parks, whom he believed were either "tested road builder himself or had such talent available."[256]

223. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919* (Washington D.C.: Government Printing Office, 1919), 25-26.

224. Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919, 46-47.*

225. Mather, 47.

226. Ibid., 31-57.

227. Ibid., 160.

228. Ibid., 165.

229. Ibid., 167.

230. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1920 and the Travel Season 1920* (Washington D. C.: Government Printing Office, 1920), 90 and 92.

231. Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1920 and the Travel Season 1920,* 106 and 102.

232. Mather, 104.

233. Ibid., 208.

234. Ibid., 104 and 209.

235. Ibid., 234.

236. Ibid., 213.

237. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921* (Washington, D.C.: Government Printing Office, 1921), 163.

238. Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921,* 167.

239. Mather, 169.

240. Ibid., 171.

241. Ibid., 24.

242. Ibid., 49 and 50.

243. Ibid., 56, 58, and 59.

244. Ibid., 63 and 65.

245. Ibid., 187.

246. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal year Ended June 30, 1922, and of Travel Season 1922* (Washington D. C.: Government Printing Office, 1922), 37, 102, 104-105.

247. B.L. Vipond, "Park Service Outlines Plans," *Western Highway Builder. Vol. 4 No. 12.* December 1922, 11.

248. Ibid.

249. Senator Lawrence Phipps, "Roads in National Parks," speech of Honorable Lawrence Phipps in the Senate of the United States, Friday, January 5, 1923. (Washington D.C.: Government Printing Office, 1923), 2-3.

250. Phipps, "Roads in National Parks," speech of Honorable Lawrence Phipps in the Senate of the United States, Friday, January 5, 1923, 5.

251. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1923, and the Travel Season 1923 (Washington D.C.: Government Printing Office, 1923), 37-38.* Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1924, and the Travel Season 1924 (Washington D. C.: Government Printing Office, 1924), 11. The Stockton Record,* December 22, 1923. Article describes the proposals for the California national parks.

252. Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1923, and the Travel Season 1923,* 10-11.

253. Mather, 48-49.

254. Ibid., 114.

255. Ibid., 116.

256. Arno B. Cammerer, Acting Director, National Park Service to Horace Albright, Superintendent Yellowstone National Park, 26 December 1923. Yellowstone National Park Archives, Yellowstone National Park.

CHAPTER VII

THE NATIONAL PARK SERVICE BEGINS ROAD PROGRAM 1924-1925

Before long the rain began to fall, and as the roads were soft clay they soon became very slippery and we had to put on our chains to avoid a serious accident. Even then it was difficult driving on those steep, narrow, winding roads, and we made very poor time, the car just crawling along on low or second gear for hours at a stretch. In places we had to stop and wait for a passing car or truck to extricate itself from the mud, and considered ourselves fortunate that we were not ditched ourselves. *Modern Gypsies, 1924*
- Mary Crehore Bedell

In February of 1924, the House Committee on the Public Lands held hearings on H. R. 3682, a Bill authorizing the construction, reconstruction and improvements of roads and trails in the national parks, under the jurisdiction of the secretary of interior. Mather, Albright, and M.O. Eldridge, Secretary of the Good Roads Board of the American Automobile Association, were among the men who testified. Mather felt that this legislation was the most important bill to be considered since the act that created the National Park Service in 1916. Albright explained to the committee that the 3-year plan would enable the National Park Service, which has a total of 1,060.5 miles of roads, to reconstruct 391.5 miles, surface 353.6 miles, and construct 360.85 miles. He further explained that expensive paving was not part of the program, except for 28 miles through the Yosemite Valley. All of the surfacing would be crushed rock or gravel, with a small section of bituminous macadam.

Albright believed that in most cases, the roads were not ready for paving. Since most had been built for animal-drawn vehicles, they would need widening and the curvatures and grades corrected for automobile use. Albright told the congressmen that the National Park Service would have to come back to them some time in the future for paving monies. In comparison to state roads, he stated that most of the park roads in Montana, Idaho, and Wyoming were not paved. Albright testified that the three-year $7,500,000 project would provide good curvatures, proper widths and grades and thus a good base for future paving projects.

Eldridge told the congressmen that the American Automobile Association had consistently supported appropriations for park road construction and improvements and certainly supported the impending bill. He related that the late Executive Chairman A. G. Bathchelder, had been appointed by Secretary of Interior Franklin Lane to serve on a commission with the duty to assess the question of whether automobiles should be admitted to national parks. The commission also had written the initial rules and regulations under which automobiles could be admitted into Yellowstone.[257]

Mather felt that the passage of the authorization bill in April of 1924, reflected the "will of the people in demanding that the roads in the national parks be placed in a good and safe condition for motor travel."[258] The first appropriation fell short of the expected $2,500,000 due to the Treasury having to pay for the Adjusted Soldiers Compensation Act. The first appropriation of $1,000,000 came with the request from the House that this money be used for improvements on the existing roads, bringing them up to a safe and comfortable traveling condition. However, they did promise that appropriations for the second year would come early in the spring, so longer projects could get underway. The deficiency of the first appropriation resulted in few accomplishments for 1924 in Yellowstone.[259]

However, one of the major accomplishments for 1924 in Yellowstone, but not financed by road money, was the construction of a combined checking and ranger station at the West Entrance. The log-trimmed frame building was the idea of the chief ranger who supervised its construction. A temporary station, similar to the West Entrance Station, was also built at the East Entrance until a permanent building could be designed and built. A new 1,300-foot-long road was built near the Old Faithful permanent camp and the old road was abandoned. A new log-trim frame, 16 -by- 24-foot bunkhouse was built for the road camp on Dunraven Pass.[260]

Probably the most important thrust during 1924 was roadside cleanup. Albright and the Yellowstone Park Hotel Company agreed to a three-year plan of reconstructing all of the poles and lines throughout the Park, and most importantly, using only one set of poles. Prior to 1924, the government ran its telephone or other lines on one side of the road and the hotel company ran its down the other side. During 1924, the lines and poles were removed on the Mammoth Hot Springs to Norris road and new joint lines and poles were placed in a swath cut through timbered areas away from the road. In the open areas, the lines and cedar poles, with six-foot crossbars, were placed farther away from the road and preferably on the side of the road with the more inferior scenery.[261] Albright's wish, "If we now had the means to clean up the roadside of the Yellowstone, this park would be in first-class condition so far as its landscape protection is concerned" was soon fulfilled.[262]

A visit to Yellowstone by John D. Rockefeller, Jr. during the summer of 1924 had several implications for public enjoyment of the park. The first, and the one with the most immediate effect, was his assessment of the condition of the park roadsides. Upon his return to his summer home in Seal Harbor, Maine, he wrote to Albright thanking him for the kindness shown to him on his trip, but also stating, "There was just one thing in the Park which marred my enjoyment of that wonderful region, and I have wondered if I might be helpful to the Park administration in improving that situation. I refer to the vast quantities of down timber and stumps which line the roadsides so frequently throughout the Park." Wishing to remain an anonymous donor, Rockefeller went on to offer suggestions for cleanup and financial backing for a parkwide roadside cleanup project.[263]

For the next few months, correspondence flowed between the East coast and the Park, with Albright making estimates and Rockefeller offering suggestions and also sending the first of many checks to cover the cost of the cleanup operation. Albright explained to Rockefeller that both he and Mather had been concerned about the roadsides since their 1915 trip to the Park. Both had discussed cleanup with the Army officers at that time, but the Army estimates "almost paralyzed us but we took them at their face value."[264] He continued by stating that since the National Park Service took over the administration of the Park, the grim financial situation had never allowed any cleanup other than picking up firewood for use during the winter. Albright had brought up the situation before several congressmen and before several subcommittees, but to no avail. He said the congressmen felt there were too many more pressing needs than cleanup.

In September, Albright and Park Engineer A.W. Burney made a careful inspection of the road between Mammoth Hot Springs and Norris Junction, in order to assess the amount of work to any given area on this section and to estimate the cost of cleanup. It had been decided that this section was the worst in the Park and that it should have priority, particularly since this was also the first section for telephone poles and lines relocation. Albright felt that the public image of the Park might improve since part of this section was in the area of the forest fire that burned through a Douglas fir forest extending from Terrace Mountain in the west to Bunsen Peak on the east in the early 1880s. While a portion of this burned section reforested soon after the fire, much of the section through which the road ran, did not experience reforestation. Many of the burned trees had been used for lumber in the building of Fort Yellowstone and at the Mammoth Hotel. Thus for over 30 years, stumps remained near and in the view of the road south of Mammoth Hot Springs. Albright feared that visitors would misinterpret the situation and assume that government policy allowed the operation of sawmills within the Park, to provide lumber for park buildings and perhaps even for shipment outside of Yellowstone. Albright and Engineer Burney recommended stump clearance from 200 to 500 feet away from the road's edge "in order to restore a condition that could be regarded as natural."[265]

Rockefeller sent Albright a check for $1,000 to cover the experimental project and indicated that more money would be forthcoming based upon the success of the experimental project.[266] Thus the cleanup operation began in September, with Albright and Engineer Burney personally supervising a crew of three laborers, one cook, two teamsters, and a truck driver under the direction of a foreman. The crew was equipped with a camping outfit, 3-1/2 ton dump wagons, chains, axes, shovels, etc., and began at a point approximately eight miles south of park headquarters. The amount of cleanup ranged from 50 to 60 feet on each side of the road. The crews hauled away all dead and down timber, brush, debris, etc. Dead standing trees within 10 to 15 feet of the roadway were cut down and removed. The other dead trees farther away from the road were left standing, unless they were about to fall down, or were an impairment to the landscape.

As the work progressed, Albright formulated an estimate of $14,430 for the heavy and light cleanup of the entire Mammoth Hot Springs to Norris Junction section. He hoped to have an estimate for the Park by the opening of the 1925 season.[267]

During the fall of 1924, Rockefeller not only sent additional monies, but he personally became involved with cleanup procedures. He suggested that hauling costs could be lowered if the dead trees, stumps, brush, and debris could be piled and burned. He also favored the removal of the dead trees that were farther than 15 feet from the roadside.[268] Albright agreed with Rockefeller's suggestions.

In a November letter to Rockefeller, Albright announced that the 11-mile section from Mammoth Hot Springs to Apollinaris Spring was:

> as clean and beautiful as any similar stretch of road in the western part of the United States, except perhaps where millions have been spent on landscape improvements such as along the Columbia River Highway. I can truthfully say that the results we are obtaining in this cleanup work are beyond my expectations. Truly, no more important work has ever been undertaken in this park than the landscape improvement that you have authorized and I find that I personally am getting more pleasure out of supervising this work than almost anything else I have undertaken.[269]

In addition to the overall landscape improvements, Albright felt that the improved appearance impressed the road crews to such an extent that their previous attitude toward the roadside would be changed. Prior to the cleanup, the crews tended to cut trees along the roads and trails for use in repair work of the bridges, culverts, and buildings and dig gravel pits along the roadsides. The cleanup project also prompted Albright to instruct the road crews to include cleanup and maintenance of the roadsides as part of their normal duty. The new duties also included the removal of old gravel pits along the roads.[270]

Also during the summer of 1924, Mather requested Albright's views on the Bureau of Public Roads assuming road construction and improvements in the parks. The day after receiving Mather's telegram, Albright responded in detail his opinion:

1. The standards of the U.S. Bureau of Public Roads are extremely high, making road work very costly. Should we adopt the standards of the Bureau of Public Roads, our fund of $7,500,000 would not build half as many miles of new roads, nor improve half as many miles of old roads, as we expect to build and improve. Furthermore, our standards call for retention of curves in order to avoid deep cuts and more or less unsightly fills and often extensive destruction of timber, whereas, the Bureau of Public Roads standards call for elimination of curves wherever possible and straight roads.

2. The Bureau of Public Roads up to the present time has not had supervision in its road building from landscape engineers. If it performed our road work it would have to establish a special division of landscape engineers. We have such a division at the present time. Lack of landscape engineer is responsible for the cutting of the right-of-way into the Calaveras Grove of Big Trees which

resulted in the loss of one of the biggest sugar pines in California, as set forth in articles and pictures regarding the recent visit of Director Mather and myself to the Calaveras Grove.

3. The Bureau of Public Roads is a big organization, but does not have sufficient engineers to take over our work. That Bureau would have to add just as many engineers to supervise our work as we ourselves would have to add to our organization, and in addition our appropriation would have to bear a portion of the overhead of the Bureau of Public Roads, which has a higher overhead than ours.

4. In certain parks, such as Yellowstone for instance, most of the road work which will be done under the new appropriation, can be handled under the supervision of the regular engineering organization. In other words, we have to have engineers here all the year round to plan and carry out maintenance work and these men can also supervise what construction we have to do. This observation applies to several parks.

5. Much of our road work will be improvement of existing roads such as widening, improvement of grades and surveying. This work will have to be carried on while the tourist season is in full swing. Such work will have to be done by force account and should be done under our direction because we will have to control the traffic and enforce our rules and regulations with reference to the use of the road during the time that the construction work is in progress. We had an example last year on the West Yellowstone approach road from Ashton, where the BPR let a contract for surfacing this main approach and through the summer tourists were routed over atrocious detours and complaints were myriad.[271]

Albright explained that the Forest Service was also opposed to the Bureau of Public Roads doing their road work. He then detailed the conditions under which the Bureau could be allowed to administer the road construction program.

1. The Secretary of the Interior be empowered to absolutely fix:

    a. The standard of the road
    b. The amounts to be expended on any given project
    c. to have equal voice with the Secretary of Agriculture in the fixing of overhead charges against park appropriations

2. That the National Park Service's Landscape Engineering Division have full authority to pass on all survey and specifications before contracts were let and to supervise the landscape end of the work after contracts had been awarded.

3. In parks where the regular engineering organization necessary to properly maintain the park is fully qualified to perform the road work, then the Secretary of the Interior should have power to permit these organizations to do all road work in their respective parks by and with the general advice of the engineers of the Bureau of Public Roads.

4. That for the first three years' program the appropriation should be not less than $100,000.[272]

Albright concluded by adding that if the above conditions were met, he would have no problem with the Bureau assuming the road construction and improvement programs in the national parks. He spoke very highly of his friends, the Chief of the Bureau Thomas McDonald and his deputy, Dr. L. I. Hewes.[273]

Before the end of 1924, Albright found out that a little less than $1 million was being spent on the approach roads to Yellowstone National Park. Most of the funding had come from the Federal road aid and Forest appropriations and a smaller percentage from the states of Montana, Idaho, and Wyoming. Most of this work was done within 50 miles of the park boundary and on roads primarily used by tourists to Yellowstone. Albright noted that since the time the Army left the Park in 1918, Yellowstone had received $60,403.32 for road improvement, (the widening of Dunraven Pass road and the surfacing of the south entrance road) compared to anywhere from $500,000 to $750,000 by the surrounding states for improvement of old roads and the construction of some new sections. Albright found their figures to be very discouraging. In the past, the road system within the Park had outshone the free approach roads. However, the free approach roads were becoming far superior to the fee-collected intra-park roads which Albright called "really toll roads". He warned the director that "nothing but criticism can be expected by Department and National Park Service officials from people who will have to use our roads."[274]

The approach road situation worried Albright and it prompted him to request a report from Engineer Burney on the feasibility of the National Park Service assuming the responsibility for construction and maintenance of the approach roads to Yellowstone National Park. Albright concluded that the most pressing problem was the 60-mile north approach road from Livingston to Gardiner, Montana. This section, designated by the Montana State Highway Commission as part of the State Highway System, could have received money under the Federal Aid Road Act, however, the county's share would have been 47 percent. With Park County having nearly 700 miles of roads and 28 large bridges to maintain on a $40,000 per year budget, the outlook for the Livingston to Gardiner section was dim. Of the 700 miles of Park County roads, 103 miles were designated as being on the National Park-to-Park Highway system, and 35 miles of it north of Livingston were presently under construction. The construction of the 35 mile section was funded under the Federal Aid Road Act and the State Highway Commission. Park County's share was raised by bonds; thus, the county was in no position to take on further road projects for a long time.

Albright believed the Forest Service should take care of the 3-1/2 miles of the approach road that runs through the Gallatin National Forest, but that the National Park Service should be responsible for the reconstruction and maintenance of the 18-mile section, from Gardiner through the Yankee Jim Canyon. The Yankee Jim Canyon was in dire need of reconstruction to correct the dangerous, steep grades, sharp curves and narrow road widths. The Bureau of Public Roads engineers estimated that the reconstruction of the 18-mile section would be $314,000. A section south of Livingston had recently been reconstructed and given a crushed gravel surface.[275] This program did not go unnoticed nationally. Shortly after Engineer Burney's report, H. R. 8882, a bill authorizing the construction of approach roads to national parks and monuments, was being prepared to be introduced to the House of Representatives by Congressman Scott Leavitt.[276] Six years later, appropriation bills backed by Congressman Leavitt awarded $10 million dollars to the National Park Service, with a portion designated for approach roads into the parks and monuments.[277]

257. Published hearings before the House of Representatives Committee on the Public Lands regarding H. R. 3682, 68th Congress, 1st Session, February 7, 1924, 3, 18, 19, 20, 26, and 27. The text of the hearings contains good information on other national parks - Yosemite, Crater Lake, Mount Rainier, Glacier, Mount McKinley, Grand Canyon, Mesa Verde, Hawaii, General Grant, Lassen Volcanic, Sequoia, Lafayette, Rocky Mountain, Wind Cave, Platt, and Zion.

258. Stephen Mather, *Report of the Director of The National Park Service to the Secretary of The Interior for the Fiscal Year Ended June 30, 1924, and the Travel Season 1924* (Washington, D.C.: Government Printing Office, 1924), 12.

259. Mather, *Report of the Director of the National Park Service to the Secretary of The Interior for the Fiscal Year Ended June 30, 1924, and the Travel Season 1924, 12.*

260. Mather, 34 and 96.

261. Horace Albright, "Report on Roadside Clean Up," October 8, 1924.

262. Mather, 96.

263. John D. Rockefeller, Jr. to Horace Albright, 15 August 1924. Rockefeller Archives, Tarrytown, New York.

264. Horace Albright to John D. Rockefeller, Jr., 2 September 1924. Rockefeller Archives, Tarrytown, New York.

265. Horace Albright, "Report on Conditions of the Roadsides Between the Superintendent's office at Mammoth Hot Springs and Norris Junction, September 1924." There are good photographs in Rockefeller Archives of before and afterviews of the cleanup program. Many details of the cleanup can be found in the correspondence and reports regarding the project. These are located in the Rockefeller Archives in Tarrytown, New York.

266. Rockefeller to Albright, 9 October 1924. Rockefeller Archives, Tarrytown, New York.

267. Albright, "Report on Roadside Clean-up," October 8, 1924.

268. Rockefeller to Albright, 16 October 1924. Rockefeller Archives, Tarrytown, New York.

269. Albright to Rockefeller 4 November 1924. Rockefeller Archives, Tarrytown, New York.

270. Ibid. Rockefeller Archives, Tarrytown, New York.

271. Horace Albright to Stephen Mather, Director of the National Park Service 17 June 1924. Yellowstone National Park Archives, Yellowstone National Park.

272. Ibid.

273. Ibid.

274. Albright to Mather, 11 November 1924. Yellowstone National Park Archives, Yellowstone National Park.

275. R.W. Burney, Assistant Engineer, Yellowstone National Park to Albright, 6 December 1925. Yellowstone National Park Archives, Yellowstone National Park.

276. Leroy Hill, Acting Superintendent, Yellowstone National Park to Congressman Scott Leavitt, 7 December 1925. Yellowstone National Park Archives, Yellowstone National Park.

In Doris Whithorn's *"Yankee Jim's National Park Toll Road and the Yellowstone Trail,"* April 1989, she writes . . . In 1924 construction was started . . . this time on the east side of the river - across the gorge from Yankee Jim's rough trail. When the contractor, L.T. Lawler of Butte announced the January completion of the grading and rock work started on August 18th with a crew of 60 men, the comment ran: 'The construction of a road on the east side of the river to eliminate the hills in Yankee Jim Canyon has been the desire of Park County people for a number of years.' During 1925 all of the 10 miles from Carbella to Corwin were graded and immediately there were plans to hard surface the entire section. It was August 1926 when the paving project was done, and by mid-September of that year, traffic was routed over the beautiful new highway. Altogether for the 10-mile stretch there had been an outlay of $92,000 - $60,000 worth of grading and $32,000 for hard surfacing.

277. John Ise, *Our National Park Policy A Critical History* (Baltimore: John Hopkins Press, 1961), 327.

CHAPTER VIII

THE BUREAU OF PUBLIC ROADS AND THE NATIONAL PARK SERVICE

"A Splendid Working Agreement" - Stephen Mather, 1928

There was much debate during 1924 and 1925 over the advantages and disadvantages of the Bureau of Public Roads taking over the responsibility of road improvement and road construction in the national parks. In a 1924 report, Albright spoke very highly of the Chief of the Bureau of Public Roads Thomas McDonald and his deputy, Dr. L.I. Hewes, but he was not in favor of the Bureau assuming the roadwork in the parks. He felt that since National Park Service road standards were lower than those of the Bureau of Public Roads, the parks would get more roads for the money, the National Park Service could protect the park landscape and could build roads at a lower cost due to lower National Park Service overhead. However, by April 1925, Albright concluded that for the following reasons, it would be advantageous for the Bureau of Public Roads to be in charge:

1. Engineer Goodwin cannot co-operate with the park Superintendents and is out of harmony with some of Director Mather's policies. It appears that he must be replaced anyway.

2. Roads built in Bureau of Public Roads standards will be on a par with approach roads to the parks, will be safe for all park travel, and be constructed for all time to come, while roads on other standards will ultimately have to be improved.

3. It will be vastly easier to obtain future road funds under General Road acts and with the close of the 1927 fiscal year, both the National Park Service and the General Road authorities expire.

4. The Bureau of Public Roads have all of the best road engineers available to the Federal Government. We would have to offer higher salaries to get their men or to entice men away from the states.

5. The Bureau of Public Roads has been building roads for nearly ten years, and as one of their men recently told me, "They have made all the mistakes it is possible to make, and that they know how to build without making so many mistakes, at least mistakes that a new organization would make."

6. The Bureau of Public Roads will probably be transferred to the Interior Department under the present plan of departmental reorganization, so ultimately it is likely that the Bureau will take over our road work anyway.[278]

In his recommendation for the changeover, he stipulated several conditions:

1. To revise the 3-year road program to conform to Bureau of Public Roads standards in general.

2. To turn over National Park Service road improvements to the Bureau of Public Roads.

3. To have the Bureau of Public Roads survey all projects and plan future roads.

4. To abolish the National Park Service office in Portland.

5. To work out a plan of cooperation with the Bureau of Public Roads that will continue authority in the Interior Department to:

    a. Approve location of projects and areas to be opened to roads.

    b. Control protection of the landscape.

    c. Continue all maintenance and repair work, and where practicable to improve or build roads by force account under park engineers.[279]

One of the first changes to occur at the national level was the reorganization of the Civil Engineering Department. Chief Civil Engineer Goodwin was relieved of his duties by Secretary of the Interior Hubert Work, July 1, 1925. Goodwin's assistant, Bert Burrell became the acting chief engineer. During 1926, the Civil Engineering Office was moved from Portland, Oregon, to Yellowstone National Park, remaining there until its relocation to San Francisco on October 1, 1927. Bureau of Public Roads Engineer Frank Kittredge was named the chief civil engineer with Burrell named as his assistant. The following year, 1928, the San Francisco office was designated as the National Park Service's Field Headquarters. Both the Civil Engineering Division and the Landscape Architecture Division were moved to the Underwood Building in San Francisco.[280]

In 1926, the National Park Service and the Bureau of Public Roads signed a Memorandum of Agreement relating to the survey, construction, and improvement of roads and trails in the national parks and national monuments.[281] Mather called the document a "splendid working agreement." He believed that the Landscape Division would be "indispensable" to the Bureau of Public Roads in their joint effort "where scenery must be conserved and at all costs left as little scarred as possible."[282]

Daniel Hull, chief of the Landscape Engineering Division, could not have agreed more. Even before the National Park Service and the Bureau of Public Roads signed their agreement, Hull found that his division spent a "larger portion of time than ever before . . . to landscape protection in connection with the road construction program."[283] The division's specific duties included:

> . . . inspection of the territory before survey is made, going over preliminary road line with the idea of suggesting modifications for the protection of landscape features or to take advantage of some scenic point which had been previously overlooked, and inspection on the ground during actual construction for the purpose of adding in the best means of carrying the program forward, particularly with an idea of making the finished result the best possible in its relation to the landscape. Bridges in connection with the road projects have received considerable attention. [284]

During 1925, the Civil Engineering Department maintained 291.8 miles of road in the park, 28 miles of road in the Shoshone National Forest and 30 miles of road in Teton National Forest. Throughout the travel season, 107 miles of roads were sprinkled twice daily. Of the 13 projects proposed as a part of the first 3-year road improvement program, 5 were planned for completion or near completion in 1925:

1. Lake Shore Road--reconstruction of the 11-mile stretch of road along Yellowstone Lake between Bridge Bay and West Thumb--replaced a steep, narrow, and uninteresting section.

2. Firehole River Road--widening the 1 1/2-mile section along the Firehole River, south of the Firehole Cascades--would allow 2-way traffic.

3. West Thumb to Arnica Creek Road--widening a 3/4-mile section of road over Bluff Point, 2 miles from West Thumb on the Lake Road.

4. Mammoth Hot Springs to Tower Falls Road--widening a 1 1/8-mile section and surfacing a 3-mile section between the 2 and 5 mile posts from Mammoth Hot Springs.

5. Inspiration Point Road--reconstruction of a 2 1/2-mile section along the north rim of the Grand Canyon.[285]

The 54-foot steel bridge removed from a Gardner River location in 1919 replaced an old log bridge over Crawfish Creek. The steel bridge, placed on concrete abutments, was a 15 degree skew bridge and its placement allowed the road to be straightened at the bridge crossing. Other bridge work included painting 23 steel bridges with paint composed of 15 percent sublimed blue lead, 10 percent silica and 10 percent zinc, 20 percent pure chrome yellow, 35 percent white lead and 10 percent National Park Service green coloring ground in pure linseed oil.[286]

During the autumn of 1925, park engineers completed preliminary surveys of an 8-mile stretch between Turbid Lake and Sylvan Pass on the East Entrance Road and an 18-mile section north and west of Grayling Creek on the West Gallatin Road.[287] The National Park Service expected the Bureau of Public Roads to conduct reconnaissance surveys on the Canyon Junction to Tower Junction road, the Tower Junction to Mammoth Hot Springs road, from Fishing Bridge to Lake Butte on the East Entrance Road, the Norris Junction to Madison Junction road, and the Lake Junction to West Thumb road.[288]

The working season of 1926 was a trying one for Superintendent Albright. In addition to the transfer of the responsibility of the roadwork to the Bureau, Albright faced problems with independent contractors trying to complete small jobs within the Park. The Inspiration Point road in particular illustrated the unsatisfactory working arrangement with contractors on small projects. Albright felt the park road crews could have completed the project on time. Since many of the park projects were small in scale, the very large contractors did not bid. In the case of the Inspiration Point Road, a nearby contractor, Pioneer Construction Company, was awarded the contract, despite the fact that they did not have the equipment or any engineers. In the end, park road crews worked on it at the expense of the contractor. Albright feared that the Bureau would be faced with similar problems.[289]

With the prospects of an expanded roadwork program lasting many years, another issue was housing for road crews. Road camp facilities for the crews were examined and tentative proposals offered for improving the situation. In the Mammoth Hot Springs area, road workers were housed in several locations. One unwinterized building had seven private rooms and a dormitory configuration large enough for 15 iron bunkbeds. The truck drivers, barn men, commissary employees, and others occupied 14 small rooms over the old carpenter shop. The 14 cubicles were heated by individual stoves which consumed large quantities of fuel. Three men lived in one end of "McFarland's" shop without the benefit of washing or bathing facilities or toilets. The proposal for this area was to build additional quarters for single, permanent employees and the partitioning of the old carpenter shop into more rooms and a bathroom. At Beaver Lake, the present log messhouse and frame stable were repaired by putting in a new fir floor and a large range with hot water tank and the addition of a frame bunkhouse for 10 men. At Norris, the frame mess house was found to be too large and unsightly and was earmarked for replacement by a new one. The log and frame stable and frame bunkhouse with log trim needed painting or staining. The two small frame buildings need to be relocated to a less conspicuous place. At Gibbon Meadows, the log stable and frame mess house were sufficient and changes were not needed. At Madison Junction, a log bunkhouse to house 12 men was recommended. The frame messhouse and log storehouse were adequate, but because more motor equipment was needed in this area, the stable located in one end of the storehouse probably would not be needed. At Excelsior Geyser, a frame bunkhouse addition was recommended for the frame messhouse and log stable complex. At Old Faithful, the frame mess house and frame officer's house complex needed a frame bunkhouse for camp cleaners, sprinkler man, and truck driver, and a frame stable for the cleaner's team and the ranger's horses. Nothing besides the frame messhouse and bunkhouse, small frame house for the cook and frame stable, was required at Spring Creek. Nothing more was required at DeLacey Creek, other than the frame messhouse and bunkhouse and frame stable. At West Thumb, it was recommended that the frame messhouse and bunkhouse located in the auto campground be torn down and a new unit built on the hill south of the campground. In addition, it was recommended that a stable be built. A frame granary and a log and slab shed for a stable were also located in the auto campground.

At Lake, it was recommended that the log mess house be remodeled to add a cook's quarters, and that the log bunkhouse be remodeled or a new one built. A new log or frame stable was required, and it was recommended that the old sheds in the area be razed. At Trout Creek, it was suggested that the frame stable be razed, a smaller one be placed behind the log messhouse, and a frame bunkhouse built. At Canyon, the log messhouse had to be enlarged to include a cook's quarters and a new bunkhouse for 15 men be built. A log stable was also in the complex. At Dunraven Pass, the frame mess house, frame stable with log trim and the frame bunkhouse with log trim were adequate. At Tower Junction, the old log stable had to be razed and a smaller one built behind the frame mess house. A log or frame bunkhouse had to be built. At Blacktail Deer Plateau, the old log mess house and log stable had to be razed and a new complex of messhouse, bunkhouse, and stable be built at a site nearer the road. At Virginia Meadows, a small log or frame bunkhouse and stable needed to be added to the existing log messhouse. At West Gallatin, a log messhouse and log bunkhouse needed to be built after the road was completed. Two complexes containing a messhouse, bunkhouse, and stable needed to be built at the Lamar Canyon and at Devil's Well, on the Cooke City Road. A frame or log messhouse, bunkhouse, and stable needed to be built at Turbid Lake and at the East Entrance. A log bunkhouse needs to be added to the log messhouse and log stable at Lewis River. The log messhouse, log bunkhouse, log stable, and log bathhouse at Cub Creek were adequate.[290]

The first five projects of the three-year plan were completed in 1926. The work along the Firehole River between Madison Junction and the Firehole Cascades was "constructed on the highest standards of any used in the National Park Service" since "the beauty of the canyon justifies the very great attention that is being given to details of wall and fill construction."[291] The maintenance staff painted five bridges including the Gardner River and Yellowstone River bridges on the Cooke City road the National Park Service green. The Lamar River Bridge was realigned and repaired and the Lava Creek, Blacktail Deer Plateau and the Gardner River bridges were redecked. The Park and the Yellowstone Park Hotel Company continued their telephone line removal project with removal of lines between Norris Basin and Old Faithful that year. The landscape architects worked very closely on this project, particularly where vista cutting was required.[292]

The Rockefeller funded cleanup operation completed the Mammoth Hot Springs to Norris Junction section with crews working out of the road camp buildings at Beaver Lake, a tent camp set up in the public campground at the 16.5 milepost near Twin Lakes and a crew at Norris Junction. Due to the high fire risk, the piles of debris were left for the rangers to burn later.

In June, a crew worked out of Lake Camp on the Bridge Bay section, and in September, out of the road camp at West Thumb. During September, other crews working the Lake to Canyon Road found the slopes of the Cascade Creek Canyon just below the Canyon Hotel and the canyon west of the ranger station very steep and difficult. Stump removal on all of these sections was done with blasting and/or with 75 Holt tractors. By the close of the 1926 season, Rockefeller had given $22,368.37 toward the cleanup of 31 miles of Yellowstone roads.

The Park crews, using government funds, continued work on the Lake Shore Road by cleaning up the shoreline and cutting vistas at specific points along the road. They removed old slashings that had been dumped over the rim at Canyon, cleaned up the road to the Canyon bear dump behind the hotel, and removed old trees and stumps from the dump.

Reconstruction of the East Entrance Road was scheduled to begin in September using park crews. Bad weather, however, prevented any excavation, so the crews began clearing and grubbing. The workmen found these sections to be the heaviest work in the Park, due mostly to the extensive piles of old slashings along the road.[293]

Rockefeller visited Yellowstone during 1926. He was very pleased with the progress and authorized more work for the next year. This project affected the entire National Park system. Not only did Rockefeller offer aid to Crater Lake National Park, he also used his influence with Congress in support of the parks on this and other projects. Albright described the improvements in his Annual Report of 1926:

> One must see the Yellowstone roadside improvements to appreciate what the work means to the park. The effects obtained are almost unbelievable. The mere removal of the litter constitutes a transformation, but after the snow of a winter and the following summer's sun have done their part, one can hardly realize that the highway has not been removed to a new location. The grass and flowers among the trees and along the road present a truly park atmosphere that did not exist before that work was undertaken.[294]

Albright visited many western parks during 1926 and was quite impressed with the emphasis now placed on roadside cleanup within the road construction program. He expressed his gratitude to Rockefeller in a May 1927 letter:

> I feel that we owe all of this interest in the improvement of our highways to your help in the Yellowstone. You started one of the most important movements ever undertaken in the national parks and the results obtained have attracted so much attention that there has been no difficulty in getting roadside cleanup recognized as an exceedingly important part of future road construction programs to be carried on by the Government. I only wish I could put down on paper and thus convey to you the interest and enthusiasm that I observed among park superintendents and road engineers for this roadside improvement work.[295]

Another road related issue, one not resolved in 1926, was Albright's study of possible restoration of some of the old roads for use in fire protection. His intent was to make them passable for light truck use during the emergencies of big forest fires.[296]

With most of the 3-year program projects completed, the Park began planning for a new 5-year program based upon a survey of all of the roads in Yellowstone with the exception of Cooke City and Mount Washburn roads and the assumption of a congressional appropriation of $5 million per year or $25 million for a period of five years, Servicewide. Yellowstone's share of the $25 million for five years would be $3,240,000, or $1,620,000 should lower appropriations be approved. With these amounts, Yellowstone officials realized that only the very worst road sections in the Park would be reconstructed and that most of the old Army bridges would have to be retained and not replaced with adequate bridges.[297]

With the state highway departments completing roads of high standards near the Park, the contrast with road conditions inside Yellowstone continued to be evident. Albright, who called the East Entrance Road, ". . . one of the most dangerous roads in the national park system," recommended its reconstruction as a high priority. The road, with no parapet protection, grades up to 16 percent, and widths in some places of only 8 feet, was used by 105,000 travelers in 1927. He also called for the reconstruction of the Gallatin Highway section and the road through the Gibbon Canyon. In addition to reconstruction work, Albright's other major concern was the dust problem.[298]

Albright and the Bureau of Public Roads officials knew that it would be at least ten years before the whole Yellowstone road system would be addressed, but the National Park Service planned to continue the experimental oiling program effort to eliminate the dust nuisance. Yellowstone's maintenance crew adopted the "California method, more particularly known as the 'Victorville' or the 'Brycebury-El Portal' method". During the summer of 1927, the Park received many positive comments from the public about the use of oiling as a dust palliative. Maintenance crews oiled 124 miles of roads with from 1/9 to 1/2 gallons-per-square yard (or 300,000 gallons) of light oil during June, July, and August. Besides eliminating dust, the switch from water sprinkling to more successful oiling benefited the landscape by keeping the roadsides and wildflowers looking cleaner and green. Another benefit was removal of the entire water sprinkling system, i.e. the "eyesores," caused by the many wooden water tanks along the roadsides.

The oil hauling operation used nine tank trucks and one distributing truck. Four of the tank trucks, which were World War I surplus, had steel ammunition bodies with steel plates welded and mounted on the backs to haul the oil.[299]

Removal of the wooden water tanks complemented the continuing roadside cleanup program. Throughout 1927, privately funded work concentrated on the road from West Thumb via Lake to Canyon. Roadside cleanup was part of the road construction project from Canyon Junction to Tower Junction. The intent of this new road was to give the visitor "one last look at the

Canyon before going over Dunraven Pass, and also to shut out the unsightly view that one sees from the old road, i.e., the backyard of the hotel, the transportation sheds, barns and buildings and old cuttings from previous logging operations."[300]

In 1928, Yellowstone's resident engineer, Merrill Daum, was named assistant superintendent and Cecil Lord was chosen to replace him. Lloyd Regnell was named Lord's assistant. The dust prevention program was augmented with six new white trucks, having 1,000-gallon capacity insulated tanks and a World War I surplus vehicle fleet for oiling the 180 miles of road. Approximately 500,000 gallons of heavy-duty road oil were hauled from the heating plant at Gardiner. While the use of the heavier oil achieved better results in dust abatement, it increased public complaints about its adhesion to vehicles. The Park responded by having a road grader distribute sand and gravel on the freshly oiled surface. In the end, this produced a thicker more desirable mat.[301]

Three new road projects were initiated in 1928, Norris Junction to Madison Junction, East Entrance to Sylvan Pass and the Grayling Creek section of the West Gallatin Road. New road camp buildings were constructed at Madison Junction, Norris Junction, and Lewis River.[302]

Several landscape architecture issues loomed during 1928, the most serious of which was precipitated by a careless contractor and the abusive use of explosives. The resultant destruction of trees, shrubbery, and telephone lines for a 1/8-of-a-mile segment along the Sylvan Pass to East Entrance Road left a furious Albright blaming the Bureau of Public Roads, the contractor, and the Landscape Division of the National Park Service, and calling this "an excellent example of the type of work which we do not want in the parks." Albright demanded a tightening of all new end hauling specifications and the approval of the chief landscape architect for any excess material being stored along points of work.[303]

Yellowstone's landscape architect supervised the effacement of some of the old, disused road sections in the Park. Roads were first plowed and reseeded. In addition, Chief Landscape Architect Thomas Vint suggested the roads be covered with manure to promote more rapid vegetation growth.[304] He also requested that during the reconstruction or construction of roads "when we limb trees along the right-of-way for construction purposes or to improve the sight distance or similar reasons, he would much rather that we would fell the trees as he does not like to see trees covered with axe marks and minus limbs."[305]

By the end of 1928, the interdepartmental relationship between Interior's National Park Service and Agriculture's Bureau of Public Roads had been responsible for the survey and identification of reconstruction needs for approximately 1,500 miles of park roads with an estimated $50 million tab. As of 1928, Congress had authorized $17,500,000 and had appropriated in cash $15 million. Under the cooperative agreement with the Bureau of Public Roads, 211 miles had been completed, an additional 103 miles were underway, and 61 miles would be started in 1929. senior highway engineer, Bureau of Public Roads, wrote:

> . . . By reason of the rugged mountainous character of most of the parks, road construction in these areas involves engineering problems of more than ordinary difficulty, . . . the solution involves spectacular features which give to these roads high rank among the most interesting highways in the world. In all the work done, close attention is given to the preservation of the natural beauty of the landscape. The Park Service sees to that. Heavy cuts are avoided by rolling grades and graceful curves which closely fit the topography. In making the side-hill cuts which are unavoidable the plans provide for future covering of the banks on the upper side with ferns, flowers, and shrubs, and the excavated material is not cast down on the lower side as in ordinary road construction but is hauled to locations where it can be disposed of without scarring the landscape. The existing tree growth is saved wherever possible. Bridges, faced with native stone, are designed to blend harmoniously with the natural surroundings; and the highways are designed in every respect to develop and give access to the natural beauty spots and to detract as little as possible from the undisturbed beauty of reservations. The roads are not designed as speedways but with the idea that they will be traveled at speeds which will permit observation of the scenery; and ample parking spaces are provided for more leisure study.[306]

The closing of 1928 saw the history of Yellowstone entering a new period. Horace Albright, who had served as superintendent longer than any other person (June 28, 1919 to January 12, 1929) replaced Stephen Mather, who had resigned due to ill health, as director of the National Park Service. Albright had assumed the administration of the Park when responsibility for the road system had been transferred from the Army to the fledgling Civil Engineering and Landscape Architecture Divisions of the National Park Service. These were very important times in the history and development of the road system, because Yellowstone was faced with the transition of a road system designed and built for animal-drawn vehicles, to a road system used by the ever-increasing numbers of motor vehicles. Albright, as field director, also assisted Mather in establishing the working relationship between the National Park Service and the Bureau of Public Roads.

By the time Albright left Yellowstone, the Park had an annual visitation of 230,984, with 183,565 of them arriving in 58,028 automobiles. Most of the others, 41,697, were rail visitors. The road system covered 305 miles--Grand Loop, 142 miles; the entrance and connecting roads, 79.6 miles; roads to certain points of interest, 83.4 miles. In addition to the intra-park system, Yellowstone maintained the 32 miles of approach roads through the Teton National Forest and 28 miles of approach roads through the Shoshone National Forest.[307]

278. Horace Albright, Field Assistant, to the Director of the National Park Service, "National Park Road Construction," 15 April 1925.

279. Stephen Mather, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the 1925* (Washington, D.C.: Government Printing Office, 1925), 134.

280. Vernon L. Hammons, "A Brief Organizational History of the Office of Design and Construction National Park Service 1917-1962," unpublished document, N. D.

281. A copy of the Memorandum of Agreement can be found in the Appendices.

282. Stephen Mather, "Engineering Applied to National Parks," *Proceedings of the American Society of Civil Engineers, v. 54, December 1928, 2,675.* Mather delivered this paper at the Joint Meeting of the City Planning and Highway Division, New York, N.Y., January 19, 1928.

283. Mather, *Annual Report . . . 1925, 135.*

284. Mather, 135-136.

285. Ibid., 78-79.

286. Ibid.

287. Horace Albright to J. W. Johnson, 11 March 1926, File Box: Roads General Correspondence, 1919-1926, Folder, Roads Correspondence May-December, 1926, Yellowstone National Park Archives, Yellowstone National Park.

288. Arno B. Cammerer to Thomas MacDonald, 11 September 1926, File Box: Roads, General Correspondence 1919-1926, File, Roads Correspondence May-December 1926, Yellowstone National Park Archives, Yellowstone National Park.

289. Horace Albright to Stephen Mather, 18 June 1926, File Box: Roads, General Correspondence 1919-1926, Folder, Roads Correspondence May-December 1926, Yellowstone National Park Archives, Yellowstone National Park.

290. "Tentative suggestions for improving road employee's housing facilities at Mammoth and in the Park," File Box: Roads, General Correspondence 1919-1926, Folder, Roads Correspondence May-December, 1926. Yellowstone National Park Archives, Yellowstone National Park.

291. Stephen Mather, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1926* (Washington, D.C.: Government Printing Office, 1926), 56.

292. Mather, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for* 1926, 54.

293. "Report on the Roadside Cleanup, Spring and Fall 1926," "The Report on Roadside Cleanup, Yellowstone National Park, 1927," R.G. III, 2 E, Box 83, Folder 774, Rockefeller Archives, Tarrytown, New York.

294. Horace Albright, *Annual Report of Superintendent of Yellowstone National Park for 1926* (Washington, D.C.: Government Printing Office, 1926).

295. Horace Albright to John D. Rockefeller, Jr., 26 May 1927, R.G. III 2 E, Box 83 Folder 774, Rockefeller Archives, Tarrytown, New York.

296. Superintendent's Monthly Report, October 1926, 3, Yellowstone National Park Library, Yellowstone National Park.

297. F.A. Kittredge and M.F. Daum, an unpublished report of survey of Yellowstone Park roads July 10-13, 1927, File Box, Roads-Correspondence- 1927-1929, File, Roads, 1927, Yellowstone National Archives, Yellowstone National Park.

298. Horace Albright, Field Director, National Park Service, to Stephen Mather, Director of the National Park Service, 12 July 1927. File Box: Roads, Correspondence-1927-29, File, Roads, 1927, Yellowstone National Park Archives, Yellowstone National Park.

299. Albright to Mather 19 August 1927, File Box: Roads General Correspondence 1927-1929, File, Roads 1927. *Annual Report of the Superintendent of Yellowstone National Park for 1927,* 2 and 7, Yellowstone National Park Archives, Yellowstone National Park.

300. Albright, "Report on Roadside Clean Up Yellowstone National Park 1927," R. G. III 2 E, Box 83, File 774, Rockefeller Archive Center, Tarrytown, New York.

301. *Annual Report of the Superintendent of Yellowstone National Park for 1928, 6,* Monthly Report for June 1928, File 143, Box; Bureau of Public Roads, Roads Monthly Reports 1928, Yellowstone National Park Archives, Yellowstone National Park.

302. Ibid., 6-7.

303. Horace Albright, superintendent, Yellowstone National Park to T.C. Vint, chief landscape architect, National Park Service, 27 September 1928. Yellowstone National Park Archives, Yellowstone National Park.

304. Monthly Report for August 1928, File 143. M. Daum to C. Lord, 26 July 1928, File Box: Bureau of Public Roads, Roads Monthly Reports 1928, Yellowstone National Park Archives, Yellowstone National Park.

305. Daum to Capes, Bureau of Public Roads, 25 July 1928, File Box: Bureau of Public of Public Roads Monthly Reports 1928, Yellowstone National Park Archives, Yellowstone National Park.

306. Frank A. Nickols, "Picturesque Highways Built in National Parks to Give Access a Natural Beauty of Woodlands." Article in Horace Albright Papers, Albuquerque, New Mexico.

307. Horace Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1929* (Washington,D.C.: Government Printing Office, 1929), 132-133.

CHAPTER IX

THE MODERN ROAD SYSTEM IS SET 1929-1940

In all the work in the National Parks, the Bureau of Public Roads has been guided in its design by the Landscape Division of the National Park Service. Landscaping of highways is comparatively new in America, and the bureau has been fortunate indeed in having the effective cooperation of a splendid group of landscape architects. The landscaping of the National Park Highway System has as its essential aims the diminution of scars; the introduction of certain elements of grace in alignment; the use of architectually pleasing structures; and the protection of trees, shrubs, and other natural growths from destruction and damage during construction.

L. I. Hewes, Deputy Chief Engineer, Bureau of Public Roads, 1932

Roger Toll replaced Albright as superintendent of Yellowstone in February 1929. No major road projects were begun during his first year, except one 6-mile section between the East Entrance and Sylvan Lake. All other ongoing road projects were either completed or scheduled for completion before the 1929 season was over. The roadside cleanup project continued with Rockefeller funding the completion of 45 miles and the remaining 61 miles funded by the National Park Service. Between 1926 and 1929, some 300 of the 350 wooden sprinkling tanks had been removed along with other related sprinkling structures.[308] Construction of buildings tied to road projects included the 3-lane checking station at the East Entrance, a new road camp at Lake (messhouse, 20-man bunkhouse and 3-stall stable), and a stable each at Canyon and West Thumb.[309]

On the national level, Director Albright called the building of highways "the most important construction project before the National Park Service." Several very interesting and challenging projects were being undertaken in other national parks--the Zion-Mount Carmel Road in Zion National Park, the Transmountain Road in Glacier National Park, the Generals' Highway in Sequoia National Park, the Trail Ridge Road in Rocky Mountain National Park, and a road opening up the Yakima Park section in Mount Rainier National Park.[310]

Albright's experience with roadside cleanup projects in Yellowstone, Lafayette (Acadia), and Crater Lake National Parks led him to become a spokesman for roadside improvement and scenic reserves across the country. In an article he wrote for the *Saturday Evening Post,* he described the efforts in California, Yellowstone National Park, and along the Columbia River Highway as good examples. He spoke of the stiff regulations imposed within the boundaries of the national parks regarding signs and the despoliation of the scenery. He commended the citizens of Cody, Wyoming, and Gallatin County, Montana, for their agreements to ban billboards and "roadside nuisances" along the approach roads. The town of Cody set aside a hill, known as "Signboard Heaven" to accommodate those who wanted to advertise, thus leaving the last 60 miles to the East Entrance free from clutter. The county commissioners in Gallatin County appealed to the private landowners to refrain from spoiling the Gallatin Highway leading into West Yellowstone and similar efforts were made along the highway from Livingston to Gardiner. In addition to billboards and signs, unsightly wayside stands marred the nation's roads during this period. Mrs. John D. Rockefeller, Jr., joined her husband in his crusade to cleanup roadways and roadsides, particularly those leading into national parks. She offered a very generous annual prize for the best designed wayside stand. She also organized a planning board of architects who would furnish designs for roadside stands free of charge. Throughout the mid-to late 1920's, the Rockefeller family had a tremendous impact on the appearance of the nation's roads and landscape architecture in general.[311]

Reconnaissance survey work over the entire road system kept the Bureau of Public Roads busy during the early 1930's. In order to keep up with this planning effort and also with the National Park Service's new six-year plans, the Civil Engineering Division and the Landscape Architecture Division were both expanded. A second office, the Eastern Branch of the Landscape Architecture Division, was opened in Yorktown, Virginia.

On a national level, the 1932 Bureau of Public Roads program was involved in 44 major projects estimated at a cost of $8,400,000 and the National Park Service supervised 82 minor roads and trails projects, for an estimated $962,000. The minor roads and trails work were generally one-year projects completed by day labor and paid for with cash allotments.[312]

The Landscape Architecture Division designed "an unprecedented number of bridges" for the Bureau of Public Roads projects and experimented with staining several concrete bridges to "harmonize with the predominate color of the surrounding landscape." In addition to bridge designs, the Bureau began to incorporate the National Park Service landscape architects plans for parking areas, sidewalks, and curbs. The Division expended major effort in designing bridges, gateways, and other buildings for particular sites. During 1931, standardized specifications for rounding and flattening of slopes, and methods of blasting and removal of form marks were adopted. Inspection by National Park Service landscape architects resulted in borrow pits, quarries, and abandoned road camps being left in better condition.[313]

In Yellowstone, plans were drawn for the Tower Falls Bridge, Seven Mile Bridge, Gardner River Bridge, six bridges on the Red Lodge to Cooke City Road, the Pilgrim Creek Bridge and the North Entrance checking station. Funds for the Red Lodge to Cooke City Road and the Moran to South Boundary Road were provided by special legislation, the Leavitt Approach Road Act of January 31, 1931, which authorized:

> The allocation of not to exceed $1,500,000 of the national park and monument road and trail funds for each of the fiscal years 1932 and 1933 for construction, reconstruction, and improvement of national park and monument approach roads which cross lands wholly or to the extent of . . . owned by the United States. As the primary value of these roads is to carry national park travel, and as they cross lands wholly owned by the United States, the cost of construction is properly being borne 100 percent by the Federal Government. The expedition

> of the construction of these approach roads will result in securing in the shortest possible time, the maximum usefulness of the road systems being constructed in the park.[314]

This act also funded the construction of the connecting road between General Grant and Sequoia and the Desert View to Cameron approach road to the Grand Canyon.[315]

During the summer of 1931, the park road crews, some of the Bureau of Public Road and contractor's crews were pulled off road projects to assist in fighting forest fires in Yellowstone. Even though the fires caused a slowdown, the Bureau accomplished more in Yellowstone that year than ever before. The Lewis River to West Thumb, the West Thumb to Arnica Creek, the Bridge Bay to Mud Volcano, which included the Fishing Bridge and Lake Junction layouts, and the Mount Washburn loop roads were completed. Different stages of construction projects were carried out on the East Entrance Road, Canyon to Tower Road, Obsidian to Firehole Road, Tower Falls to Blacktail Deer Creek, Mammoth to Obsidian and the Moran to the South Boundary Road.[316]

Albright surveyed the Yellowstone road work in September of 1931. He was very pleased with the progress of the interbureau relationship and remarked that "I had never seen the roads in better condition or the park in general in better trim than it is at the present time, nor can I recall that it ever had a more enthusiastic and capable group of employees than the permanent organization now in charge of its destinies." [317]

While complimenting the appearance and condition of the roads, he also extolled the policy of keeping as much of Yellowstone "in primitive" conditions or "wilderness unspoiled by roads, in many cases untouched even by man-made trails, the paths of animals having been cut out to provide routes for patrolling rangers."[318]

Despite the Depression, travel to the National Parks increased by 5.9 percent during 1931. Albright described the parks as being "a strong influence for stabilization and good citizenship." He felt "the true value of the parks was: "clearly shown . . . by the fact that in a time of anxiety and restlessness, they (the parks) were immensely useful to large numbers of our people."[319]

Visitors praised the condition of the park's roads. By this time, the Grand Loop had received the palliative oiling treatment, thereby abating the dust nuisance.[320]

In July of 1932, the American Society of Civil Engineers met in Yellowstone. Frank Kittredge, the chief engineer of the National Park Service, delivered a paper entitled "Preserving a Valuable Heritage." He explained to the gathering that the act creating the National Park Service, " . . . conserve the scenery and the natural and historic objects and the wild life [sic] therein; and, to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations," presented a tremendous challenge to the Engineering and Landscape Architecture Divisions of the National Park Service. He said the government term "improvements" (construction projects of all types) could be a misnomer as many would feel "that Nature's work cannot be improved, and that anything man can do is destructive and hence not an improvement." In order to minimize the effects on the Park, the road work was carefully planned. Kittredge felt that "a bridge will always look like a bridge no matter what attempts are made to blend it into the surroundings or how much money is expended on it." Thus conceding this fact, he built many concrete and steel bridges throughout the system. However, the landscape architects did promote the use of masonry arch bridges that blended with the landscape, as the most desirable type, particularly where "ruggedness of landscape is the rule."

Kittredge drew the participants' attention to the fact that many "excellent bridges" had been built in Yellowstone, including two that were at that time considered outstanding engineering achievements--the concrete viaduct through the Golden Gate and the Melan-type arch bridge sited 1,000 feet above the Upper Falls of the Yellowstone near the Grand Canyon. Both of these achievements were the work of Hiram Chittenden, U. S. Army Corps of Engineer officer. Kittredge believed that the "chief value of the parks to the nation is in their inspiration and educational features, and this fact must be recognized in making all improvements."[321]

Kittredge was followed by Dr. L. I. Hewes, deputy chief engineer of the Bureau of Public Roads, who delivered a paper entitled "America's Park Highways." He stated that with very few exceptions, such as the 50 miles between Williams, Arizona, and the south boundary of the Grand Canyon, most park roads and approach roads were in very rugged terrain and required heavy mountain-type construction. As a general rule, the construction of the park roads was to a high standard of cross-section, alignment, and grade. Surfacing was to an 18-foot minimum, and in some cases, 20 feet. The sections incut were 27 feet wide and the ruling grades were generally 5 percent. However, some areas had a 6 percent grade and a few required a grade of 7 percent. Dr. Hewes pointed out that every curve received careful attention and individual design. Recognizing that park roads were not primarily built for thoroughfares but for recreation, the engineers still had to consider safety and peak traffic load. Their philosophy also included the premise that "park highways now under construction are in their final location."

Dr. Hewes explained that in the construction of curves, "operating safety is never sacrificed to landscaping effects." The engineer introduced "long, carefully compounded curves with gradual changes in length of radii" to eliminate "broken back" curves. He said that all of the curves were designed to have "grade compensation, which is increased when the ruling grade is 5 percent or more." He told the group that grading and surfacing costs were averaging $40,000 per mile and that plans were to use some type of bituminous topping on a minimum width of 20 feet. Saying that it was too early to evaluate the ultimate life of the surfacing (usually 3 inches of fine crushed material laid over 4 inches of fine crushed stone, rolled into place), they had found the finish provided "excellent riding qualities" and the advantage of "the ease which it can be scarified and relaid" if necessary.

One of the other recent changes in park road construction had been the elimination of the steep, narrow ditches and the substitution of "a broad shallow type, which will be much safer for traffic and serve to increase the total driving width of the highway."

In order to minimize the scars in cuts and fills on park roads, engineers employed the more expensive techniques of "judicious use of riprapped embankments, and less frequently, by the building of retaining walls and careful design of the grade to permit end-hauling to invisible gullies."

Dr. Hewes also spoke of landscape considerations in bridge and culvert design, stating that wherever possible, arch bridges with concrete barrels and natural stone masonry were built. Because of the extra consideration, use of arch bridge designs had been extended to crossings for which they would have hitherto been considered inadvisable, or in some cases, impossible. He cited the Mount Vernon Memorial Highway bridges as examples of some of those considered inadvisable, since they were constructed on silt. In addition to bridge design, he elaborated on the architectural details of culverts, stone walls, and pullouts, citing the preferred use of stone culverts or the construction of stone masonry head walls with pipe culverts and the use of cement rubble masonry guard walls.

In concluding his talk, he told the engineers that of the 1,800 miles in the National Park road system, approximately one-third of them had been completed for an approximate cost of $25 million. More importantly though, Dr. Hewes felt that the National Park Service philosophy of what a park road should be had permeated to their other work beyond park boundaries and to many of the western states' highway departments.[322]

Economic hard times continued to plague the country, but in 1933 the automobile travel to Yellowstone again increased. Even though visitation increased, concession owners suffered heavy financial losses because tourists did not stay in the hotels or use the dining rooms. Showing a preference for camping, travelers also shortened their length of stay in the Park. Park employees, including the per diem employees, also were hit by the governmentwide 15 percent cut in pay as of April 1, 1933, under the provisions of the "Act to Maintain the Credit of the United States Government."

However, President Roosevelt's newly organized government relief programs benefited the parks in many ways, including funding for different types of road projects. The local road contractors used funds from the Emergency Conservation Work Program to employ men from outside the Park to work on Yellowstone roads during 1933. Two of the road projects, the Tower Falls-Mammoth Hot Springs and the Golden Gate, provided employment well into the winter for many local men. The Golden Gate to Obsidian Cliff grading project was unusual in the history of road construction in Yellowstone, in that it was underway during the winter months with only a two week delay due to severe weather.

Under the Public Works Program of the National Industrial Recovery Act, Yellowstone received approximately one-fifth of the $16 million allotted to the entire park system for road and trail construction work. Yellowstone's funding included $2,531,400 for major projects, $102,050 for minor projects and $736,000 for approach road work. The Bureau of Public Roads awarded four projects from this funding--surfacing of the sections from Tower Falls to Lava Creek and from Mammoth Hot Springs to Obsidian Cliff, grading the Bridge Bay to Yellowstone rapids and from Lewis River to Arnica Creek sections. This allotment to Yellowstone, the single highest amount of money received for road construction in the Park's 61-year history, was one of Horace Albright's last official actions as Director of the National Park Service.

President Roosevelt's most popular relief programs, the Civilian Conservation Corps (CCC), was authorized by an Act of Congress dated March 31, 1933. Four camps were set up in the Park during June 1933. The CCC projects were telephone line repair, bank erosion control, roadside cleanup, cleanup of old dump grounds, campground cleanup, truck trail construction, fire protection, trail construction, landscaping, range improvements, reforestation, insect control, old fence removal, repair and building of new fences, removal of old buildings and fire suppression work. During the year, the Bureau of Public Roads completed or nearly completed the grading between Tower Junction and Lava Creek, surfacing and oiling of the Canyon to Tower Junction section, grading of the Terraces to Obsidian Cliff section.

Yellowstone's maintenance staff now maintained 361 miles of road, 310 miles inside the Park. About 120 miles of the Grand Loop system had been built to a highway standard, 74 miles of which were paved with crushed rock or gravel and treated with asphaltic road oil. All road sections in the Park, except the Cooke City Road, were given an annual oil treatment for dust prevention and maintenance for better surface conditions. The maintenance crews now operated out of 15 carefully selected locations in the park. The crews varied in numbers from 6 to 15 men. [323]

During the summer of 1933, a change was made in road finishing. The new Director of the National Park Service Arno Cammerer, requested that the practice of painting traffic stripes on curves be discontinued on all national park roads. Feeling that the center stripes had "an undesirable appearance in a national park," he recommended that the existing stripes be allowed to wear out and not be replaced.[324]

The Bureau of Public Roads was very busy during 1934 awarding contracts for Yellowstone projects, for which nearly $3 million of Public Works Program funds had been allocated. The major focus was the improvement of the Grand Loop and the worst sections of entrance roads. Superintendent Toll felt that within two or three years, the Yellowstone roads would meet modern standards and be "comparable to any of the highways found in the surrounding states." Park visitors complimented the "marked improvements" to Yellowstone's roads, particularly the highway through the Golden Gate.[325]

Two more CCC camps were set up during 1934, bringing the total to six camps with 225 men working on 20 different types of projects. Civilian Conservation Corps road projects during 1934, for the most part, were related to roadside cleanup in the Canyon to Norris section, and along the Gibbon River just above the Virginia Meadows and bank slope treatment and road obliteration near Artist and Inspiration Points.[326] One other roadside cleanup project completed before the summer's end, was the removal of old bridge abutments and ruins at Grayling Creek on the Gallatin Road. Temporary Landscape Architect Walter Popham, felt that "considerable change had been effected in the appearance of the highway."[327]

In a November, 1934 letter to Chief Landscape Architect Thomas Vint, Superintendent Toll reiterated the goal of building roads that "will not have to be rebuilt." He called the "reconstruction of roads, and the unsightly abandoned roads . . . most detrimental to the landscape." He wrote of the demands that heavier traffic and larger vehicle size had on park road designs:

> The size of bus units and trailers is steadily increasing. In passenger cars, the normal operating speed has increased greatly during the last decade. State highways are now built under and on better alignment than formerly. We do not aim to build speedways, but if we did not build roads that are comparable with highways throughout the country, the chances are that the roads will be rebuilt before [*sic*] long. To avoid that possibility is of the greatest importance. The loop road has two standards of width. As I recall it, the shoulder to shoulder width is 26 feet on some sections and 28 feet on other sections. . . . it would seem to be a serious mistake to adopt any standard of width or alignment less than the rest of the loop road. We would be forfeiting the considerable sum that has been spent to secure these standards. . . . If we do not build to acceptable standards, we will not get full value for the money spent. [328]

Travel to the Park (260,775 visitors) exceeded the pre-Depression high level and increased the 1933 figures by 61 percent. Maintenance crews increased the number of miles maintained by 21 miles, for a total of 382 miles, 328 of which were within the park boundaries.[329] There were now 15 road camps within the Park and one for each of the approach roads.

A major reconstruction of 12 miles of the East Entrance approach road was underway during 1935. In addition, major road reconstruction of 165 miles within the park encompassed several stages of construction--80 miles of grading, 29 miles of surfacing, and 56 miles of oil mat surfacing.

The opening of the Red Lodge to Cooke City or Northeast approach road necessitated the construction of a proper checking station at the Cooke City entrance to the Park. The log station, constructed with Public Works Allotments funds, replaced older structures on the nearby abandoned road.[330] Other Public Works road-related projects conducted during 1935 were improvements to the Lake Shore section of the West Thumb to Lake Road, construction of two miles of 22-foot-width roads into the Black Sand Basin, three miles in the Firehole Lake area, and a spur road near Sheepeater Cliff. These new road sections replaced dirt roads.

The CCC road-related work in Yellowstone continued to be mostly roadside cleanup and some landscaping activities. Aesthetics remained a major concern of Superintendent Toll. He requested the Bureau of Public Roads include a provision (in all road construction or surfacing contracts), for removing conspicuous stumps that were in view of the roadways. He definitely wanted them removed at least up to 50 feet from the road's edge. He also suggested that as a part of road obliteration, border stones be placed over the abandoned or obliterated roads.[331]

It was during these years of extensive road reconstruction and bridge building that the National Park Service wrote stringent specifications for special landscape features such as masonry guardrails, wooden guardrails, and stone paving. The specifications covered the materials, construction, and treatment of the features. Other special construction actions such as blasting and cleanup procedures were also addressed.[332] In some cases, the contractors were required to build sample masonry guardrail sections for approval by the park engineer or landscape architect. The wooden guardrails for the most part followed the Standard Specifications for Forest Road Construction, Form F. R. 50, Revised 1932, with a few additional requirements regarding the cutting of timber and preservative treatment.[333]

The road width issue fell somewhere between the safety factor and the aesthetics factor. With increased automobile travel to Yellowstone, the question of safety played a major role in Toll's acceptance of the earlier decision by the National Park Service and the Bureau of Public Roads to have a standardized width of 28 feet, shoulder-to-shoulder, for the Grand Loop and 26 feet, shoulder-to-shoulder, for the other roads. This allowed for a paved width of 20 feet and either 4-foot or 3-foot shoulders, respectively. Superintendent Toll was aware that the disadvantage of the wider roadway would be increased visibility of a wider clearing, higher cuts and fills, and greater costs. The advantages, however, were better support for the paved surface, less risk of accidents for automobiles parked off the road, more room for snow disposal, and a safer road in general. Toll knew the Bureau of Public Roads had been building a higher standard of road, including the building of 30-foot width roads on California State and National Forest projects, with the anticipation of similar proposals for the states surrounding Yellowstone. Toll concluded that building the wider roads would "prove economical in the long run. They are safer and more satisfactory to visitors."[334]

In February of 1936, a tragic automobile accident near Deming, New Mexico, took the lives of Superintendent Toll and the chief of the Wildlife Division for the National Park Service George Wright. The unfortunate accident left a void in the Service, especially at a time when the Wildlife Division was in its infancy and the park system was in a growth period. In Yellowstone, the road program was in full swing with 199 miles of roads under some form of reconstruction and the construction of some of the major park bridges underway. Additional work was done on the secondary road in the Firehole area, and grading and surfacing of the three mile road from near Fountain Paintpot to the number seven milepost near Old Faithful.[335]

Edmund Rogers, who was appointed the new superintendent of Yellowstone, reported to the director that the 1936 travel season posted record numbers of visitors. Visitation reached 432,570, some 36 percent higher than the 1935 figures. Rogers, who received many compliments on the condition of the road system, praised the contractors for their handling of "traffic without very little loss of time or inconvenience to motorists."[336] Work progressed during 1937 on 87.5 miles of road and three contracts were awarded for the construction of 12 bridges and culverts, each more than 20 feet in length. The number of CCC camps had been reduced to four over the past year and most of their road-related work was road obliteration.[337] During the winter, all of the department heads met to discuss sign use in the park and to develop a policy to submit to the director for approval. It was agreed by all to eliminate the use of the mile post signs and all officials generally agreed to a simplification of the informational material on the signs. Engineer Capes of the Bureau of Public Roads sent a recommendation for removal of directional signs from the junction islands and their subsequent placement at least 100 feet from the junction, on the right hand side of the road. He also suggested that a small parking area be placed to "accommodate the 'sign studier'." [338]

During 1937 and 1938, the maintenance crews maintained 401 miles of roads, of which 51 miles were outside the boundaries. In 1938, a short dead end stretch to the Bechler River ranger station in the southwest corner of the Park was added to the maintenance schedule.[339] Temporary measures to improve the checking stations were taken at the North Entrance and East Entrance. In March of 1937, fire destroyed the checking station inside the boundary at the North Entrance Arch. A temporary station was built several hundred feet east of the burned station for use until a new one could be built.[340] At the East Entrance, plans were made to move the checking station to another location where it would be "off center so any new construction can be accomplished without removing the old buildings." [341]

The question of center striping arose again in Yellowstone National Park after four people died in two separate automobile accidents within a 48-hour period. While not proving that these accidents were caused by a lack of striping, it was inferred by an editorial in the *Livingston Enterprise,* which stated that " . . . the absence of a stripe in the middle of the park roads is a probable cause. . .." The vice-president of the Yellowstone Park Company, in urging Superintendent Rogers to consider striping the roads stated that:

> The use of the center stripe has been adopted by the best highway engineers as a safety measure, and has proven and continues to prove its value. Our transportation drivers complain the Park motorists, in their attempt to view the scenery and drive at the same time, are continually encroaching on the left side of the road, thus making travel extremely hazardous. Our own experience in driving the Company's cars verifies this report of the bus drivers.
>
> We feel that the ordinary requirements of safety demand that the highways in this Park be immediately marked with a center stripe. Scarcely a day passes but that an accident is avoided only by the extreme care and skill of our transportation men. The contention has been maintained by the Park Service that this stripe detracts from, not only the appearance of the Park, but the motorists enjoyment of the scenery. It seems to me that it is more desirable for a tourist to leave the Park all in one piece than it is for him to see every object of interest on his tour.

> The use of illuminated discs on the curves, especially at night, has been of material aid in avoiding accidents and we feel that the center stripe in general use in all towns and cities and on the highways is imperative in this Park.[342]

Road construction work in the Park during 1938 was at its lowest and employed the fewest workmen since before 1932. Most of the work that year consisted of completing projects started in 1936 and 1937. Grading was started for a section of the East Entrance approach road and bituminous surfacing for 21 miles of the Northeast Entrance Road was begun. Some work on the Mammoth esplanade and road to Gardiner were completed, as were the two bridges over the Gibbon River.[343]

However, the projection of 1939 work was near the level for the maximum years of 1934 and 1935. Most of the 1939 work was devoted to surfacing previously graded sections. Crews finished the surfacing of 48 miles of road, began surfacing an additional 17 miles, graded 9 miles of road, and completed the Gardner River Bridge, including the grading and surfacing of approximately 1 mile of it's approaches. Five crushing plants and three bituminous mixing plants operated in the Park that year producing over 400,000 tons of surfacing material. Several day labor projects funded by the Public Roads Administration were carried out during the year. The day labor crews continued their drainage improvement program, which had been in progress for several years. Its purpose was to stabilize slides and moving embankments. This expensive and tedious procedure attempted (through the installation of perforated metal drains), to release water from under the fills and thus remove the lubrication along the slippage seams that caused the sliding.

Another day labor project concentrated on removing the stain from the concrete bridges on the Tower Junction to Cooke City Road. A Keramic solution, which had been used on the original construction, produced an unsightly color or stain on the concrete. At the Superintendent's request, a bush hammering technique produced a satisfactory appearance, but the treatment probably exposed the masonry to elements that would shorten the life of the concrete.[344]

By far the highest profile project was completion of the Gardner River Bridge. Construction of the 940-foot bridge involved the fabrication and erection of approximately 1,000 tons of steel. Favorable weather enabled the project, begun in April, to be completed on November 14. Workmen obliterated old road scars, some of which were from the 1880s. The engineers felt that completion of this bridge eliminated one of the "worst traffic hazards on the Grand Loop Highway".[345]

In 1938, the Park was asked by officials of the Golden Gate International Exposition to keep its roads open during the winter so that visitors could travel through on their way to the exposition in California. In response to the request, Thomas Allen, regional director in region two of the National Park Service, stated that in addition to the safety factor created by travelers unfamiliar with the hazardous conditions in Yellowstone, maintenance of the roads during the winter would be very expensive. He explained the Park would need a special congressional appropriation to cover the work.[346] Travel figures for 1939 showed an increase over 1938. Congress did appropriate money for the Park to keep the Gardiner to Cooke City Road open for the first time. This enabled some winter visitors to see the wildlife in the Lamar Valley and it also allowed the Cooke City citizens to leave their homes in the winter. Park officials felt the San Francisco Exposition and the New York World's Fair did contribute to increased visitation.[347]

The period from 1926 to 1939 proved to be one of the most significant periods in the history of the road development in Yellowstone National Park. By the time the third decade ended, 155 miles of the 347-mile system had received a bituminous surface. Ninety-two of the remaining 192 miles of the system had been improved to various stages, leaving approximately 100 miles unimproved. During this period, 30 major bridges were built. The major focus of construction had been the Grand Loop and the entrance roads. Of the 155 miles of bituminous surfaced roads, 96 miles were on the Grand Loop. Only 27 miles of the Grand Loop needed to be improved, including 11 miles between Canyon and Norris Junction.

By the end of 1939, the old days of mudholes and dust had been eliminated. The average motorist probably didn't appreciate the transformation of the road system as he was now "accustomed to improved all-weather highways throughout the nation".[348] The National Park Service and the Bureau of Public Roads attributed their success in park road programs largely to the cooperation with the National Park Service's branch of plans and designs.[349] The satisfaction of the Inter-Bureau program prompted the National Park Service to recommend the relationship continue. The Bureau adopted some National Park Service requirements for use on their Forest Highways projects and other Federal Aid projects, thus improving the appearance of roads outside the parks.[350]

In reviewing the past 13 years of Bureau work in Yellowstone, Bureau Engineer Capes realized that in order to maintain the public's confidence and satisfaction, considerable work still needed to be done in the Park. Recognizing that many of the very early Bureau projects were based on now outdated design standards and that some of the sections would not be adequate for the present and future volume of traffic, a suggested tentative six-year road improvement program, costing approximately $6,500,00, would complete the system.[351] A total of approximately $9 million had been spent over the previous thirteen years.

The Bureau felt that a highway classification study should be completed to indicate safe speed limits on particular routes or sections of routes and to devise a classification of the routes. While the accident rate in 1939 was not significant, the fatal accidents over "the past few years indicated that there was a need for an intensive safety program study." Capes believed that several safety measures; centerline striping, improved road signing, and an intensive road patrolling system, initiated over the past year, helped to improve the safety on the park roads.

In 1939, the established maximum speed limit was 45 miles-per-hour, with a few 15 mile-per-hour zone exceptions. Capes felt the conditions of Swan Lake Flats, Fountain Flats, near the Buffalo Ranch, and a few other road sections justified the allowed 45 miles-per-hour limit. However, the majority of the roads did not. Using computations based on sight distances of vertical and horizontal curves and braking distance in addition to three seconds' reaction time, Capes believed the majority of the roads warranted a 35 mile-per-hour limit with a few exceptions--perhaps 25 miles-per-hour on Mammoth Hot Springs to Golden Gate, most of the Norris to Madison Road and the Dunraven Pass Road.[352]

Another survey the Bureau of Public Roads requested was a subgrade soils survey for the entire road system. While most of the road surface failures had been in the northern section of the Park, engineers felt that it was worthwhile to investigate their causes and possible corrections. As a whole, the system did not experience many failures due to faulty subgrades, but mostly due to slides and movements caused by "deep underground slippage seams." In addition to the soils survey, the Bureau felt that an investigation of such construction materials as sand, aggregates, and stone, would complement the National Park Service's systemwide policy proposal of "predetermining and designating quarries and pits for construction materials whereby the number of borrow pit excavations may be better controlled and limited throughout the Park."[353] Capes felt that this was particularly important in Yellowstone National Park where the engineers were faced with such a wide variety of geological formations.

In concluding his assessment of the Yellowstone road system, Capes advised that maintenance and improvements to the "so-called completed portions" should not be overlooked. If overlooked, the neglect could result in a major reconstruction program in a few years. The improvements that should be monitored were the following:

1. Much of the 10-to-12-year-old timber guardrail was in bad condition and was unsightly.

2. The bituminous surface that was completed under the trench method should be reinforced and strengthened along the edges.

3. Headwall hazards should be eliminated by the installation of drop inlets and gutter paving.

4. Attention should be given to the bituminous surfaces that showed signs of distress and were in need of seal and cover.

5. Monitor cross-section distortion due to subgrade or settlement movement.[354]

In 1940, the Yellowstone road system accommodated a volume of vehicular traffic equal to five times the amount present when the Bureau of Public Roads (now the Public Roads Administration) took over road construction in 1926, without the restraints of the one-way system that had existed on approximately 50 percent of the Grand Loop. In 1940, road engineers continued their previous year's projects, and started only one new project late in the season. That year's accomplishments were: the completion of 34 miles of bituminous surfacing, 5-1/2 miles of grading, the construction of the 335-foot Lamar River Bridge, and construction of four bridges on the East Entrance Approach road. Road officials projected that six major bridges remained to be built in the Park and three on the approach roads. Despite having to pay more for skilled grades of labor, road construction costs seemed to decline, probably due to improved methods and equipment and less reliance on hand labor. Only 15 percent of the engineering force was hired from the local areas and those were usually jobs such as stakemen and flagmen. The remaining 85 percent were classified Civil Service personnel.[355]

Capes felt that with the proposed six-year plan, all essential work would be done to complete the Yellowstone road system. The only project proposed and surveyed in 1927 that had not been planned or completed was the Bighorn Pass Road off the Gallatin River Entrance Road. In 1940, this proposed road was not considered necessary. Capes did express concern over the 18 miles of unimproved road on the Grand Teton to Yellowstone Approach Road. Calling it a "disgrace to the two National Parks which it serves," Capes stated that it had the "lowest standard of improvement of any Federal Aid highway in that section of the State, and being a link in both U.S. Highways 89 and 287, is very deserving of improvement."[356]

With the diligent maintenance program costing $200 to $300 per mile that Capes had been promoting, the Park could avoid major rehabilitation in a few years. Capes recognized the various problems of road construction in such a diversified area. One of the major problems was frost heave damage which varied from year to year. The worst areas in the Park occurred where the roadbed crossed a wet or swampy area over a superimposed 3 to 4-foot fill. In Yellowstone, frost can go down 5 to 6 feet and cause the roadbed to upheave.

Another concern was that asphaltic material of the older bituminous surfaces had oxidized and had become brittle. Any slight underground movement seemed to result in surface cracks. Still another concern was the parkwide replacement of timber guardrail. Most of the existing guardrail had deteriorated to a condition where it settled out of alignment and no longer provided protection. Furthermore, it presented an unsightly appearance.[357] The state of Wyoming recommended that the National Park Service abandon the standard log guardrail used on all park roads and replace them with the post and reflector type that Wyoming had adopted. In the end, the National Park Service began using a native stained post, 8 inches in diameter, with a reflector placed on each post, spaced 30 to 50 feet apart.[358]

Maintenance crews continued the oiling program, treating more than 60 miles of roadway. The procedure varied from the use of a dust palliative treatment on unreconstructed roads to the use of a more intensive road mix. About 30 miles of this was sealed with a rapid-curing oil treatment, followed by application of native pit-run sand or rhyolite.[359] Maintenance issues received national attention, perhaps as a result of the rapid expansion of the National Park system, including the Natchez Trace, the Blue Ridge Parkway, and Shenandoah's Skyline Drive, as well as the fact that more motorists were visiting national parks. During the 1940 travel season, visitation figures for the system were more than 16.7 million people; and Yellowstone, for the first time, reached more than one-half million (526,437) people.[360]

The National Park Service began gathering detailed road data and equipment records in order to formulate a comprehensive road maintenance program. The engineering laboratory was used to examine road and construction materials.[361]

more for skilled grades of labor, road construction costs seemed to decline, probably due to improved methods and equipment and less reliance on hand labor. Only 15 percent of the engineering force was hired from the local areas and those were usually jobs such as stakemen and flagmen. The remaining 85 percent were classified Civil Service personnel.[355]

Capes felt that with the proposed six-year plan, all essential work would be done to complete the Yellowstone road system. The only project proposed and surveyed in 1927 that had not been planned or completed was the Bighorn Pass Road off the Gallatin River Entrance Road. In 1940, this proposed road was not considered necessary. Capes did express concern over the 18 miles of unimproved road on the Grand Teton to Yellowstone Approach Road. Calling it a "disgrace to the two National Parks which it serves," Capes stated that it had the "lowest standard of improvement of any Federal Aid highway in that section of the State, and being a link in both U.S. Highways 89 and 287, is very deserving of improvement."[356]

With the diligent maintenance program costing $200 to $300 per mile that Capes had been promoting, the Park could avoid major rehabilitation in a few years. Capes recognized the various problems of road construction in such a diversified area. One of the major problems was frost heave damage which varied from year to year. The worst areas in the Park occurred where the roadbed crossed a wet or swampy area over a superimposed 3 to 4-foot fill. In Yellowstone, frost can go down 5 to 6 feet and cause the roadbed to upheave.

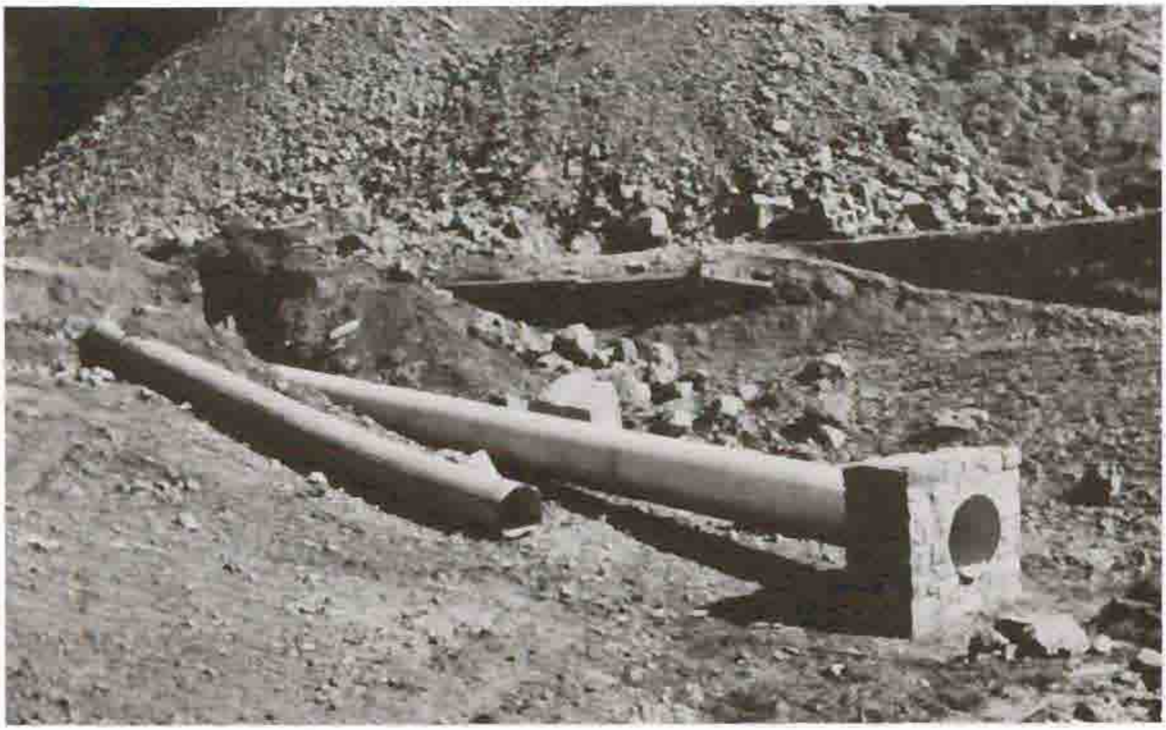
Another concern was that asphaltic material of the older bituminous surfaces had oxidized and had become brittle. Any slight underground movement seemed to result in surface cracks. Still another concern was the parkwide replacement of timber guardrail. Most of the existing guardrail had deteriorated to a condition where it settled out of alignment and no longer provided protection. Furthermore, it presented an unsightly appearance.[357] The state of Wyoming recommended that the National Park Service abandon the standard log guardrail used on all park roads and replace them with the post and reflector type that Wyoming had adopted. In the end, the National Park Service began using a native stained post, 8 inches in diameter, with a reflector placed on each post, spaced 30 to 50 feet apart.[358]

Maintenance crews continued the oiling program, treating more than 60 miles of roadway. The procedure varied from the use of a dust palliative treatment on unreconstructed roads to the use of a more intensive road mix. About 30 miles of this was sealed with a rapid-curing oil treatment, followed by application of native pit-run sand or rhyolite.[359] Maintenance issues received national attention, perhaps as a result of the rapid expansion of the National Park system, including the Natchez Trace, the Blue Ridge Parkway, and Shenandoah's Skyline Drive, as well as the fact that more motorists were visiting national parks. During the 1940 travel season, visitation figures for the system were more than 16.7 million people; and Yellowstone, for the first time, reached more than one-half million (526,437) people.[360]

The National Park Service began gathering detailed road data and equipment records in order to formulate a comprehensive road maintenance program. The engineering laboratory was used to examine road and construction materials.[361]

Steam Roller and Grader near Frying Pan Springs, 1917
Courtesy Yellowstone National Park Archives

Superintendent Horace Albright Pointing to Ruts in Cooke City Road, 1922
Courtesy Yellowstone National Park Archives



Culvert Stone on East Entrance Road
Courtesy Yellowstone National Park Archives

Culvert Construction on Cooke City Road, 1929
Courtesy Yellowstone National Park Archives

Homemade Distributor Working, July 1927
Courtesy Yellowstone National Park Archives

Experimental Sanding with High Clay Content, September 24, 1927
Courtesy Yellowstone National Park Archives

Showing Texture on Shoulder of California Oil Processed Road, March 1928
Courtesy Yellowstone National Park Archives

Improved Oil Heating Plant at Gardiner, July 26, 1927
Courtesy Yellowstone National Park Archives

Roadside Cleanup, August 4, 1929
Courtesy Yellowstone National Park Archives

Old Water Tank, 7 Milepost, Lake to Canyon Road, 1929
Courtesy Yellowstone National Park Archives

308. Horace Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1929* (Washington D.C.: Government Printing Office, 1929), 134-135.

309. Albright, *Annual Report of the Superintendent of Yellowstone National Park to the Secretary of the Interior for* 1929, 17-18.

310. Horace Albright, "Unusual Difficulties Encountered in Developing System of Scenic Highways in National Parks," an article in Horace Albright Papers, File, Roads/Trails, Albuquerque, New Mexico.

311. Horace Albright, "Scenic Reserves," *The Saturday Evening Post, 4546,* September 4, 1929.

312. Horace Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1931* (Washington D.C.: Government Printing Office, 1931), 121.

313. Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1931,* 129-131.

314. Albright, 32-33.

315. Ibid., 2-3.

316. Monthly Narrative Report, August 31, 1931, Yellowstone National Park District No. 3, Yellowstone National Park Archives, Yellowstone National Park.

317. Albright, 77.

318. Ibid., 76.

319. Horace Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1932* (Washington, D.C.: Government Printing Office, 1932), 1.

320. Albright, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1932,* 1.

321. Frank Kittredge, "Preserving a Valuable Heritage," *Civil Engineering,* Vol. 2 No. 9, 553, 536-537.

322. L.I. Hewes, "America's Park Highways," *Civil Engineering,* Vol. 2, No. 9, September 1932, 537-540.

323. "Annual Report of the Superintendent of Yellowstone National Park for 1933," Yellowstone National Park Library, Yellowstone National Park.

324. Roger Toll, superintendent of Yellowstone National Park to C.F. Capes, Bureau of Public Roads Highway Engineer, 4 September 1933. Yellowstone National Park Library, Yellowstone National Park.

325. Roger Toll, "Annual Report of the Superintendent of Yellowstone National Park for 1934," Yellowstone National Park Library, Yellowstone National Park.

326. Ibid., 20-21. "Report of Sanford Hill, landscape architect ECW, July 1934." Yellowstone National Park Collection. Box 10. National Archives and Records Center, Denver, Colorado.

327. Walter D. Popham, temporary landscape architect, "Emergency Conservation Work. Report to the Chief Architect Through the Superintendent of Yellowstone National Park for the month of September, 1934," Yellowstone Collection, Box 10. National Archives and Records Center, Denver, Colorado.

328. Roger Toll to Thomas Vint, Chief, Landscape Architecture Division, National Park Service, 30 November 1934. Landscape Architecture and Engineers Reports for 1934-1960, Yellowstone National Park Archives, Yellowstone National Park.

329. Of the 328 miles of maintained road within the park boundaries, 210 are on the Grand Loop, 52 miles are subsidiary or side trip roads, and the remaining 66 miles are service roads in the Government and concession utility areas. "Annual Report of the Superintendent of Yellowstone National Park for 1935," 16.

330. The Northeast Entrance Station is considered a classic example of the entrance or checking stations of the National Park Service. It was designated a National Historic Landmark in 1986.

331. Roger Toll to C. F. Capes, Bureau of Public Roads, 18 September 1935, File Box: Roads and Bridges 1919-1936, Yellowstone National Park Archives, Yellowstone National Park. "Annual Report of the Superintendent of Yellowstone National Park for 1935," 17-18.

332. Untitled document found in File Box: Road Specs. Bridge Specs 1919-1936. 1956, Folder: Grand Loop Highway 1-D-2 Report, July 6, 1936 to August 13, 1936, Bid Contract and Bond Report, Yellowstone National Park Archives, Yellowstone National Park.

333. Ibid.

334. Roger Toll, Superintendent, Yellowstone National Park to Arno Cammerer, Director of the National Park Service. 12 February 1936, File Box: Road Construction, File: 332.1 F.Y. 1934, Yellowstone National Park, Archives, Yellowstone National Park.

335. "Annual Report of the Superintendent of Yellowstone National Park for 1936," 5, 24, and 26.

336. Edmund Rogers, superintendent, Yellowstone National Park to Arno Cammerer, director of the National Park Service. 6 October 1936. " Monthly report for September 1936," Yellowstone National Park Archives, Yellowstone National Park.

337. " Annual Report of the Superintendent of Yellowstone National Park for 1937," 40-41. The road obliteration conducted by the CCC crews during 1937 was to the following road sections:

> Chittenden Bridge to Artist Point - The remanent of old road scars and road grades were sloped and regraded to the original ground forms. Trees and sage were planted to eliminate the scars.
> Mammoth Hot Springs area - Earth fill, sod clumps and sage were brought in to regrade areas of the many old road scars in the complex. The old road section between buildings No. 3 and 4 was obliterated. Most of this section was resodded using sod removed from the proposed road to the Power House, and the remaining area was seeded.
> Roads south of the Fish Hatchery - The road east of Lake Lodge was completely obliterated. Many young trees were planted and duff spread. It was found that this procedure worked well through wooded areas.
> Fountain Paint Pots - The old contractor's road into the borrow pit area was obliterated and planted.
> Nez Perce Creek - The old road heading east of the creek on the north side was obliterated and planted.

Yellowstone River Auto Camp road - This road, which left the Grand Loop just south of the auto camp and ran through heavy cut sections near the river on the north side, was restored.
Lewis Lake area - The road that joined the South Entrance road just north of Lewis Lake and opposite the road to Heart Lake was obliterated by removing the oil mat back about 200 feet, grading the road to remove the ditch lines and setting out trees. The project also involved the removal of an old log bridge that was about 150 feet off the Grand Loop road.
Old Faithful - Grading and placement of duff was done in several areas.
Norris area - The old road that was south and west of the Minute Man Geyser was obliterated by spreading fill over the areas and restoring the natural ground contour. The road was graded and planted out with trees and duff was spread near the intersection of the Grand Loop road. Sanford Hill, and Howard Hill, "Monthly Narrative Report to the Chief Architect, for Yellowstone National Park, for June, July and August, 1937," File Box: Landscape Architects and Engineers, Reports 1934-1960, Yellowstone National Park Archives, Yellowstone National Park.

338. Howard Gregg, Assistant Landscape Architect, "Monthly Report to the Chief Architect, for November 20 to December 20, 1937, for Yellowstone National Park," Box File: Landscape Architects and Engineers Reports. 1934-1960, Yellowstone National Park Archives, Yellowstone National Park.

339. "Annual Report of the Superintendent of Yellowstone National Park for 1938," 26-27.

340. Howard Gregg, "Monthly Narrative Report to the Chief Architect, December 20, 1937 to January 20, 1938," File Box 10, Yellowstone National Park. National Archives and Records Center, Denver, Colorado.

341. Sanford Hill and James K. Somerville, "Report on Yellowstone National Park, October 1938," File Box: Landscape Architects-Engineers, Yellowstone National Park Archives, Yellowstone National Park.

342. Edmund Rogers, Superintendent of Yellowstone National Park to the Director of the National Park Service, 15 August 1938, File Box: 630 Roads, General, Part 1. 1936-1939. Yellowstone National Park Archives, Yellowstone National Park.

343. C.S. Capes, "Progress Report Season of 1939 on Public Roads Administration Activities on the Yellowstone National Park Highway System Yellowstone Park Wyoming, Federal Works Agency Public Roads Administration District No. 3," December 18, 1939, Technical Information Center, Denver Service Center, National Park Service, Denver, Colorado.

344. Capes, "Progress Report Season of 1939 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone National Park Wyoming."

345. Ibid.

346. Thomas Allen, Regional Director of Region Two, National Park Service, to C. M. Vandeburg, Director, Publicity and Promotion Department, Golden Gate International Exposition, 20 May, 1938, File Box: Roads Construction, General Correspondence, 1936-1939, 1945-1953, Yellowstone National Park Archives, Yellowstone National Park.

347. "Annual Report of Yellowstone National Park for 1939."

348. "Progress Report, Season of 1939 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone National Park."

349. The Landscape Architecture Division was changed to the Branch of Plans and Designs in December 1934.

350. Thomas Carpenter, Stanley Abbot, and Edward Zimmer, "Report of the Committee on Roads and Parkways," Branch of Plans and Design Conference, Washington D. C., February 23 to 28, 1939. File Box: Landscape Architects/Engineers, Folder, 1939 reports, Yellowstone National Park Archives, Yellowstone National Park.

The Bureau of Public Roads adopted the following National Park Service techniques and designs:

1. design for flattening and rounding of earth cut slopes

2. transition cut slopes in relation to flat gutter slopes and paved gutter ("Flattening the lower part of steep cut slopes give stability and enables plant growth to become established. This will reduce maintenance in the gutter sections to a considerable extent. Taking the slope as a whole, curvature at the bottom together with curvature in the reverse direction at the top, results in an ogee. As a form, curvature at the bottom of the slope improves the perspective appearance through the resultant feeling of stability expressed. Actual stability of the slope is created in the lower portion of 1:1 and 1-1/4:1 slopes, with the introduction of a slope 1-1/2:1 and flatter at the bottom. It is the kind of slope that nature makes at the bottom of steep slopes through erosion, in reaching angle of repose. Slopes of this kind appear to be more of a natural part of the landscape than the straight geometric or plane form, and serve to further the appearance of the road fitting the natural terrain . . .. It is recognized that this type of sloping may not apply in terrain that is predominantly rock."

3. flat gutters avoid the sharp angles and permit cars to pull off the traveled lanes . . .." a better appearance is gained and safety added to the road." A rough textured finish for the gutters and top of shoulders to enable a driver to know when he has left the travel lane.

351. "Progress Report for the Season of 1939 on Public Roads Administration Activities on the Yellowstone National Park Highway System Yellowstone National Park Wyoming."

"Based on meager information we (Bureau of Public Roads) have thus far obtained, it is found that the average traffic density on the Grand Loop Route is 250 to 300 vehicles per hour, and on the Entrance Roads, about 150 per hour. The character of traffic is primarily passenger vehicle traffic, as the volume of truck traffic seldom amounts to more than 5%[*sic*] of the total. Based on the average annual increase for the past five years, it is reasonable to forecast that in 1945 the traffic density on the Grand Loop will be 400 vehicles per hour and the Entrance Roads, 200 per hour."

352. Ibid.

353. Ibid.

354. Ibid.

355. Capes, "Progress Report Season of 1940 on Public Roads Administration Activities on the Yellowstone National Park Highway System Yellowstone Park Wyoming, February 28, 1941," File Box: No. 40, Progress Reports, Public Roads Administration--1940, Yellowstone National Park, National Archives and Records Center, Denver, Colorado.

356. Ibid.

357. Capes, "General Maintenance Inspection Report on Yellowstone National Park Highway System, Wyoming, May 15, 1940," File Box: Roads General. Yellowstone National Park, National Archives and Records Center, Denver, Colorado.

358. Sanford Hill, "Narrative Report on Yellowstone National Park, May 1940," File Box 10: Monthly Narrative Reports, Landscape Architects, Yellowstone National Park, National Archives and Records Center, Denver, Colorado.

359. "Annual Report of the Superintendent of the Yellowstone National Park for 1940."

360. "Annual Report of the Superintendent of Yellowstone National Park for 1941."

361. *Report of the Secretary of the Interior for the Fiscal Year Ending June 30, 1940,* (Washington, D.C.: Government Printing Office, 1940), 194-195.

CHAPTER X

THE WAR YEARS UP TO MISSION 66

The standards of roads within the parks do not necessarily need to comply with the highway standards outside of the parks and moreover, the parks, of necessity, should set standards of their own.
- Frank Mattson, National Park Service, Landscape Architect

Due to inclement weather, the 1941 road construction program in Yellowstone reached its lowest volume of work since the Public Roads engineers began in 1926. In addition to the weather problem, the road program also began to be affected by the pre-war atmosphere and preparation at the national level. With more efforts focused on defense projects, it was reasonable to expect the road projects to be curtailed. On a positive note, however, the past urgency for immediate road improvements had passed, and now the engineers had time to develop more detailed studies of what was needed on the overall park road system, and had time to draw up plans. An immediate example of a pre-war problem, and one that would become more serious over the next few years, was the difficulty in hiring skilled labor in the area. During 1941, jobs for the most part, were filled by inexperienced young men.

The 1941 travel season recorded the highest number of vehicles ever to enter the Park and the total visitor count again exceeded half a million. Using both a mechanical recorder, a Butte-Electric, and a manual count, road engineers were able to establish information necessary to predict inadequacies in the road system, in particular, where bottlenecks might occur. It was found that the southern half of the system received the most traffic and that the existing plans for this section would adequately provide the service needed. The section from West Thumb to Lake revealed that the 12 mile stretch from Arnica Creek to Bridge Bay would need improvement, as well as the West, East, and South entrance roads, since they carried about eighty percent of the traffic. Records showed that the Grand Loop was accommodating about 4,000 vehicles per day on some of the sections. Feeling that this was the maximum number for the existing width of the two-lane roads, the engineers recommended that consideration be given to widening and/or stabilizing the shoulders in order to provide space for emergency situations and parking.

The 1940 East Entrance Road project, the construction of parking areas near Squaw Lake, the construction of approximately 500 feet of stone paved gutters, and the improvement to a large cut bank near the Fishing Bridge parking area were completed during 1941. Another 1940 project completed in 1941 was the grading of four miles in the vicinity of Canyon Junction, and the construction of a triple 3-by-9-foot treated timber box culvert. Work began on the West Thumb to Old Faithful section, with mainly surfacing, road obliteration, and flattening and stabilization of slopes. Plans called for the construction of the Isa Lake Bridge, but there was difficulty in securing the treated timber. Surfacing progressed on the East Entrance approach road, but the 1940 project was again not completed in 1941.

Minimal survey work was carried out, but an interesting test begun in 1940 on the effects of hydrogen sulphide gas at the excavation pits for the bridge foundation on the Northeast Entrance Road, was concluded during the summer. In 1940, a concrete cylinder was buried in the thermal area, in hopes of finding the effects of the gas on concrete. In 1941, it was unearthed and put under a compression test. The cylinder showed no effects from the gas, and finally broke under a load of 5,000 pounds per square inch.

In the recommendations for 1942, Capes again stressed the necessity for substantial guardrails. In reviewing the history of the rails, he found that they were generally made of local timber which had been cleared from the rights-of-way. The use of Lodgepole pine was considered an economic and temporary measure since the pine is of poor quality and is shortlived. Capes felt that the lodgepole pine rails had served their purpose, but he strongly urged conversion to a more substantial type. He further recommended a newly manufactured curved metal steel rail to replace the deteriorated sections. He felt that if the metal were painted brown, it would resemble the rustic pine log rails. He suggested that the metal rails be attached to salt-treated timber from the west coast region.

The park crews proceeded with center line striping and it was recommended that the entire system be striped. Capes recommended that double center stripes be applied, or some other type of warning in areas where visibility was limited. He particularly suggested that the Gibbon Canyon, the Old Faithful to West Thumb, and the Dunraven Pass sections receive this attention, as well as some of the entrance roads.

Capes could foresee the decrease in tourism to Yellowstone due to the world situation, but he felt that this lull in the program would offer a good time for planning for the future. He could also foresee that the increased visitation in 1941 and the establishment of the United States Travel Bureau as a division of the National Park Service, would probably mean that when the country returned to a normal condition, visitation would again take giant leaps.[362]

In December of 1941, the United States Government declared war against Japan, Germany, and Italy. Within weeks, measures were taken in Yellowstone to aid the war effort, including tire rationing within the Park. Department heads requested that use of government vehicles be carefully monitored, and that cooperation of all transportation be urged.[363] The emergency situation resulted in many of the Public Roads Administration engineers being sent to work on the Alaska Road Project. However, a few were kept back to continue work in Yellowstone.

The Isa Lake Bridge on the West Thumb to Old Faithful Road was completed, but it would not go into service until the surfacing on this stretch was finished. The East Entrance Road surfacing project was completed, but the final step, the plant mix mat on the Old Faithful surfacing project was delayed because the Public Roads office in Denver gave the contractor permission to defer completion until the war was over. The Canyon project was closed for the duration of the war.[364]

At the national level, limited road construction proceeded with the grading of the Crystal Cave Road in Sequoia National Park, the excavation, construction of a 535-foot-long tunnel through solid rock, and grading of the No Thoroughfare Canyon Road in Colorado National Monument; the Yazoo City Road at Vicksburg National Military Park; and the Virginia Highway 24 Bypass Road at Appomattox Courthouse National Historical Park. Work also continued on the Blue Ridge and Natchez Trace Parkways.[365]

In fiscal year 1942, visitation across the system showed a decrease of 30 percent and Yellowstone dropped just below the half million mark. Due to the many different rationings, the National Park Service and the concessionaires in the parks, curtailed their promotions for park visitation. Almost all construction in the parks was halted as it was in most other Federal agencies. A small segment of the planning office remained in the regional offices and in the Director's office. Their priority was to respond to any emergencies, but they also spent considerable time on the "plans-on-the-shelf" program, which the National Park Service had been requested to prepare. The idea for the program was to not only provide "mature and sound plans for future programs of development," but to "take up the slack in employment that may well be anticipated at the end of the war."[366]

The National Park Service contributed in many ways to the war effort in 1943. In Yellowstone, the main roads were kept open for military trucking on an emergency basis. Any damage sustained by these operations would be repaired after the emergency was over. No road contract work was underway and all of the CCC camps had been discontinued in the Park. Even though the CCC did not play a major role in the road construction program, it was involved with landscape improvements. The Mammoth and Cascade Creek CCC camps were transferred to the War Relocation Authority and the buildings were relocated to the Heart Mountain Relocation Project near Cody.[367]

Visitation to Yellowstone fell to its lowest number in many years. A loss of 67 percent over the 1942 travel season was recorded. Most of the visitors were nearby residents or those involved in cross-country, war-related travel. None of the hotels, lodges or cafeterias were open in the Park.[368]

The only large road project associated with the National Park Service underway in 1943 was a study for the protection of the landscape and prevention of unplanned development on government lands through which the 310 miles of the Alaska Highway were being constructed.[369]

The number of visitors to the Park dropped again in 1944, but increased somewhat in 1945. During both of those years, maintenance crews in the Park were made up of old men and high school boys. Again, no new work was initiated during these years, but due to Yellowstone Lake reaching its record-setting height in July of 1944, and the resulting wind and wave action, emergency work had to be done on the roads at Steamboat Point, Mary Bay, and West Thumb. Another problem was the frost boils and heaves on the Gallatin Road, which required reshaping and reprocessing. The concrete rails on the Chittenden Bridge necessitated some filling of cement grout. However, the rails were in such deteriorated condition that complete replacement was projected for two or three years hence. Other maintenance activities involved the deck replacement on the Gardner River Bridge two miles north of Mammoth Hot Springs and the partial construction of a log bridge at Soda Butte Creek.[370]

In addition to the Chittenden Bridge concrete rail problem, the log railings, which were set in the concrete curbs of the concrete bridges on the Tower Falls to Cooke City Road were badly deteriorated and in need of replacement. After his 1944 visit, Acting Chief Engineer A.W. Burney suggested to Chief Landscape Architect Thomas Vint, that the rails be replaced by the National Park Service standard type steel railing then being used on most of the newly built concrete bridges in Yellowstone. Vint felt that the problem bridges had not been designed to support the new steel railings and replacement with log railings was easier and more economical. Thus he recommended replacement in likekind.[371]

As was predicted, the visitation to the Park rose immediately after the war was over, with the West Entrance being the most popular gateway. The remaining order of popular entries was East, South, North, then Northeast. Maintenance of the Red Lodge to Cooke City Road, which fed the Northeast Entrance, was a problem all throughout the war years. One year, the Public Roads Administration received money for its upkeep, but not for snow removal; one year after the states of Wyoming and Montana refused any assistance, the citizens of Red Lodge, Montana, raised money to rent a snow plow to at least open the road for travel. In 1946, the states of Wyoming and Montana again refused any assistance for snow removal and maintenance of the road. After much controversy and pressure from Red Lodge, Billings, other nearby towns, and the Montana congressional delegation, the National Park Service resumed responsibility for snow removal and maintenance. The Park moved in three camps along the road.[372]

Prior to the war years, safety was an important issue and studies were requested for the system. After the war, the Agency hired a safety engineer whose total job was to "effect prompt improvement of any condition of hazard which his studies or those of others may reveal."[373] But, the most pressing problem was staffing. Many of the functions in the parks in the prewar period had been accomplished by different emergency agencies, such as the CCC. With the demise of these agencies, along with the beginning of the 40-hour, rather than 48-hour work week for Federal employees, (a decrease of one-sixth in manhours), the work force suffered.[374]

"Never have the inadequacies of development of the National Park System been so highlighted as during the travel season of 1946 and 1947, which have brought such tremendous increases in numbers of visitors," wrote Newton Drury, the then Director of the National Park Service. In Yellowstone, the numbers increased from 348,880 in fiscal year 1946 to 827,032 in fiscal year 1947. During the war years, the roads actually did not suffer much deterioration, but the surge of visitors in such a short period of time caused much destruction to the road system, particularly since most of these visitors came in their own vehicles. The Public Roads Administration had in readiness, plans and surveys for as estimated $4,151,000 worth of park road work, in addition to $21,007,600 for future parkway road projects. However, in fiscal year 1947, only one contract for $48,619 for a bituminous surfacing of five miles of road was awarded in the entire system. During the summer of 1947 (fiscal year 1948), a contract was awarded for completion of the seven miles of Old Faithful to West Thumb bituminous surfacing.[375]

By the end of June, 1948, the Park's visitation was nearing one million and it registered well over a quarter of a million vehicles. The Isa Lake to Old Faithful stretch finally received the bituminous surfacing that had been programmed for completion prior to the war. The other prewar project completed during 1948 was the grading, base surfacing, and construction of a steel and concrete bridge over the Snake River on the Moran to South Entrance Road. No other new projects were initiated during 1948. Regular maintenance projects such as filling pot holes, reprocessing and sealing, and striping continued on most of the system. A hot spot that developed on the Norris to Canyon Road was repaired with the placement of a heavy concrete slab. Much of the log guardrail was replaced, particularly in the Beryl Springs, Madison Junction, Fountain Paint Pots, Mammoth to Tower Falls, and Mammoth to Norris sections. A new deck was placed on the first bridge out of Gardiner toward Mammoth Hot Springs, and log cribbing and guardrails were replaced on the eastern approach to the Yellowstone River Bridge near Tower Falls.[376]

Yellowstone visitation exceeded the million mark at the end of the 1948 travel season with the popularity of the entrance stations remaining in the prewar order, West, East, South, North, and Northeast. The acceleration in the numbers of visitors prompted the Park to enforce an improved safety program, including improved accident investigation reports, to be used in conjunction with the Wyoming Planning Board traffic volume study, more center line striping, widening the shoulders, building additional smaller parking areas, and increasing the number of patrol cars.

The overall road condition of the system was considered fair in July 1949, with the exception of the South approach road and the Canyon to Norris Road. Considerable patching had to be done all over the system, and over 600 feet of log guardrail had to be replaced on the East Entrance Road and 320 feet needed to be replaced on the Bechler Road near Cave Falls. An entire deck was replaced on one of the bridges of the Firehole Loop Road. The road crews now only occupied three road camps in the Park and one on the Red Lodge to Cooke City Road.

Problems again arose on the Gallatin Road. A 400-foot section of the road broke into "a regular quagmire, black sticky silt being pushed up through the light bituminous mat and cars and trucks were getting stuck." This occurred about one mile south of the Bacon Rind road camp. Steam vents broke out on the road in three locations in the park -- in front of the Norris Museum, near Nymph Lake, and near the Mud Volcano. Two new construction projects were started at the end of 1948 and continued into the 1949 season. A 38-mile chip sealing project on the Mammoth Hot Springs to Firehole Canyon road and a grading and base surfacing project in the Canyon area were begun.[377]

The National Park Service was able to secure war surplus equipment for roads and trails construction with funds from the National Military Establishment and the War Assets Administration. The stated value of the equipment was $322,000. The same donation of equipment occurred after the end of World War I. However, the 1940s equipment was not in as good a condition and replacement parts were hard to find. Nevertheless, construction began again across the system with 10 new road projects started, including the two in Yellowstone, Colonial National Historic Park, Great Smokey Mountains, Shenandoah, Rocky Mountain, Zion, Bryce Canyon, Yosemite, Sequoia, and Kings Canyon National Parks.

Surveys indicated that cost per mile for maintenance on the park roads for the near future would be approximately $571 per mile, some seventy-five percent of the national average. The reality of the financial situation was that the national budget could only expend approximately $320 per mile, leaving the park roads in less than satisfactory condition. Thus, the National Park Service engineering division devised a five-year program to help alleviate the maintenance problem. With over 5,215 miles of park roads in the system, the program called for $3,500,000 in 1950 with increases annually to $3,900,000 in 1954. These funds helped eliminate post World War II special maintenance projects. The goal was to reach a point at which a preventive maintenance program could be established on an annual basis. An equipment amortization program was established to assist in having adequate equipment.[378]

In March of 1950, Superintendent Rogers submitted a list of needed Yellowstone road system improvements amounting to $41,870, knowing full well that all would not be accomplished:

Madison to Old Faithful
  restore raveled edges
  restore eroded shoulders--.5 miles
Old Faithful to West Thumb
  restore raveled edges--3 miles
  replace 1,000 feet guardrail with guide posts
West Thumb to Lake Junction
  sand seal--10.4 miles
  reprocess--2.5 miles
  replace guardrail--1,500 feet with guide posts
Lake Junction to Canyon Junction
  replace guardrail, 2,000 feet with guide posts
  treat with linseed oil, 5,000 feet guardrail
Tower Falls to Mammoth Hot Springs
  base course repairs
East Entrance to Lake Junction
  repair stone barriers, parking at Mary's Bay
Moran to South Entrance
  center stripe
Northeast Approach road
  chip seal 1.5 miles

replace rail and curb logs, Rock Creek and Wyoming Creek bridges
Canyon to Norris
repair two Gibbon River bridges
Canyon area
replace rock retaining walls, 3 places on Mount Washburn Road
Mammoth Hot Springs to Gardiner
center stripe--4.8 miles[379]

Yellowstone's maintenance crews started the 1950 season doing routine patching over most of the system and the South and Northeast Approach roads. Guardrails were replaced on the Lewis River, Sheep Creek, Fox Creek, and Index Creek bridges. The Teepee Creek Bridge on the Gallatin Road was reconstructed. Some shoulder improvement was done on the Mammoth Hot Springs to Madison Junction road. Maintenance crews also applied pentachlorophenol to guide posts, guardrails, and bridge timbers as a preservative. Most of the new work involved grading and base surfacing on the northern half of the South Approach road. Under a Minor Road Construction project, the South Approach Road was widened. A road camp was set up near Lizard Creek.[380]

In 1951, Frank Mattson, Yellowstone's landscape architect, reported on the road standards and maintenance in the park. Mattson felt that the initial purpose of improving road standards, providing wider and safer roads and providing roadside parking to permit the visitors to observe the wonders of the park, had not been accomplished. The recent improvement of treating the shoulder with bituminous surfacing had only increased the width of the traffic lanes, thus creating a three-lane-plus traffic surface, inviting faster speeds and hazardous passing conditions. Mattson reiterated the earlier National Park Service philosophy, "The standards of roads within the parks do not necessarily need to comply with highway standards outside of the parks, and moreover, the parks, of necessity, should set standards of their own."[381]

In 1952, an inspection of the primary roads in Yellowstone showed that the system was in generally good condition, with the exception of the Gallatin Road. As stated earlier, the unstable subgrade, the less than desirable base, and the heavy volume of truck traffic continued to plague the engineers on this section of the road. Approximately 75 percent of the 21.3 miles of road had been patched or showed distress. It was felt that at least 12.5 miles of the road would need complete reconstruction. The good condition assessment to the remaining system was attributed to the improved maintenance practices of ditch cleaning and other drainage methods.

One of the major maintenance jobs had been and would be in the next few years, the replacement of thousands of feet of log guardrailing. The 1952 inspections called for several thousand feet of new log railing to be replaced as funds permitted. The other major maintenance job was shoulder widening.[382]

For the next few years, no new major construction projects were underway, and routine maintenance tried to address the ever increasing problems.[383] However, the question of the maintenance of the park approach roads attracted the attention of the Congress. In *Report on Negotiations for States to Take Over the Maintenance of Roads Outside the Boundaries of the National Parks and Monuments as Required by the Conference Report on the Interior Department Appropriation Bill, 1955,* three of Yellowstone's roads were an issue -- the Northeast Approach Road, the 59.86 miles from Red Lodge to Cooke City Montana, the South Approach Road, 7 miles, and the Gallatin Road, U.S. No. 191, 22 miles within the boundary of the park. The report suggested:

> South Approach Road--This road is so short and so far removed from State maintenance forces that the State of Wyoming would be unwilling to assume the responsibility. It appears that the only practical solution would be to extend the boundaries of the park to include this road in the National Park System. Gallatin Road--This road is in an isolated section of the park and serves only minor park interests as compared to the usage it receives throughout the year by commercial traffic. . . . The Governor was requested by Assistant Secretary Lewis on March 5, 1954, to consider transfer of this road to the State, and at the Governor's suggestion, a meeting of Service and State Highway personal held on June 2, 1954 for a general discussion of the matter. Subsequently, the State took action to accomplish a portion of the reconstruction and is currently working on a two-mile section within the park in conjunction with contiguous construction just outside of the park. The Service will follow up on the various aspects of this general operation relative to additional reconstruction and determination of the width of right-of-way acceptable in transferring responsibility to the State. Northeast Approach Road--This road begins in Montana, then passes into Wyoming, and back into Montana before reaching the park boundary. The National Park Service has not been successful in getting the States to take over either section. Field studies in recognition of the stalemated situation suggest that the Service should continue to maintain this road and eventually propose appropriate action to give the Service jurisdiction over the roadway proper, plus jurisdiction over a strip of land abutting the road of sufficient width to permit the control of undesirable development or use. If the above objective cannot be attained, the Service can, as has been done in the past: (1) continue its efforts to have the State of Montana take over the easterly section (approximately 15 miles) to the Montana-Wyoming line; (2) continue with Service maintenance of the Wyoming section (approximately 31 miles) until such time as a connecting road from the south would be included in the Wyoming State System, making State maintenance of the Wyoming section of the approach road more practicable and feasible; and (3) recognize that the westerly section (approximately 10 miles) in Montana is so isolated from State operations that maintenance by the State is impractical and should remain a Service responsibility.[384]

ENDNOTES

362. C.F. Capes, "Progress Report Season of 1941 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone Park Wyoming," February 2, 1942.

363. "Annual Report of the Superintendent of Yellowstone National Park for 1942." Sanford Hill, "Report of the Associate Landscape Architect for February 25 to March 25, 1942," File Box: Monthly Narrative Reports for 1942, Yellowstone National Park, National Archives and Records Center, Denver, Colorado.

364. Sanford Hill, "Monthly Report of the Associate Landscape Architect for March 26 to April 25, 1942." "Monthly Report of the Associate Landscape Architect for July, 1942." "Monthly Report of the Associate Landscape Architect for August, 1942," File Box: Monthly Narrative Reports for 1942, Yellowstone National Park, National Archives and Records, Denver, Colorado.

365. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal year Ended June 1941* (Washington D. C.: Government Printing Office, 1941), 276, 279, 282, and 299.

366. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal Year Ended June 1942* (Washington, D.C.: Government Printing Office, 1942), 161, 163, 168, and 169.

367. "Annual Report of the Superintendent of Yellowstone National Park for 1943," 16. *Report of the Director of The National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1943* (Washington, D.C.: Government Printing Office, 1943).

368. "Annual Report of the Superintendent of Yellowstone National Park for 1943," 1.

369. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended 1943* (Washington, D.C.: Government Printing Office, 1943), 215.

370. "Annual Report of the Superintendent of Yellowstone National Park for 1944," 7 and 9. "Annual Report of the Superintendent of Yellowstone National Park for 1945," 7.

371. Memorandum to Regional Director, Region Two from Acting Chief Engineer A. W. Burney, April 2, 1945. Record Group 79, Entry 7, File Box: 1741, National Archives, Washington D.C.

372. "Annual Report of the Superintendent of Yellowstone National Park for 1946," 1, 2, and 11.

373. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal year Ended June 39, 1946* (Washington, D.C.: Government Printing Office, 1946), 330.

374. Ibid., 310.

375. "Annual Report of the Superintendent of Yellowstone National Park for 1947." Newton Drury, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal Year Ended June 30, 1947* (Washington D.C.: Government Printing Office, 1947), 326, 327, and 330.

376. "Annual Report of the Superintendent of Yellowstone National Park for 1948," 2, 12, 13, and 15. Many times asphalt or concrete were poured over thermal spots as a maintenance measure, however, this method caused resource problems in the thermal areas in later years.

377. "Annual Report of the Superintendent of Yellowstone National Park for 1949," 2, 4, 14, 15, 17, 18, and 22.

378. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1949* (Washington D. C.: Government Printing Office, 1949), 302, 303, 304, and 306.

379. Memorandum to Regional Director, Region Two, National Park Service from Superintendent of Yellowstone National Park, March 17, 1950, File Box: 25, Yellowstone National Park, Folder: 630-01 Major Road Progress, National Archives and Records Center, Denver, Colorado.

380. "Annual Report of the Superintendent of Yellowstone National Park for 1950," 17, 18, 19, and 20. Sheep Creek, Lizard Creek, Fox Creek, Teepee Creek, and Index Creek are all outside of Yellowstone National Park.

381. Frank Mattson, "Report July 1951 Road Cross Section Design, Construction Standards and Maintenance in Yellowstone National Park and Grand Teton National Park, July 1951." Record Group 79, Yellowstone National Park, Box 25, File: Construction Projects. National Archives and Records Center, Denver, Colorado. Mattson's report gives a good summary of the changes in the road standards revealing the results of decades of changes.

382. "Report on Yellowstone Park Maintenance, Yellowstone National Park, Wyoming, June 19 to 23, 1952," Record Group 79, Yellowstone National Park, Box 25, File: Roads, General, National Archives and Records Center, Denver, Colorado.

383. In 1955, a list of roads and trails cost estimates was submitted to the Regional Director.

384. Memorandum to Superintendent, Yellowstone National Park and Glacier National Park from Regional Director, National Park Service, Region Two, March 3, 1955, Record Group 79, Yellowstone National Park, Box 10, National Archives and Records Center, Denver, Colorado.

Chapter XI

MISSION 66

In all phases of the work the landscape architect and the highway engineer shall exercise imagination, ingenuity, and restraint to conserve park values.
- Conrad Wirth, Director, National Park Service

During the early 1950s, with visitors to the National Park system increasing at record rates, funding and staffing inadequate, and the physical plants and road systems in deteriorated condition or otherwise inadequate, a dismal picture was being painted for the parks and monuments. In a 1953 *Harper's Magazine* article, "Let's Close the National Parks," author Bernard DeVoto presented the state of the parks situation. DeVoto wrote:

> Congress did not provide money to rehabilitate the parks at the end of the war, it has not provided money to meet the enormously increased demand. So much of the priceless heritage which the Service must safeguard for the United States is beginning to go to hell. ... The crisis is now in sight. Homeopathic measures will no longer suffice; thirty cents here and a dollar-seventy-five there will no longer keep the national park system in operation. I estimate that an appropriation of two hundred and fifty million dollars, backed by another one to provide the enlarged staff of experts required to expend it properly in no more than five years, would restore the parks to what they were in 1940 . . . No such sums will be appropriated. Therefore only one course seems possible. The national park system must be temporarily reduced to a size for which Congress is willing to pay. Let us, as a beginning, close Yellowstone, Yosemite, Rocky Mountain, and Grand Canyon National Parks--close and seal them, assign the Army to patrol them, and so hold them secure till they can be reopened. . . . held in trust for a more enlightened future ... [perhaps this would] bring this nationally disgraceful situation to the really serious attention of the Congress which is responsible for it.[385]

Perhaps the national focus on the parks dilemma forced action, because it was not long before the endorsement of President Dwight D. Eisenhower, his Cabinet, and the Congress backed the National Park Service new 10-year plan, MISSION 66, a proposal to "develop and staff these priceless possessions of the American people as to permit their wisest possible use; maximum enjoyment for those who use them; and maximum protection of the scenic, scientific, wilderness and historic resources that give them distinction." The new program was projected to be completed in time to celebrate the 50th anniversary of the creation of the National Park Service. The main focus of this program of "enjoyment-without-impairment" was construction of roads, trails, camp and picnic grounds, public use and administration buildings and utilities to meet the needs of the expected 80 million visitors in 1966. An estimated $786 million was needed to complete the plan. Congress, with the support of western senators and representatives such as

Senators Murray, Barrett, Neuberger, Goldwater, Jackson, and O'Mahoney and Representative Engle, appropriated $48,866,300 for 1956, $68 million for 1957, $76,004,000 for 1958, and $79,962,000 for 1959. However, for road activities, the funds were given under the authority of the Federal Aid Highway Act, which in 1956 amounted to $16 million.[386]

In Yellowstone, the MISSION 66 program needed to address three areas in order for the Park to "yield the benefits of which it is capable: an adequate road and trail system giving access to important and significant features of the Park; adequate facilities for visitor comfort, welfare, and subsistence; and effective presentation, interpretation, and protection of the resources of Yellowstone by a management staff." [387]

The Park projected visitation of over two million by 1966 and officials knew the road system was the "major key to the most effective use of the Park." The original configuration of the Grand Loop and the entrance roads still fulfilled visitation needs, but it was felt that the system needed to be modernized to accommodate present and future traffic volume. The MISSION 66 plan did not call for any additional miles of road to be built, but did suggest that some of the existing roads located near important features of the park be relocated. The road standards of 20 feet of traffic lane, with the additional 3 feet of flanking-improved shoulder were used. In addition to addressing the road system, attention was given to providing sufficient parking and pullout areas to aid visitors in their enjoyment of the resources and beauty of the Park safely. They also called for the replacement of 14 old bridges, which were considered too narrow for then present day traffic. The estimate for the 10-year road and trail improvement program was $36,500,000. The total estimate for all improvements for the MISSION 66 program in Yellowstone was $70 million, which included the private investment of $15 million by the concessioner for lodges, cabins, and other concession facilities. Yellowstone estimated that in order to provide proper maintenance, management, protection, and service to visitors, their operational costs would rise from $1,471,000 to $2,226,000 by 1966.

The Park knew that the immediate visitors would have some inconvenience due to facilities and road construction, but the overall goal of providing the visitors with a "meaningful experience in observing, enjoying, and understanding Yellowstone would be worth the 10-year effort."[388]

In 1956, the Bureau of Public Roads and the National Park Service began formulating the projects for the first year, 1957. The tentative plans called for two projects -- base and top surfacing of the Lake Junction to Canyon Junction road and construction of adjacent parking areas (11.4 miles); and the final paving of the Norris Junction to Canyon Junction road, and top surfacing of 3.5 miles of the east section of the road.[389]

The two Agencies agreed to specific design and construction items:

1. A minimum width of 26 feet will be used which includes 22 feet of pavement and 2-foot shoulders. Additional width up to 28 feet, primarily on fill sections, to be obtained where possible through utilization of waste material resulting from slope flattening and other operations.

2. Native grass shoulders to be provided by addition of fines to shoulder material, nutrients, seeding and watering, and a bituminous mulch. This would not be equivalent to a stabilized grass shoulder, but is the best that can be provided on the present roadbed.

3. Plant mix surfacing to be included on all parking areas in lieu of bituminous surface treatment previously proposed.

4. Due to the type of material available for the plant mix, the Bureau of Public Roads recommended and all concurred in elimination of seal coat and chips. The reason for this is that material requires excessively long period to cure and a seal coat would merely retard this process. In addition, the Bureau is of the opinion that a seal coat is not necessary on the dense graded plant mix surfacing to be used on this job.

5. A special design has been prepared for the Mud Geyser area using a concrete slab with proper drainage provided for the escape of gases and corrosive liquids. The concrete slab to be surfaced with a standard plant mix pavement.

6. Horizontal alignment near station 445 to be eased to relieve sharp turn from the South. Vertical curve between 416-426 to be lowered to provide better sight distance

7. Since existing fill slopes have stabilized naturally over the years, all bituminous berms will be eliminated except for approximately 375 feet in two locations.

8. All standard AASHO regulatory signs to be furnished and installed by the contractor. Road striping to be done by the National Park Service with funds provided as a supplemental item in the estimates.

9. At parking areas painted delineator strips to be used rather than minimal aggregate guide markers.

10. Bituminous gutters to be used but only in reasonably dry locations where subsurface moisture conditions will not cause early disintegration.

11. Minimum 8-inch diameter guide posts to be substituted wherever possible for guardrail. However, some guardrail replacement will still be required in certain hazardous locations.[390]

In addition, it was decided that 12-inch-diameter log curbs would be used in all of the ten new parking areas instead of the then useful 18-inch logs or stone curbing, which was prohibitively costly and difficult to obtain. All of the logs used for curbing guardrails, and guide posts were to be given a soak treatment of "penta" after fabrication.

Roadside slopes, which were stabilized and had revegetated naturally, would not be disturbed. Those that were disturbed would be seeded with native grasses, watered, and given a bituminous mulch. All surfacing, aggregate material and top was to be obtained from the Trout Creek pit, and all concrete aggregate would be obtained from outside of the Park.[391]

Toward the end of 1956, the tentative 10-year road program was set. However, several emergency situations and logistical problems caused by building construction in particular areas shifted the priorities a bit.[392] Due to the necessary passage of many heavily loaded vehicles supplying construction activities, the building of the older, weak bridges moved to the top of the list. While the bridges appeared to be adequate for visitor needs, bottlenecks caused by hauling supplies, safety factors, and increased building and construction costs due to construction delays demanded their immediate replacement. Of particular note were the condition of the Lewis River Bridge and the Yellowstone River Bridge near Tower Junction. Very high water during the spring of 1956 caused heavy runoff, especially on the East Entrance Road. Extensive damage was done to the road by slides and erosion, requiring new and more substantial drainage structures.[393]

In November, 1958, Conrad Wirth, a landscape architect by training and the current director of the National Park Service, wrote a preamble for the "Handbook of Standards for National Park and Parkway Roads" in which he tried to guide the direction in which this extensive MISSION 66 program would take road improvements and reconstruction in the system:

> This Handbook is intended to be used as a guide by those who are responsible for the locating, designing, and building of park and parkway roads. The purpose of roads in units of the national park system is to give the public reasonable and leisurely access to scenic and other features. Such roads shall be located, designed and constructed with this in mind. Thus they become principal facilities for presenting and interpreting the inspirational values of a park, monument or parkway. In the location, design and construction stages, the alignment, grade and cross section of all park and parkway roads shall be fitted to the terrain as closely as possible to preserve the landscape. Pavement, shoulder widths and curvature should be adequate for the leisurely traveler and turnouts and parking overlooks shall be provided at frequent intervals. In all phases of the work the landscape architect and the highway engineer shall exercise imagination, ingenuity, and restraint to conserve park values.[394]

However, the 1958 standards did allow "tremendous flexibility of application" and in many areas of the system, the weakness of the standards resulted in the unnecessary ruin of distinctive park roads, ie. Grand Canyon South Rim Road and the Tioga Road along the Tenaya Lake in Yosemite.

By 1966, some 14 major bridges and several major culverts had been constructed in Yellowstone.[395] For the most part, these new bridges blended with the environment, despite the fact that their design moved away from the obvious rustic design of the pre-World War II era.

While the widths of the roads increased and more modern and less rustic bridges were built in the Park, it would be the period just after the MISSION 66 when part of the Yellowstone road system would take on a "less than park roads-like feeling". The construction of the modern, "anywhere USA" Old Faithful Interchange in 1969 was a definite deviation from the nearly 90 year old philosophy of roads "blending with the environment." The motives for building a bypass to remove the traffic congestion away from the natural features were quite sound, but the execution was a landscape design failure. During the late 1960s, bypasses for the Park's other congested intersections were discussed and planned -- Lake, Fishing Bridge, Grant Village, and West Thumb. In addition to the Old Faithful Interchange, four new bridges were built during the 1970's.[396] As the Park prepares to move into the 21st century and meet the needs of not only the American visiting public, but ever-increasing foreign visitation, a 20-year road reconstruction program began in 1988 by the Federal Highway Administration. With improved technology, copious park planning, and sensitive park management, improved park roads should provide the 21st century visitors not only comfort and safety, but also a subtle experience. In the travelers' quest to visit the different natural wonders and major areas, it is the Grand Loop and the Entrance Roads that provide the continuity of feeling that one is in a "special place."

385. Bernard DeVoto, "Let's Close the National Parks," *Harper's Magazine* October, 1953, 49-52.

386. John Ise, *Our National Park Policy, A Critical History* (Baltimore: Resources for the Future, Inc., by the John Hopkins Press, 1961), 546-550.

387. *"MISSION 66 For Yellowstone National Park,"* National Park Service, United States Department of Interior, unpublished document, Library, Rocky Mountain Regional Office, Denver, Colorado.

388. Ibid.

389. Memorandum to Chief, Western Office, Division of Design and Construction, Through, Chief, Division of Design and Construction, from Assistant Director of National Park Service Thomas Allen, 13 February 1956, Record Group 79, Yellowstone National Park, Box 10, Roads, National Archives and Records Center, Denver, Colorado.

390. Memorandum to Chief, Western Office, Division of Design and Construction from Park Landscape Architect Charles Krueger, 17 January 1956, Record Group 79, Yellowstone National Park, Box 10, National Archives and Record Center, Denver, Colorado.

391. Ibid.

392. See Appendix D for the Major and Minor Road Program for 1957-1967. Record Group 79, Yellowstone National Park, Box 10, National Archives and Records Center, Denver, Colorado.

393. Memorandum to Regional Director, Region Two, National Park Service from Superintendent, Yellowstone National Park, 17 August 1956. Letter to Mr. Edmund Rogers, Superintendent, Yellowstone National Park from Mr. K. S. Chamberlain, Division Engineer, Bureau of Public Roads, 6 September 1956. Memorandum to Regional Director, Region Two, National Park Service from Superintendent, Yellowstone National Park, 13 September 1956, Record Group 79, Yellowstone National Park, Box 10, National Archives and Records Center, Denver, Colorado.

394.Harold Bradley, "Roads in Our National Parks," *National Parks Magazine, February, 1959.* 6.

395. The fourteen major bridges constructed during the Mission 66 period.

Yellowstone River Bridge	1961
Lewis River Bridge............................	1960
Madison River Bridge..........................	1958
Gardner River Bridge..........................	1958
Gardner River Bridge..........................	1957
Chittenden Memorial Bridge...................	1962
Bridge Bay Bridge.............................	1961
Firehole River Bridge..........................	1967
Nez Perce Creek on Fountain Freight Rd.....	1965
Gibbon River Bridge...........................	1960
Gibbon River Bridge...........................	1960
Gibbon River Bridge...........................	1960
Beryl Springs Bridge..........................	1962
Gibbon River Bridge...........................	1960

396. The four bridges built during the 1970s were the following:

South Entrance Bridge	1972
Thumb Creek Bridge	1972
Firehole River Bridge	1970
Golden Gate Viaduct	1977

Chapter XII

HISTORY OF GRAND LOOP ROAD*

MAMMOTH HOT SPRINGS TO MADISON JUNCTION

During Superintendent Philetus Norris' first year, 1877, in Yellowstone, he proposed a route or bridle-path from Mammoth Hot Springs to the Firehole River region via the Gardner Falls and the Gibbon River which would connect the only two entrances to the Park, the west and north. This proposal was part of a larger scheme which included the construction of a wagon road from Mammoth Hot Springs to Henry's Lake via the Tower Falls, Mount Washburn, Yellowstone Falls, Yellowstone Lake, Firehole Basin, and exiting the Park on the older western route into the geyser basin region. Norris felt that the wagon road would connect almost all of the major points of interest and also connect the two entrances into the Park. In addition to the Mammoth Hot Springs to Firehole bridle-path, another bridle-path was proposed, from the Stillwater River to the Upper Geyser Basin via the Clark's Fork mines, Soda Butte, through the petrified forests to Amethyst Mountain, Pelican Creek, the outlet of Yellowstone Lake, Shoshone Lake, and on to Old Faithful in the geyser basin. Norris also planned to build facilities at Mammoth Hot Springs.

Upon arriving in the Park the following year with the first congressional appropriation of $10,000, Norris' priorities for building facilities and beginning the construction of the wagon road were changed due to the previous year's conflict with the Nez Perce Indians and a continual threat from the Bannock Indians. Instead, Norris began construction of the first permanent road in the Park, Mammoth Hot Springs to the Lower Geyser Basin. Completion of the road would facilitate the movement of military from Fort Ellis, Montana, to Henry's Lake in Idaho or Virginia City, Montana and of course, would be used by the ever-increasing number of visitors to the Park.[1]

Prior to his explorations for appropriate routes, Norris viewed possible routes from the top of Sepulcher Mountain. He could spot the route that he had taken in 1875 and he visualized a route to the south through the park via Gibbon Canyon, Firehole Basin, the Continental Divide and on to the Tetons. Norris knew construction through the canyons could prove difficult and dangerous, but it appeared to be the most straightforward and practical wagon route.[2] Furthermore, the unusual conditions, the presence of huge masses of obsidian, in the Obsidian Cliff area posed problems for road construction.

*In order for this document to be useful as a management tool, the history of the Grand Loop Road's construction has been divided into the following seven sections: Mammoth Hot Springs to Madison Junction, Madison Junction to Old Faithful, Old Faithful to West Thumb, West Thumb to Lake Junction, Lake Junction to Tower Junction, Tower Junction to Mammoth Hot Springs, Norris Junction to Canyon Junction.

In the survey of the road section immediately south of Mammoth Hot Springs, Norris located three possible routes from Mammoth Hot Springs to the plateau near Swan Lake. One route, the longest and most precipitous, followed the Gardner Canyon over the pass via the Osprey Falls and Rustic Falls to the plateau (route later became the Bunsen Peak Road); another route, which had a more gradual grade but also had a sheer wall section to be transversed, was the opening created by Glen Creek on to Swan Lake; the third and chosen course was the most direct route, but with steep grades, through Snow Pass above the hot spring terraces. A visitor described this first section through Snow Pass as "So steep is the climb that if the tail-board of a wagon falls out . . . the whole load is promptly dumped out in the road. A good road, though, a longer one, might have been built over the same ground."[3]

From the flat area near Swan Lake to the Obsidian Cliff area, no great construction difficulties were encountered, however penetrating the "glass mountain," Obsidian Cliff took ingenuity. Norris described his technique:

> Obsidian there rises like basalt in vertical columns many hundreds of feet high, and countless huge masses had fallen from this utterly impassable mountain into the hissing hot-spring margin of an equally impassable lake, without either Indian or game trail over the glistening fragments of nature's glass, sure to severely lacerate. As this glass barricade sloped from some 200 or 300 feet high against the cliff at an angle of some 45 degree to the lake, we . . . with the slivered fragments of timber thrown from the height . . . with huge fires, heated and expanded, and then, . . . well screened by blankets held by others, by dashing cold water, suddenly cooled and fractured the large masses. Then with huge level steel bars, sledge, pick and shovels and severe laceration of at least the hands and faces of every member of the party, we rolled, slid, crushed and shoveled one-fourth of a mile of good wagon-road midway along the slope; it being, so far as I am aware, the only road of native glass upon the continent.[4]

Leaving the "glass mountain," the 1878 road followed in an southeasterly direction to Lake of the Woods, Solfatara Creek into the Norris Geyser Basin. Norris' road proceeded through Elk Park, Gibbon Meadows into the Gibbon Canyon. At an approximate point where the Gibbon River flows in a westerly direction, the road left the canyon in a gap between cliffs and traversed pine covered slopes connecting with the Madison Junction to Old Faithful Road south of the present day Madison Junction.

During 1879, Norris supervised improvements to the grades at Obsidian Cliff, in the Norris area and into the Gibbon Canyon. He found spanning the Gibbon, Firehole and Madison rivers, or their creeks and streams could prove to be very interesting. He wrote "Few of the anomalous features of the LAND OF WONDERS are of greater scientific interest or of more practical value than the placid, uniform water-flow in its hot spring and geyser-fed rivulets and streams." Because these water courses are generally "broad, shallow, grassy and flowers carpeted to the water's brim, . . . with long stretches of flowing grass and occasional hot spring pools in the channels, . . . with overhanging turfy banks," Norris decreased the need for some bridges by cutting a slope through the turf forming a very good and permanent ford. Instead of a bridge he placed "long, limber poles and foot-logs, only a few inches above the low stage of water."[5]

The following season, bridges were built to span the Gardner and Gibbon rivers, including costly, long causeways, turnpikes, and grades along the Norris fork of the Gibbon River. An extension of the road to the Forks of the Gardner River was finished and a road "through the eastern branch nearly half-way through its terrible canon, necessitated a grade of over 1,000 feet within two miles."[6] In 1882, the new superintendent, Patrick Conger who accomplished little in road construction, was responsible for the construction of a substantial bridge over the Gardner River. The construction was supervised by Capt. E. S. Topping. The bridge, which was 12 miles south of Mammoth Hot Springs, was built in two weeks. The 96 feet long structure had abutments built well out into the river on both sides. The center pier and the abutments were constructed of log in a V-shaped configuration, pinned at the corners and filled with rock above the high water mark. The bridge was covered with hewn logs, 5 inches thick.[7] Topping and his crew built and repaired culverts and crossways, removed rocks and boulders, and still Conger wrote "Our road is still in a mountainous and rugged country, requiring much labor and expense before it can be said to be a good road." In his appeal for more appropriations for road work, he described the situation:

> . . .when you consider the extent of the territory and the great natural obstructions that have to be encountered, it seems to me it must be evident, . . . the amount heretofore placed at the disposal of the Secretary of Interior for the protection and improvement of Yellowstone National Park is entirely inadequate . . .. But to proceed with our road we have to pass over some very high hills to reach the valley of the main Gibbon, where we encounter a wide low bottom called the Geyser Meadow, a place where it will require a large amount of labor to make a good road. After passing the meadow our road enters the Gibbon Canyon and follows the river down several miles, close on the edge of the stream, crossing the same three times in as many miles over difficult and dangerous crossings in time of high water. After passing through this canyon our road gains the highlands, by a steep grade along the side of the mountain on the south side of the river. We soon come to the great falls of the Gibbon where the river plunges over a perpendicular precipice of 75 feet, which in the stillness of the evergreen forest that covers this country renders the scene as enchantingly beautiful as 'fairyland'. [8]

Army engineer Lt. Dan Kingman, who assumed the responsibility for road construction in the Park in 1883, found this section of road to be the most heavily traveled in the park and in the worst condition. His largest work crews reported there until heavy snows of 18 to 30 inches fell during the middle of October of 1883. With the exception of a 3 miles stretch in the Gibbon Canyon, this 40 miles section was widened and straightened, boulders and stumps removed and slopes reduced. Frequently spaced turnouts and a new ford were built. The existing bridges were repaired and the corduroy sections were covered with sod and earth. The work on this section cost approximately $6,300 or $170 per mile. [9]

In 1885 major projects and changes were made to Mammoth Hot Springs to Firehole Basin area. Substantial bridges were completed, one over the Gardner River at the ford, one over the Gibbon River at the lower ford, and one over the Gibbon River at the third crossing.

Work was completed on the new route immediately south of Mammoth Hot Springs. The 4 1/2 miles Mammoth Hot Springs to Gardner via Golden Gate and the West Fork of the Gardner River, which was started in 1883, was completed in a seven month period. Twelve hundred and seventy-five pounds of explosives were used and over thirteen hundred shots in drilled holes were fired. As a result, fourteen thousand cubic yards of solid rock was excavated in addition to a large amount of broken and crushed rock. This dangerous section of road was completed without any loss of life or injury. The completion of this section reduced the route by 1 1/3 miles and the time to many areas in the park from 2 hours to 1/2 day depending on the type of wagon and load. The reduced ascent of 250 feet to Swan Lake plateau enabled loaded wagons traveling in opposite directions to now pass with relative ease. The near vertical stone walls of the canyon prevented an excavated roadway, thus a 228 feet wooden trestle carried the roadway. Lieutenant Kingman noted in his report for 1885 that the "natural stone monument at the end of the trestle" marked what "visitors have called the Golden Gate."[10]

Kingman established a road camp near the Norris Geyser Basin in order to begin work on the new road between Norris Geyser Basin and Beaver Lake where it would connect with the old road at the head of the lake. The poorly located old road ran in an easterly direction south of Beaver Lake, before entering the woods near Lake of the Woods, then the road followed Solfatara Creek and crossing the Continental Divide near the confluence of the rivers near Norris Junction. Due to excessive snow depths and heavy timber covering, the snow covered the road well into May. The poor subsurface drainage caused by the heavy clay soils and the "saucer-like shape" of the pass produced "horrible conditions" for travelers. Kingman noted that it was not uncommon "to see a team lying in the mud, tangled in their harness and floundering about in almost in inextricable [sic] confusion while the drivers looked on in despair." Consequently, Kingman had sought a new route which would provide more exposure to the sun, better drainage and soil conditions. The 7 miles of new road, completed by the middle of October, cost $6,269.80. Before the close of the 1885 season, the crews replaced "a long and rather unsafe structure built of poles" with a "single span King-post truss of 30 feet" combined with a causeway, over the Gibbon River near the Norris Geyser Basin.[11]

In 1887, the wooden trestle through Golden Gate was strengthened by placing new timber supports and road-bearer cross beams. A log and pole temporary bridge had to be placed over Obsidian Creek at the ford due to the unusually high runoff. Lieutenant Kingman's replacement, Capt. Clinton Sears, proposed building a new 7 miles road from Swan Lake Flats to Beaver Lake, a new road between Norris Basin and Gibbon Canyon which would complete the 6 miles gap, and build a new road from Gibbon Canyon to the Firehole Basin. With a small appropriation for 1888, he was able to build a road from Norris Hotel across the Gibbon Meadow connecting with the road into Gibbon Canyon and a 7 miles stretch from Obsidian Cliff northwards.[12]

In 1889, a King and Queen post-truss through span of 40 feet was built over the Gardner River at the south end of Swan Lake Flats. It had a trestle span of 20 feet, a roadway width of 14 feet and a height above low water of 6 1/2 feet. A 86 feet long trestle bridge with a 13 feet and 8 inch width roadway between guardrails, a 5 1/2 feet above the low water, was built over the Gibbon River in the canyon. The engineers felt that a trestle bridge could be safely built because the river, which has many hot springs in its bed, would not receive ice build-up. Thus at the end of 1889, the following bridges were in service on the Mammoth Hot Springs to Madison Junction:

1. three spans of 33 feet over Gardner River--no truss
2. three spans of 32 feet over Gardner River--King post
3. trestle of 224 feet--Golden Gate
4. one span of 14 feet over West Gardner--no truss
5. two spans of 40 feet and 20 feet over Gardner River King and Queen post
6. one span of 32 feet over Obsidian Creek--King post
7. one span of 16 feet over Obsidian Creek--no truss
8. one span of 32 feet over Obsidian Creek--King post
9. One span of 34 feet over Gibbon River--King post
10. one span of 20 feet over slough at Norris--no truss
11. two spans of 40 feet over Gibbon River--Queen post
12. trestle of 75 feet over Gibbon River--Queen post
13. one span of 24 feet over Gibbon River--no truss
14. one span of 24 feet over Gibbon River--no truss
15. one span of 20 feet over Gibbon River--no truss[13]

During 1890, one of the two major projects in the Park was the construction of retaining walls in the Gibbon Canyon area.[14] In 1895, the Army completed another bridge over the Gibbon River at an old ford, near the mouth of the canyon.[15] The next major road projects for this section would be a part of Capt. Hiram Chittenden's 1900 multi-year plan for completion of the Grand Loop Road.

Among Chittenden's proposals for the multi-year project, he recommended a new widened road through Golden Gate Canyon including a new bridge to replace the wooden trestle around the cliff, raising 3 miles of road 2 or 3 feet in Gibbon Canyon and cutting out 1 mile of dangerous grades, and constructing 4 miles of new road down the Gibbon to connect with the western entrance road.[16]

About one mile of the original wagon road along the Gibbon River Canyon remained in 1900. The road had two very steep grades, one of which had a sharp curve at the bottom right at the river's bank. Chittenden found this particular stretch to be most dangerous as the failure of brakes or any other emergency might bring a team and wagon into the river. He called the road through Gibbon Canyon "One of the most pleasing in the park. It runs immediately along the bank of the river and is of easy grade. Unfortunately it is not built high enough above the river to make it safe. The river at every heavy flood goes clear over the road and has washed it out twice in the past six years." By 1903 the two bad grades had been cut out, one mile of new road had been constructed and a new steel bridge with concrete abutments had been built. During the winter of 1902, rock was hauled on sleds for about a mile to be used in the construction of the new heavy retaining wall on the newly reconstructed section of road about a half mile below Gibbon Falls.[17]

In 1904, a worn-out bridge in the Gibbon Canyon was replaced with a small 45 degree skew span and the following year the bridge over the Gibbon near Norris Junction was reconstructed and a steel truss was built over the Gardner River at the 7 mile post (Seven Mile Bridge).[18] Chittenden completed the construction work on the Golden Gate during 1902.[19]

Before Captain Chittenden left Yellowstone to begin supervision of the roads in Mount Rainier, he made the following recommendations for improvements to the Mammoth Hot Springs to Madison Junction road:

> . . . great care should be taken in widening the road through the 'Hoodoos' to prevent the destruction of unusual rock formations. It will be better to let the right of way have an irregular alignment--being narrower in some places than in others--than to sacrifice this peculiar formation in order to get a uniform width throughout. . . . it would be better to require all teams to come to a walk there than to remedy the defect by blasting out those picturesque rocks.
>
> Forested areas at Apollinaris Springs, a point 8 1/2 miles from headquarters, Crystal Springs, and at mileposts 13, 14, and 17 miles out should be cut back on the east side about 30 feet to expose the snow to the sun. However, if these forests contained fine specimens of trees, the stands should be preserved. The Apollinaris Spring, Kepler Cascade, Mud Geyser and other coach unloading platforms should be rebuilt and extended to a length of 100 feet.
>
> The first hill just beyond the Growler can probably be brought to the adopted grade of 8% by a small amount of cutting and filling and no relocation of the old road is deemed necessary. The second hill just beyond the first milepost can probably be dealt with better by going around it to the south. A personal reconnaissance of the ground indicates the entire

> practicality of such a line. If built, it should leave the present road at the foot of the first hill near the Minute Man Geyser and rejoin near the foot of the second hill at the beginning of the tangent across Elk Park.
>
> The maintenance of the retaining wall along the Gibbon River between Elk Park and Gibbon Meadow can probably be avoided advantageously by putting the road back farther into the rock. If the wall is retained it will have to be relaid in mortar.[20]

1st Lt. Ernest Peek, who replaced Hiram Chittenden, agreed with Chittenden's earlier suggestion of building all stone drywalls in the park and in 1907 began repairs on the drywalls near Gibbon Falls. In order to efficiently coordinate the work on this section, he established a number of road camps including one near Obsidian Cliff and one near Beryl Springs. The camps had floored and frame tents.[21] In 1908, Peek requested sufficient funds to purchase three bridges, including two for the Gibbon River, but his request was not honored. Thus very little major work occurred, but road surfacing was carried out from Silver Gate to the 5 milepost across from Swan Lake Flats. Near Crystal Spring, "considerable work was done on the roadside in order to deepen the ditches and give the road a good high crown." Surfacing was also done on the Norris to Fountain road from 2 1/2 to 2 3/4 miles. The 25 foot bridge at Obsidian Cliff and the 15 foot bridge at Apollinaris were each replaced by fills with 4 feet culverts. At Obsidian Cliff, the road was raised over 2 feet to improve the grade and it was also straightened. A fill of a foot was also made at Apollinaris.[22]

In 1909, Army Captain Willing conducted an inspection of the bridges in the Park which stated condition and made recommendations for improvements. On this section of the road, Willing found:

> Bridge No. 2 across the Gibbon River, 5 5/8 miles south of Norris Station---The present structure consists of one wooden span with two wooden approaches, and was built in 1895. The timber in the bridge is sawed pine lumber, which at present is in a decaying condition, some of the floor beams being broken and held in place by props. The structure is in an unsafe condition, and it is recommended that it be replaced by two 50' low truss, pin connected steel spans, resting on two concrete abutments and one concrete center pier.
>
> Bridge No. 3, Gibbon Canon Bridge, across Gibbon River, 7 miles south of Norris---The present structure is a trestle bridge 80' long, built 1891, of sawed pine timber which is in a decaying condition. It is recommended that this bridge be replaced by an 80' low truss, pin connected steel span, resting on concrete

abutments. As the bridge crosses the stream, at an angle of about 45 degrees, it will be necessary to make this bridge askew.

Bridge No. 4, Gibbon Canon Bridge, across Gibbon River, 9 miles south of Norris Station. The present bridge consists of two piers in the stream, two abutments of logs, and log stringers spanning the space between these piers. It was built in 1892, is 65' long is in shaky and decaying condition. It is recommended that it be replaced by a 65' low truss, pin connected steel span, resting concrete abutments. It will be necessary that this bridge also be built askew as the road crosses the river at an angle of about 45 degrees.

Bridge No. 5, across the Gibbon River at Wylie's Lunch Station. The present structure consists of one pier in the middle of the stream, and two log abutments with log stringers spanning the space between. The bridge was built about eight years ago and is in a fair condition, but two light in construction for the travel it has to carry. It is recommended that it be replaced by a 40' steel plate girder span, resting on concrete abutments.

Bridge No. 7, at the mouth of the Gibbon River, near the junction with Firehole River. The present bridge consists of one wooden span with approach at one end, resting on wooden piers and abutments, total length 66'. This bridge was built in June and July, 1896, and is also in the advanced state of decay and is unsafe. It is recommended that this bridge be replaced by a 65' low truss, pin connected steel span, resting on concrete abutments.[23]

During 1909, the road between mileposts 8 and 15 was ditched and crowned and the road was raised about 1 1/2 feet at the culvert fill across Willow Creek. The ruts caused by heavy traffic and water were filled with surfacing material.[24] In 1911, the road from Gardiner to Norris Junction was regraded and 21 miles of the road was graveled. Also that year, the engineers recognized the need to replace section of the dry, rubble wall along the Gibbon River.[25] During the winter of 1912, Captain Knight recommended that additional dry rubble guard walls be built on the outside edges of curves through the Golden Gate. He suggested the road along the Gibbon River between points 8 and 9 be raised two feet for 1 1/2 miles to keep it from overflowing in the spring and that sections of the dry rubble retaining walls be rebuilt.[26] He also felt that the old, crumbling retaining wall between Norris and Fountain should be replaced and that the narrow road should be widened.[27]

In 1914, gravel was placed over the middle 8 to 10 feet of the Golden Gate to Swan Lake Flats road to bring up the crown and fill in the wagon ruts. The gravel, which was taken from a pit just east of the 4 milepost was loaded through a trap by drag scrapers. It took approximately 1/4 yard of gravel per linear foot of road.[28] Some of the old bridges on the Mammoth Hot Springs to Madison Junction were replaced during the year. A two 40 feet span reinforced concrete bridge was built over the Gibbon River, 7 miles from Norris, and one 65 feet single-span girder and slab constructed bridge was built over the Gibbon near the confluence with the Firehole River. A 40 feet steel arch bridge was built over the Gibbon River near the Wylie Camp, 17 miles from the West Entrance. More reconstruction of stone retaining walls was done in the Gibbon Canyon and the road crews built a barn in the Gibbon Meadows camp, a cabin at the Beaver Lake camp, and two "public-comfort houses" were built in the Norris Geyser Basin.[29]

No major road projects occurred on this section of the Grand Loop Road for a few years. Shortly after the National Park Service was created, Secretary of the Interior, Franklin Lane visited the Park. During his inspection of the road system, he recognized a safety and visual problem in the Gibbon Canyon, the growth of small trees along the road. He found that the trees obstructed the view of the river and in turn made for dangerous driving. He also felt the removal of a few trees at the Gibbon Falls would "afford a better view of the falls." Other comments of condition on this section were:

> On top of hill on main road two miles from Mammoth, a number of very bad and hard rolls and bumps. Two serious holes, more than half way across Swan Lake Flats. Bridges at Upper Gardner River, Willow Creek and Gibbon River at Norris, below and above road levels. Road at Roaring Mountain in poor shape. Road Norris to Fountain down the Gibbon Canyon very rough, full of large chuck holes and broken culverts. Also contains one or two improvised log bridges where culverts have been washed out. Wylie Gibbon Camp over Mesa Road to Firehole River, about four very bad chuck holes that could be filled with little expense. [30]

During 1921, a new steel and concrete bridge was placed over the Gibbon River near Norris and wooden mess halls were built at Madison Junction and at Gibbon Meadows.[31] For the next few years, small allotments financed minor road projects, mostly accomplished on short sections at the end of the season. In September 1927, a crew composed of men and teams from disbanded work groups, began a grading project along the Gibbon River. The 1928 appropriation provided sufficient funds for work for a complete season. Foreman John Benson established a temporary work camp at milepost 17 on May 17, 1928 in order to begin the heavy steam shovel work in rock cuts and to arrange detours for traffic. Later the camp was moved to Norris Junction to continue the project which was finally finished in May 1929.

In June, 1930, Foreman O.A. Weisgerber established a camp at the old Beaver Lake road camp in order to begin work on the Bijah Springs-Obsidian Cliff section. A dangerous curve was reconstructed near milepost 15 and between the Gardner River crossing and the Glen Creek crossing, the crews were stalled by underground springs which required the installation of subdrainage. Material from a rhyolite slide north of Obsidian Cliff was used for a rock sub-base. An Osgood gas shovel, which had been moved up the Gibbon River-Norris Junction section was used on this section. The next section mostly required light cuts in the existing roadway and side cuts to straighten and widen the road. On this section, the banks were sloped up to an 8 or 10 feet cut on a 1 1/2 and a 2 to 1 slope. It was felt that the slopes, which would present a pleasing appearance, would also suffer less erosion from heavy runoff and the vegetation would take root easily. Upon completion of the excavation of this segment, the shovel removed rhyolite material from a pit behind the Norris Ranger Station for use as a light coating material for surfacing. The camp was dismantled in November.[32]

In October, 1929, when the weather became too bad to work in the interior of the Park, the crews resumed work on 600 feet of road in the Mammoth Lodge area. Most of the project was in fill, but the additional rough fill material needed was obtained from the demolished concrete grainery near the Tower Falls and Mammoth Hot Springs junction and from abandoned concrete flumes near the Mammoth Lodge. The removal of these structures were part of the Landscape Division's plan for the Mammoth area. The rough fill was covered by material obtained from the road slopes above the Mammoth reservoir and the finer material for surfacing came from the pit on Capitol Hill. In addition to the road construction, the old wooden sidewalk and the continuing gravel walk to the Mammoth Lodge was replaced with a stone curb sidewalk. The new sidewalk was described as:

> a stone curb walk, 2,412 feet in length, and with an emulsified asphalt surface. Curbing of locally quarried sandstone, is twelve inches wide and with a clear face of eight inches on the street side. Width of walk between curbs is five feet, an overall width of seven feet. The space between curbs was filled to within three inches of the top with any available material. Above this was spread two courses of grade size gravel, each coat being sprayed with a penetrating coat of Bitumen and rolled to a true cross section. A final coat of fine native sand was then broomed into the surface, giving a natural gray finish to the walk.[33]

After the Bureau of Public Roads assumed the road construction and improvement responsibilities for the Park in 1926, the Mammoth Hot Springs to Madison Junction was considered as a major project, however, adequate funding for location surveys was not received until 1929 and 1930 and as earlier stated, the lower segment of the section was constructed by National Park Service day labor work. The location survey for the Mammoth Hot Springs to Obsidian Cliff segment was made during the fall of 1930. At that time additional funds were requested for more investigation of the Golden Gate and for designs for a new viaduct.

A better route south from Mammoth Hot Springs was investigated, however, an improvement to the existing route through Golden Gate was deemed more advisable than the old route through Snow Pass and/or Bunsen Peak, or a preliminary proposal by the Park's engineering department of following a higher location through Golden Gate Canyon toward Mammoth Hot Springs through the Hoodoos. The National Park Service's landscape division did not approve of cutting.

The Bureau of Public Roads' proposed route followed the older Army road from Mammoth Hot Springs south except at the Gardner River crossing and the Obsidian Creek crossing, where it moves approximately 1/4 mile eastward for a distance of about 3/4 mile.

The 18 feet standard roadway design by the Bureau of Public Roads was used on this road segment. The design provided an 18 feet surfaced roadway with three feet shoulders on each side, both on fills and cuts. Three feet standard ditches, one foot deep with 2 to 1 slopes into the ditch, from the shoulder, were provided for sections in cuts. The cut slopes were designed for slopes 1 to 1 or flatter in common material as specified by the Landscape Division of the National Park Service. For the use of materials other than common, the cut slopes were designed at slopes thought to be stable for the particular material, except that all cuts four feet were designed with one to one slopes. The fill slopes were all designed at 1 1/2 to 1.

The Bureau called for the use of corrugated, galvanized metal pipe culverts with cement rubble headwalls for the minor drainages and for reinforced concrete box culverts with cement rubble headwalls for creek crossings. They also recommended the construction of a reinforced concrete structure, 75 or 80 feet long of 2 or 3 spans at the crossing of the Gardner River at station 233+50.

In assessing the Golden Gate viaduct situation, the Bureau found the present viaduct below the grade of the located line and too narrow thus, a new a new viaduct was necessary. In order not to incur further scarring, a wider and slightly higher structure was needed. They recommended cement rubble retaining walls on either end of the viaduct and the respective length of the wall. The new reconstruction would also require a tunnel approximately 100 feet in length.

Finding snow conditions worse in the Swan Lake Flats area, snow fences were suggested to control the conditions on the flats. The Bureau did not project possible snow conditions at either entry to the tunnel, but they did try to consider snow problems on the route in case of possible winter use of the road.

A sand and gravel pit on Swan Lake Flats was approved for concrete aggregate material, but its conspicuous location limited the amount that could be extracted from it.[34]

Following the completion of the Location Survey, the Denver office of the Bureau of Public Roads designed the road and also the plans and specifications for the Seven Mile Bridge over the Gardner River. The Bureau's plans designated grading and draining on an 18 feet 1930 standard roadway width. Concrete box culverts and corrugated metal pipe were designed for drainages; tile drain and rubble drains were planned for wet and swampy areas.

Following the advertisement for bids in the Rocky Mountain News, Denver, The Billings Gazette, Billings, Montana, and the Salt Lake Tribune, Stevens Brothers of St. Paul, Minnesota was awarded the contract with a bid of $140,126.65 or 73% of the engineer's estimate. The contractor, who was awarded the contract on August 5, 1931, set up camp immediately and began construction work on August 13.

Three camps were used for this contract. During 1931, the camp near station 55, or near Apollinaris Springs was used, then moving the camp to station 300 at Swan Lake Flats in October, 1931. For the remainder of the construction time, a camp near station 515 was used. These camps consisted of portable cabins positioned on wheels for cook houses, office and bunk houses, and tents to accommodate extra crews. The average daily crew working on the project was 57 men using the following equipment:

3 - "60" Caterpillar tractors
2 - Hydraulic Bodies
2 - Hydraulic Fresnos
1 - Concrete mixer
1 - Hydraulic Bulldozer
1 - Hydraulic scarifier
1 - Elevating Grader
14 - Teams with dump wagons
1 - 1 1/4 yard gas shovel
4 - 3 ton dump trucks
4 - 1 ton trucks
1 - Grader, 12' blade
1 - Compressor
1 - Small electric light plant[35]

One of the partners of the firm, C.R. Stevens, served as superintendent of the project. Using mostly long-time firm employees, he also hired common labor locally. The foreman was paid $140 per month, skilled labor, $100 to $140 per month, common labor, $55 per month. The contractor gave a $45 per month subsistence sum.

During 1931 season, grading began at a point south of Obsidian Cliff and in 2 1/2 months had progressed to station 245 near the crossing of the Gardner River, but cold weather forced the crews to move toward the other end of the project near Mammoth. Prior to shutting down for the winter, all concrete work had been done, the Seven Mile Bridge begun, some masonry work finished and the drainage projects completed as the grading progressed.

The contractor started the 1932 season on May 12 with shovel and dump trucks working in the Hoodoos. Extensive blasting was required to break up and loosen the huge wedged rocks, then more blasting was needed to break the rocks into manageable sizes for hauling. Grading continued on the project until August. During the 1932 season, the Seven Mile Bridge was completed, pipes, head walls, and rubble drains, were completed as grading permitted, and an old road was obliterated. The old road, from station 465 to station 496, required tearing out old retaining walls, cutting of the old shoulders, and hauling out the waste material. The new road approximately paralleled the old road.

Two concrete box culverts were installed, one 8' x 6', at station 64, the Obsidian Creek crossing and an 8' x 4' at station 369, the Glen Creek crossing. Corrugated metal pipes with masonry headwalls were installed over the other drainages. Tile and rubble drains and rock sub-base were installed in the swampy ground in areas of springs. The project required the installation of 1922 feet of tile drain and 5,955 feet of rubble drain.

The types of material the grading crews faced throughout the project were varied. From just south of Obsidian Cliff to near the Glen Creek crossing, the cuts were through solid rock, loose rock, gravel, muddy swamps and common earth. From the Hoodoos to the end of the project at the Mammoth Terraces, cuts were through solid rock and very large loose rocks, with some common earth and gravel toward the end. Since the Park required that all borrow pits should not be visible from the road, some difficulty was experienced in finding suitable material with a reasonable hauling distance.[36]

The engineering crews occupied three portable cabins built by the contractor at the National Park Service's Beaver Meadow maintenance camp during 1931, then moving to Mammoth Hot Springs until the end of the project. In addition to retracing the center line and cross-sectioning the entire project, staking culverts, and drains, the engineers placed concrete center-line markers at intervals of approximately one-half mile over the entire project. A light palliative oil treatment, 4,000 gallons per mile, was applied to the entire project to aid in the dust nuisance and serve as an interim measure until a surface course of crushed rock or gravel was applied. The project was completed by September 6, 1932 for a total cost of $136,810.94.[37]

Several landscape architecture issues were identified during 1932. During Landscape Architect Mattson's inspection of the guard rail between Mammoth Hot Springs and Norris in July, he objected to the use of the dark stain. The Bureau attributed the use of the stain as the result of competitive bidding, but he was willing to work with the Park to achieve a desired effect. After discussing the use of oil to thin the stain, Mattson was assured that the stain would bleach to a lighter shade. However, in discussing the staining of the guard rail at Madison Junction, he "asked them not to stain the guard rail at Madison Junction until it was complete and then use every effort to obtain the original desired color."[38]

Vista clearance and guard rail installation was also considered by the Park landscape architects in their July report:

sta.93	work will be done under road contract to provide turnout when waste material is cleaned up.
sta.122	Road ditch to be filled making 10 ft. dalite available for distance of 100 ft. No guard rail required. Few trees to be selected and removed.

sta.125	Dalite already available between sta. 124 and sta. 126 needs oil surface and 150 ft. guard rail. Some trees to be removed.
sta.150 - 151	some trees to be removed-no turnout no guard rail required. Vista wi be available while autos are in motion.
sta.160	remove numerous matured trees at edge of meadow for vista. No parking required, no guard rail.
sta.173 - 175	This location is on the outside of a curve. It would require considerable yardage to fill three feet deep and ten feet wide. Guard rail would be required.
sta.185	Several dead trees and a few mature trees to be removed. No parking or guard rail.[39]

Upon the completion of the Mammoth Hot Springs to Obsidian Cliff segment, the short steel Seven Mile Bridge which the new road bypassed was removed by Park crews then the old road obliterated. The new road location required the removal of 5,460 feet of telephone lines. The 18-wire system was relocated through a 16 feet right-of-way in a wooded area.[40]

In October, 1933, John McLaughlin of Great Falls, Montana, was awarded the surfacing contract for the 11.99 miles of road between Obsidian Cliff and Mammoth Hot Springs. Upon receiving the contract, McLaughlin set up camp about 600 feet to the right of station 520, a site which had been used by two previous contractors. McLaughlin purchased the frame buildings which the other contractors used for use as cook house, office, and bunk houses. He completed the camp by adding tents for use as additional sleeping quarters.

The crews began quarrying the widened heavy cut through solid rock in the Golden Gate between stations 418 and 421. The rock, obtained from the high cliffs, was blasted, put through a primary crusher and then stock piled to the left of station 409 at Swan Lake Flats.[41] The crews worked through the winter in order to avoid the traveling public during the visitor season. By the beginning of May, 1934, sufficient rock was stock piled and some surfacing had begun. By July 17, the project was complete.

The finished roadway had a 22 feet shoulder-to-shoulder width, a 4 inch base of 1 1/2 inch maximum size aggregate and 1 inch top of 1 inch maximum size aggregate. The earlier grading contract had graded the road on the 1929 standard, but on this project the super elevation on all curves conformed to the 1932 standard. The surfacing courses consisted of rhyolite. At the conclusion of the project, a palliative oil treatment was applied. A plant mixed oil course was scheduled for application during the summer of 1935.[42]

In October of 1934, Taggart Construction Company received the oiling and seal coat bid for $99,836. This project covered 36.29 miles of road, with 11.99 miles receiving a plant-mix oiled material and 24.29 miles receiving a seal coat. The contractor established his camp approximately 1000 yards left of the gravel pit which was to provide the surfacing material at station 255. A frame cook house was constructed, portable tents were used for bunkhouses and a portable building on wheels served as the office. The project required the services of about

65 men. A Pioneer Duplex crushing and screening plant was placed at the gravel pit which was approximately 1000 feet left of station 260. The crushed and screened material was stock piled nearby.[43] The project began on May 15, 1935.

Upon the completion of oil matting, the crews built masonry guard rail, performed cut slope treatment, cleaned up any slide material, obliterated old roads and borrow pits, placed top soil and planted approximately 275 trees of which 28 died. Parking areas were constructed near the Beaver Dams at station 100, at Appollinaris Spring and Roaring Mountain. The Beaver Dams parking was considered by the engineers to be a "pleasing and useful asset to the road."

The project, which extended from Mammoth Hot Springs to the Firehole Cascades was completed on September 30, 1935. With the exception for the needed construction and or/replacement on four bridges over the Gibbon River, "The smooth, wide highway, with easy curves and grades, should add greatly to the comfort and safety of the increasing volume of tourists who come to visit Yellowstone National Park each year." [44]

With the exception of bridge construction along this route, no major work was completed on the road until 1948 and 1949 when the road received another bituminous seal coat surface. The project, which was classified as a maintenance project and funded from Park funds, was awarded to Peter Kiewit Sons' Company of Sheridan, Wyoming, for a cost of $77,250.00. The park hoped that this treatment would extend the life of the existing pavement and lower the cost of maintenance on this road section. The crushed and screened material was stockpiled at locations along the route, however, the bituminous material was trucked in directly from a refinery at Cody, Wyoming. Most of the equipment and supplies were brought in from West Yellowstone or Gardiner, Montana. In order to transport the crushing and screening plant over the Madison River Bridge, the bridge had to be reinforced with the addition of eight temporary timber bents. The project was completed on August 2, 1949.[45]

The next major road project between Mammoth Hot Springs and the Firehole Cascades was the construction of the Norris Junction bypass, a project initiated by the National Park Service's Mission 66 program for FY65. The 6.32 miles long project channelized the intersection for the Grand Loop Highway and the Norris-Canyon Cutoff. The new alignment intended to provide a bypass of the Norris Museum and the Norris Geyser Basin and reduce the traffic congestion in that area.

The plans for this bypass were designed in the Region 9 Federal Highway Projects Office during the winter and spring of 1964-65. Both aerial and ground survey methods were used in siting the new alignment and automatic data processing equipment was used in its design. The mainline roadway was designed for a 38 feet graded width with 5 1/2 inches of base. The upper 1 1/2 inches of base were bituminous stabilized with a surface width of 30 feet. The two spurs road leading of the bypass were graded to a 32 feet width with a 5 1/2 inches base of which the top 1 1/2 inches were bituminous stabilized with a surface width of 24 feet. The shoulders were defined it cover aggregate resulting in a travel way of 22 feet on the main road and 20 feet on the spur roads. A 12 degree maximum curve, a 5.4% maximum grade, and minimum horizontal and vertical sight distances of 250 feet and 240 feet, respectively, were other design features.

The contract was awarded to R. J. Studer and Sons of Billings, Montana who submitted the low bid of $817,815.00. During May of 1966, subgrading began in an unstable, marshy area across from Elk Park, then moving on to a soaked peat bog near the Gibbon River. In addition to the grading operation, corrugated metal culvert pipe, vitrified clay culvert pipe, and perforated corrugated metal pipe underdrains were installed. Drop inlets, headwalls, and concrete curb and gutters were installed in October of 1966. By the end of October, 1966, the old road had been obliterated in the Norris Geyser Basin area, the areas of the old Gibbon River bridge, and the old Norris Junction. Seeding was done in one procedure with a 1,200 gallon capacity tank hydroseeder, seed, fertilizer, and green-dyed wood cellulose mulch. The one operation covered approximately 1/4 acre.

The guide posts treatment was changed from chemonite or greensalt to pentachlorophenol which produced a brown rather than green color. Other landscape details required the coloring of visible portions of concrete box culverts to be the same color as the curbs and gutters and, the removal of downed trees along part of the route. The crushed aggregate came from a pit sited to the left of station 1362+50 on Route 12, the Northeast Entrance road, the material came from an alluvial deposit and some from a highly disturbed rhyolite formation next to the alluvial deposit. A pit at Corwin Springs, Montana, provided the concrete aggregate and the cement came from the Ideal Cement Company at Three Forks, Montana. Almost all of the corrugated metal pipe, which was spot welded, came from the Bethlehem Steel Corporation. The contractor completed the project on November 7, 1966.

Upon its completion, the route now provided safer passage through this area. In the past, a common complaint and worry to Park officials was the reduced visibility caused by the steam blowing across the road from the geyser basin. The cars, which were pulled off on the road's shoulder for better viewing of the geyser basin, also caused a safety hazard. One recommendation the officials made at the end of the project was that the roadway receive a high type bituminous surface at some time in the future to replace the 1 1/2-inch thick plant-mix base which had been applied as a temporary measure.[46]

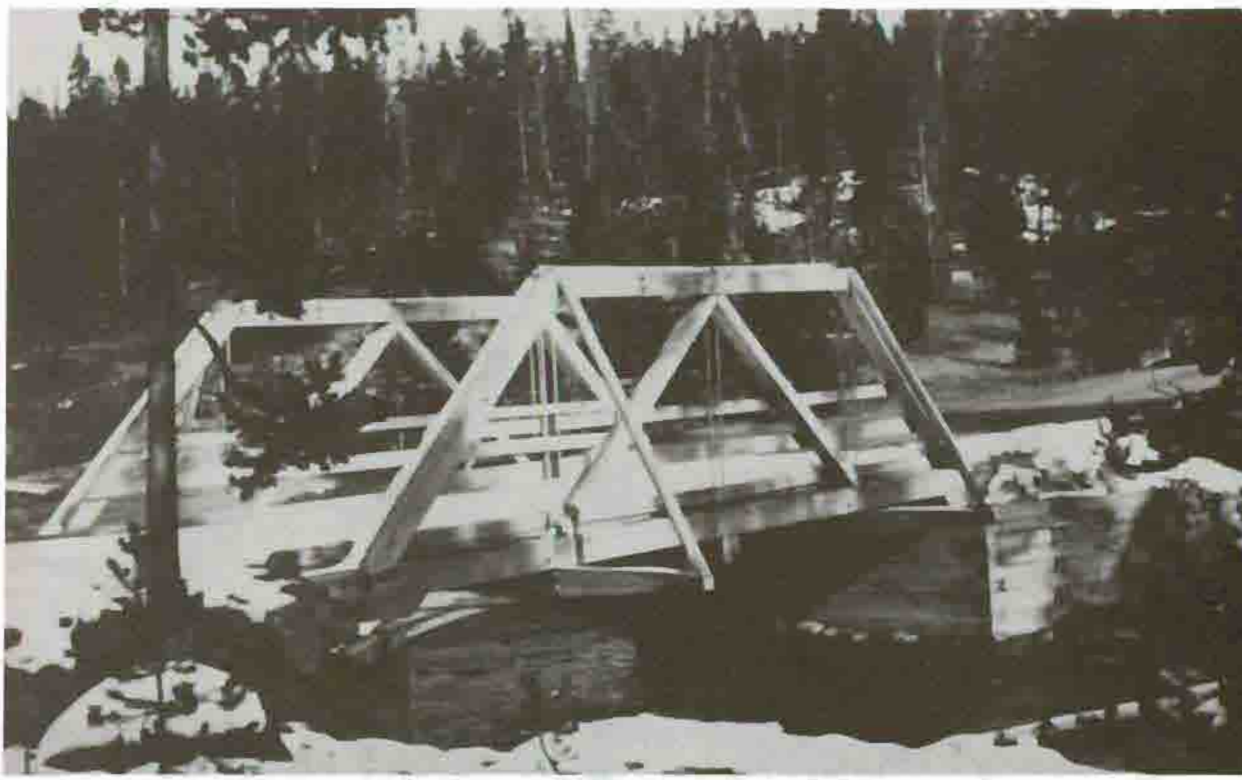
Golden Gate Early 1900s
Courtesy Yellowstone National Park Archives

Golden Gate Early 1900s
Courtesy Yellowstone National Park Archives

Golden Gate Viaduct, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Buggy at Siver Gate in the Hoodoos, ca. 1895
Courtesy Yellowstone National Park Archives

Road Below Golden Gate, ca. 1900
Courtesy Yellowstone National Park Archives

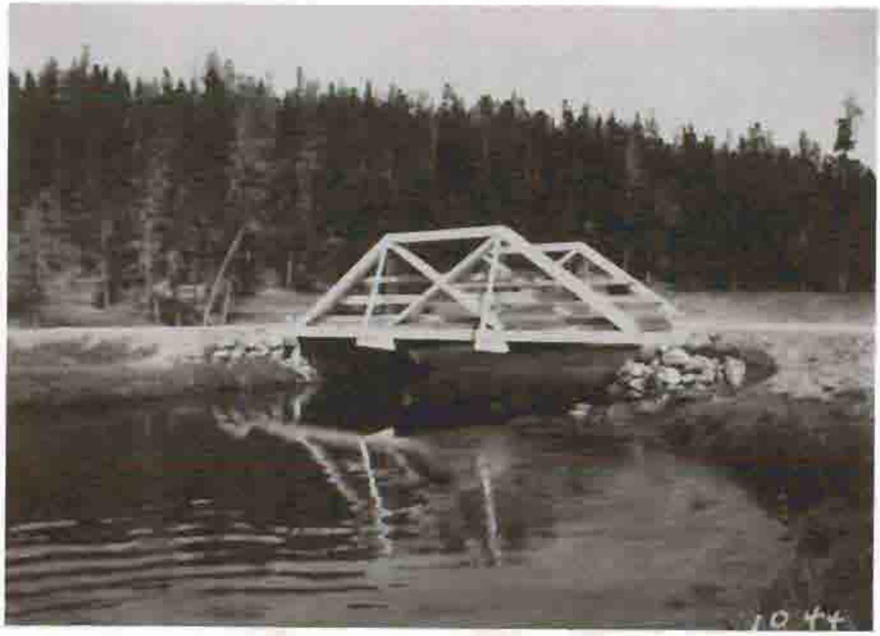


Seven Mile Bridge, ca. 1900
Courtesy Yellowstone National Park Archives

Seven Mile Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

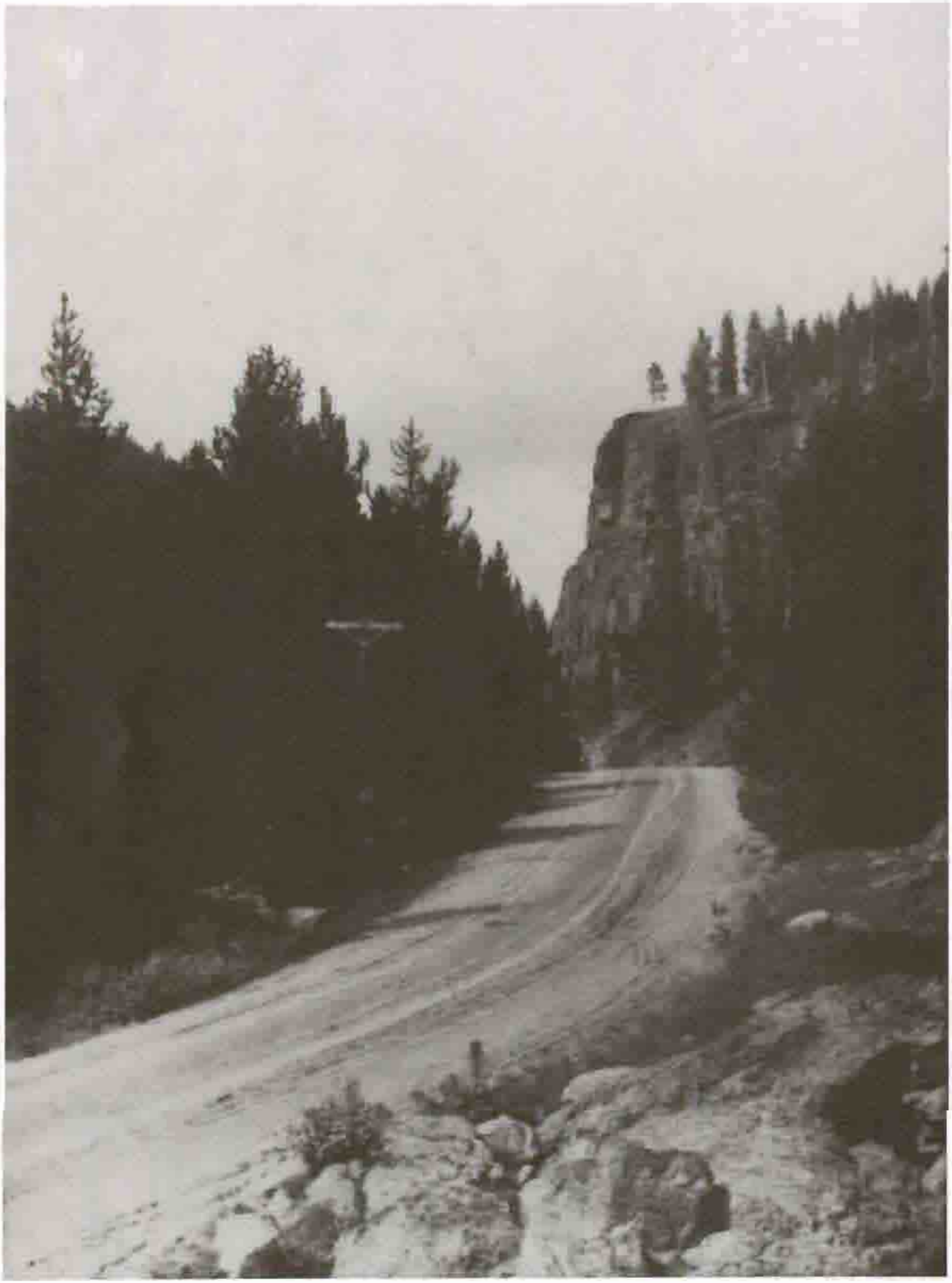
Obsidian Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Detail of Obsidian Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989



Gibbon River Bridge
Near Norris Junction, 1912
Courtesy Yellowstone National Park Archives

Gibbon River Bridge
Near Norris Junction, 1953
Courtesy Yellowstone National Park Archives



Road Near Obsidian Cliff, 1905
Courtesy Yellowstone National Park Archives

Road Near Norris Soldier Station, ca. 1900
Courtesy Yellowstone National Park Archives

Gibbon River Bridge Near Beryl Springs, 1912
Courtesy Yellowstone National Park Archives

Gibbon River Bridge, 1912
Courtesy Yellowstone National Park Archives

Norris to Madison Junction Road, 1912
Courtesy Yellowstone National Park Archives

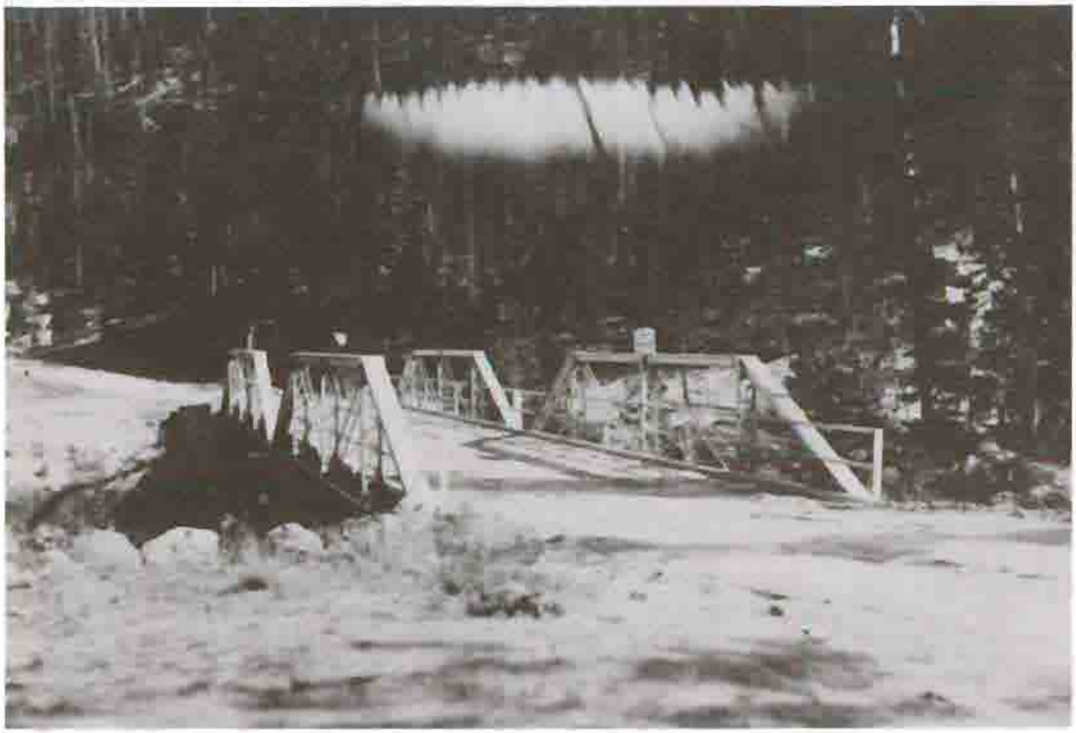
Gibbon River Bridge Near 7 Milepost
Norris Junction to Madison Junction, 1912
Courtesy Yellowstone National Park Archives

Gibbon River Bridge, 6 Milepost
Norris Junction to Madison Junction, 1912
Courtesy Yellowstone National Park Archives

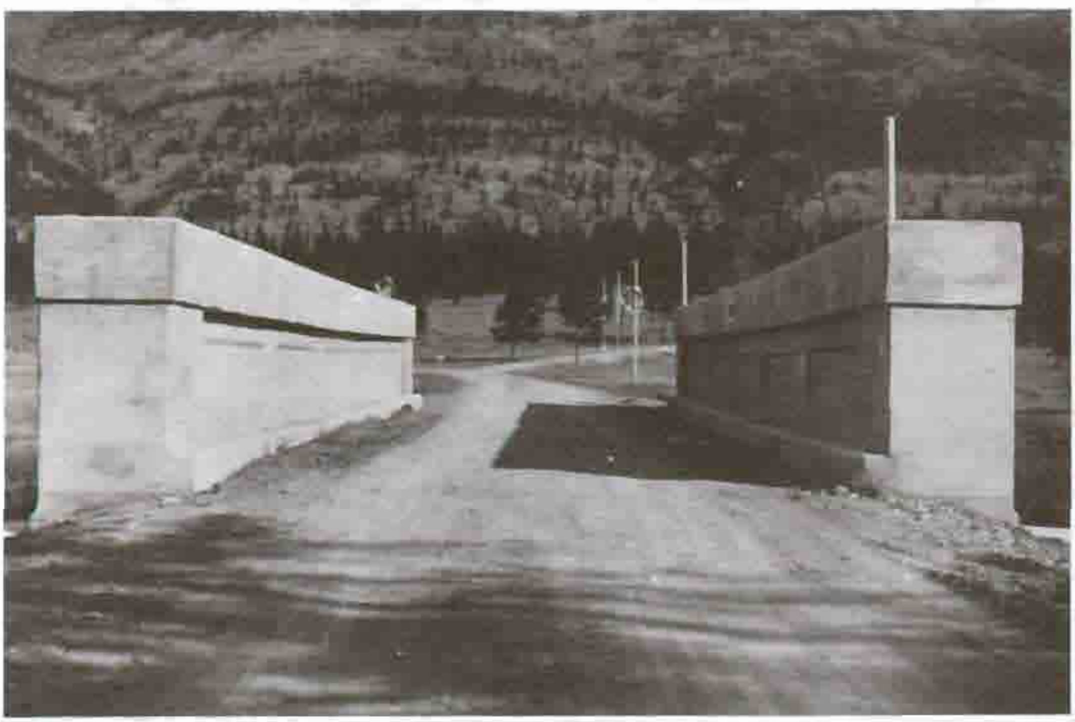
Gibbon River Bridge Below Wylie Camp Lunch Station, 1912
Courtesy Yellowstone National Park Archives

Gibbon River Bridge Near Madison Junction, 1912
Courtesy Yellowstone National Park Archives

Gibbon River Bridge Near Madison Junction, 1961
Courtesy Yellowstone National Park Archives



Gibbon River Bridge, 1917
Courtesy Yellowstone National Park Archives



Gibbon River Bridge Near Madison Junction, 1917
Courtesy Yellowstone National Park Archives

Gibbon River Bridge, Later Placed Over Firehole River on Fountain Freight Road, 1917
Courtesy Yellowstone National Park Archives

Road Near Gibbon Falls, 1908
Courtesy Yellowstone National Park Archives

Gibbon River Bridge in Gibbon Canyon, 1953
Courtesy Yellowstone National Park Archives

Gibbon Canyon Road, 1953
Courtesy Yellowstone National Park Archives

Gibbon River Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Gibbon River Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

MADISON JUNCTION TO OLD FAITHFUL SECTION

As early as 1873, a road had been completed from Virginia City, Montana to the Lower Geyser Basin, via the Madison Canyon. Gilmer Sawtell, who catered to park visitors at his hotel on Henry's Lake in Idaho, built the west entrance road and named it The Virginia City and National Park Free Road.[47] Four years later, the second superintendent of the Park, Philetus Norris proposed in his first report to the secretary of the interior, the construction of a wagon road connecting the "wonders" of the park which included a route connecting Lake Yellowstone through the geyser basins and exiting on the west side. As a result of the Nez Perce conflicts during the summer of 1877, the construction of a road from the headquarters at Mammoth Hot Springs southward to the Lower Geyser Basin became the highest priority construction project. This completion of the section of road would facilitate the movement of the military from Fort Ellis, Montana to Henry's Lake in Idaho or Virginia City, Montana, and of course, be used by the ever increasing number of visitors to the park.[48]

In 1880, improvements were made to the Firehole River Road including opening a road into the midway geyser area.[49] The following year, two footbridges were constructed over the Firehole in the Upper Geyser Basin. The next major work took place after the U.S. Army Corps of Engineers assumed responsibility for road construction in the park in 1883. At that time, the roads in the park were described as "barely passible and are daily growing worse. Just Sunday a lady was thrown out of the carriage and badly hurt at Fire Hole River. Between the 2 fords on Gibbon River, my wagon was turned over sideways and my wife thrown out. . . . The roads are terribly worn down on one side which makes it difficult to keep in a wagon."[50] Under the direction of Lt. Dan Kingman, a new bridge was built over the West Fork of the Firehole and some stretches of corduroy road were repaired and ruts filled. Finding the Mammoth Hot Springs to the geyser basins the most heavily traveled in the park, he also noted that it had the most serious natural obstacles and thus the "worst" in the park.

Kingman constructed a new road between the Firehole River and Upper Geyser Basin, as the old, poorly located road would be very costly to improve. The "unnecessarily long" and old road crossed a "kind of geyser swamp" in some places and crossed soils of a "black obsidian sand" in others.[51] As the road neared the Upper Geyser Basin, the alignments of the old and new roads were almost the same. The new route, which cost a total of $6,042.53, reduced the three to four hour travel time from the Marshall Hotel at the Forks of the Firehole River the Upper Geyser Basin to one hour. Kingman described it as "well built" and said that the bridges and culverts had "substantial character." He further describes it as "sensibly level, and as the roadbed is mostly composed of gravel that packs well, it is a very pleasant road to drive over."[52]

The first trestle bridge built in the park crossed the Firehole River above Hell's Half Acre. Kingman felt that this bridge was well suited to the unusual conditions of the locality, "enormous quantity of hot water that this river received, it never carried any ice, and as its discharge is remarkably uniform (there is hardly a difference of a foot between high and low water) it bears little or no drift wood." The trestle bridge, costing $400, was covered with 4-inch hewed planks.[53]

In 1889, 3.5 miles of new road had been built along the Firehole River above the Upper Geyser Basin and two bridges, in addition to the trestle bridge had been built--a two span of 36 feet each over Firehole River, no truss and a one span of 38 feet over the Firehole River, no truss.[54] In 1892, Lt. Hiram Chittenden urged the rebuilding of "the worst, most tedious, and least interesting drives in the park," the road from the Gibbon Falls to the Lower Geyser Basin.[55] In 1894, a new road was completed from a point on the old road near Gibbon Canyon south across the flats toward the Firehole and also connecting with the road west down along the Madison River. At the same time, a bridge spanning the Firehole River near Excelsior Geyser was built permitting teams to cross the river at this point and join the main road in the edge of the woods opposite.[56] The next year the new road had been extended to Nez Perce Creek. In 1897 a new bridge was built over the Firehole near the Riverside Geyser and a new footbridge built over Firehole River near Biscuit Basin.[57]

During the first few years of the 20th century, several bridges were built along this section. In 1903, a new steel truss bridge, whose material came from the American Bridge Company, was built over the Firehole River, 1/2 mile above Excelsior Geyser.[58] More bridge construction and reconstruction occurred during 1905 and 1906. During the 1905 construction program, a steel truss bridge over Nez Perce Creek and two wooden bridges were reconstructed, one on the old road from the Lower Geyser Basin to Excelsior Geyser, and the other just above the Upper Geyser Basin. During 1906, the wooden bridges over the Firehole River on the old freight road near the Fountain Hotel and over the Firehole River above the Upper Geyser Basin were reconstructed. "An attractive footbridge of rustic design was constructed over the small stream between the Castle Geyser and Old Faithful Inn."[59]

In 1907, the Army engineer supervised the repair of many of the park's wooden bridges and the replacement of some bridges with culverts. On this road section, a new wooden abutment was built at the bridge over the Firehole River on the Fountain to Upper Geyser Basin road and tile culverts were laid at 7 7/8 miles on the Norris to Fountain section.[60] The following year, new decking was laid on two bridges spanning the Firehole River, one crossing being near the Riverside Geyser and the other on the Upper Geyser Basin to West Thumb at the junction with Spring Creek. One 12-inch corrugated sheet iron culvert was placed at 9 1/2 miles on the Norris to Fountain road.[61]

In 1909, a bridge inspection was done for all of the Park bridges. The bridges on this section of road were described as follows:

> Bridge No. 9, across the Firehole River at Riverside Geyser, Upper Geyser Basin. The present bridge consists of a two-truss wooden span on wooden piers and abutments. This bridge is entirely too light for the service required at this point. It is located at one of the most important points in the Park, and in addition to the vehicle traffic, is at times loaded with sightseers viewing the Geysers. It is recommended that, owing the the importance of the bridge, and its location, it should be made an attractive appearing structure, and further recommended that two 32' plate girder spans with curved effect underneath be used resting on concrete piers and abutments, and that the roadway be 20' in width so as to accommodate the sightseers without interference with the vehicle traffic.
>
> Bridge No. 8, across the Firehole River at Hell's Half Acre, near Excelsior Geyser. This bridge was built in 1895, of white pine lumber, and consists of two spans with one pier in the center of the stream and two abutments. It is now in a decaying condition and its factor of safety is so much reduced that it should be removed at once. It is recommended that it can be replaced by two 50' low truss, pin connected steel spans and concrete pier and abutments.

As part of the inspection report on the bridges in the Park, it was recommended that plans be drawn for a reinforced concrete bridge to be constructed over the Firehole River near Riverside Geyser. Capt. Wildurr Willing of the Corps of Engineers felt that since this was one of the most visited areas in the park, it was necessary that the bridge be of an aesthetic design.[62] However, because of costs, a 65 feet steel arch bridge was built was built by the Minneapolis Steel and Machinery Company in 1911. As late as 1923, the 1911 bridge was still in use.[63]

Not many major changes or improvements were made to this road section after the Army left the Park and the newly created National Park Service assumed the road construction program. The new director did suggest the completion of the Firehole Cutoff road.[64] The 4 mile long freight road, which paralleled the main road between the Fountain Soldier Station and the Excelsior Geyser, was closed in 1917 due to its unsafe condition of the wooden truss bridge over the Firehole River about 1 mile from the soldier station. A new 50 feet bridge was built as a replacement and a 40 feet bridge over Nez Perce Creek was reconstructed.[65] And in 1921, a new foot bridge was constructed over the Firehole River near Castle Geyser.[66]

Prior to the next major construction program initiated after the Bureau of Public Roads took over the road work in Yellowstone in 1926, the Firehole River Road south of the Firehole Cascades for 3.5 miles was widened for two way traffic.[67] The work began in May, 1925 in the immediate vicinity of the Firehole Cascades and a camp was set up near the cascades. By the middle of July, 5,160 cubic yards of excavation had been removed by hand and team labor. Of the total, 4,400 cubic yards was of solid rock. The crews installed approximately 150 feet of drainage culvert. The cost of the project was approximately $6,000. In 1926, Director Mather reported that the work along the Firehole River between Madison Junction and the Firehole Cascades was "constructed on the highest standards of any used in the National Park Service"as "the beauty of the canyon justifies the very great attention that is being given to details of wall and fill construction."[68] The 1926 project, which involved widening a 1.5 miles section of the road in very narrow places and new construction for 1.5 miles, had originally been started by the Army engineers, but abandoned in 1916. The project required 1 foreman, 1 cook, 1 flunkey, 1 compressor operator, 2 Jackhammer men, 1 powder man, 1 grade man, 14-horse teamster, 2 2-horse teamsters, 1 axe man, 1 blacksmith, 6 laborers, and 3 teams. The project required the excavation of 360 cubic yards of common material, 820 cubic yards of loose rock, 2,945 cubic yards of solid rock and the installation of 120 linear feet of 12" C.M.P. culvert in place and 24 linear feet of 18" C.M.P. culvert in place. All excavated material was used on the project. "Neither the amount of material nor the nature of the country would permit fills on a naturally stable slope and all embankment was constructed with hand placed fill or rubble wall on slopes of 1/4 to 1/2 to 1."[69]

Work also began on a new bypass road at Fountain Paint pot as the old road was widened and improved to become a short loop road. The necessary fill material was hauled from the cut at the 7 milepost, about 1 1/4 miles distant. About half of the construction in this section was through sandy material which required a binder to create a stable surface. A sharp curve above the Firehole River Bridge at Excelsior Geyser was widened by the excavation of 600 cubic yards of solid rock. The borrow for the material on this project came from a pit near Firehole Lake. The project was finished in July, 1930. A total of 2.16 miles of road had been built and 196 linear feet of 18" CMP culvert had been installed.[70]

Shortly thereafter, the crews began lessening the curvature and widening the grade on a sharp curve at a point five miles north of Old Faithful. This project required the hand excavation of about 475 cubic yards of material which was then used to widen the grade from 18 to 24 feet, both at the curve and a distance of 200 feet on either end. All of the excavation was through a sand-clay formation, thus no additional surfacing was required. It was finished with an application of oil.[71]

In 1930, the realignment of the Norris Junction to Madison Junction road resulted in two steel bridges across the Gibbon River approximately 9 1/2 miles below Norris Junction being abandoned. It was proposed that both would be removed, however one bridge, which served the old stage road (Mesa Road) to the Firehole Cascades, was still needed as diverted traffic used this route while the new road was being completed. The other Gibbon River Bridge, a steel arch bridge with concrete floor, constructed in 1913 at a cost of $4,010, was dismantled and reassembled over the Firehole River on the Fountain Freight Road. This relocated bridge replaced an unsafe timber bridge. This bridge has since been removed.[72]

In an inter-bureau conference held in San Francisco in 1931, the National Park Service requested a reconnaissance survey be completed for the road between Firehole Cascades and Old Faithful. The average daily traffic during that period was about 600 vehicles per day with about 10% of the total being trucks and busses. The survey found that the first 2.5 miles from Madison Junction to the Firehole Cascades, which had been reconstructed by day labor of the National Park Service and surfaced by the Bureau of Public Roads in 1931, to be in satisfactory condition. Thus most of the survey was for the remainder of the road. The Park requested the feasibility of rerouting the main road via the Firehole Lake, the east end of Biscuit Basin and Black Sand Basin. They also felt that if this was not desirable then they wanted loops built in these areas. The recently built bypass of the Fountain Paint Pot proved to have reduced the interest at this point, thus the Park desired a rerouting producing a closer approach. Within 10 days, the survey crew recommended many slight variations from present alignment, flattening of curves, reducing curvatures and widening the present road. It was estimated that approximately 10 culverts would be needed for every mile. The width of the road from shoulder to shoulder should be 28 feet for the main roads and 22 feet shoulder to shoulder for the proposed loop roads. The four bridges on the project were considered too narrow and too light of construction to carry the average daily traffic load, and therefore should be replaced.[73]

The location survey for this project was completed in 1932 and the Morrison-Knudsen Company, of Boise, Idaho was awarded the grading contract on July 17, 1934, for the low bid of $188,216.10. The contractor began establishing his camp at Goose Lake on July 19, 1932. The camp had frame buildings which facilitated 125 men. Family members were provided for at a camp just across the creek from the main camp. The engineers camp, which consisted of two 16' x 16' portable houses and two tents, was located at Riverside Geyser. Work began immediately and closed for the season on December 26 with 84 percent of the project completed. The 1935 season began in May and with 95% of the project finished by September 9 when the contractor closed down for the year.

By the end of the 1935 construction season, the road had been graded to a minimum width of 28 feet at the recommendation of the National Park Service. The Bureau of Public Roads standard for that time was a 26 feet roadway, shoulder to shoulder. The bridge construction was handled by separate contracts. All cross and side drainage structures were corrugated metal (1,898 linear feet) and Vitrified Clay Pipes (4,254). Since many of the drainages are through areas of unusual chemical composition, vitrified clay pipe was preferred. The 271 cubic yards of rock for the masonry work was obtained at a quarry at a point where the Mesa Road leaves the Grand Loop Road between Gibbon Falls and Madison Junction. Because of the superior condition of the subgrade, it was deemed possible for traffic to move over the road for a season or two until the final surfacing is done.[74]

Concurrently with the road construction project, a bridge contract was awarded to McLaughlin Construction Company of Livingston, Montana, for the construction of the Nez Perce Creek Bridge, the Firehole River Bridge and a foot bridge over the Firehole River at Excelsior Geyser. Work began in 1934 and the bridges were completed on September 6, 1935. Following the completion of the bridges, the Park felt that "great improvements" had been made in the roadways. The use of four to one slopes on low embankments was preferable, however, that combined with not diverting branch streams left:

> some undesirably conspicuous culvert headwalls especially on the road recently completed between Madison Junction and Old Faithful. It is believed that a change in design of culvert headwall is desirable and that an improvement in appearance can be readily obtained. One plan would be to move the headwalls closer to the road shoulder, to bevel the projecting corner, and to provide 90 degree wingwalls on the same slope as the embankment. Another method would be to bevel the end of the culvert and protect the bank by hand placed embankment or by masonry laid flush with the surface of the embankment. While the masonry of large bridges adds to the attractiveness of the roadway it seems to be undesirable to make the headwalls of small culverts conspicuous and the more invisible they can be the better the appearance of the roadside.[75]

Another landscape issue identified with this section's bridge work was the type of curbing desired. The Park felt:

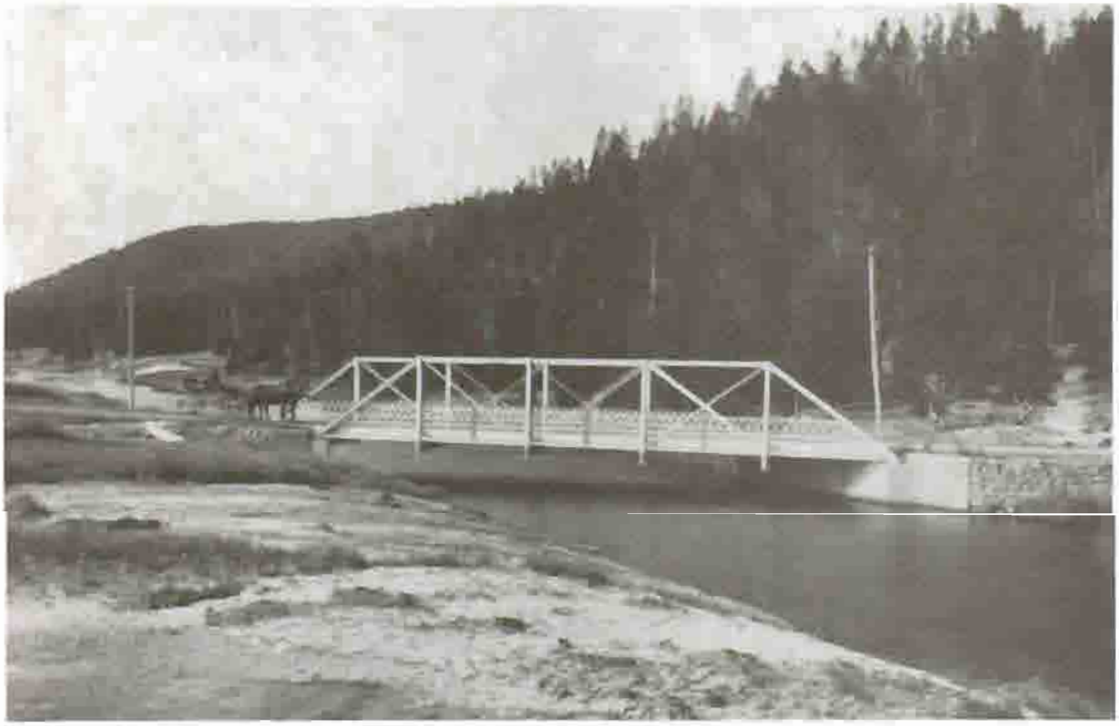
> that a concrete curb is more serviceable than a masonry curb. It is, however, suggested that the appearance of wingwalls would be improved by making the wingwalls all of masonry including a masonry curb rather than introducing a concrete curb as a portion of a masonry wall. A single course of masonry above a concrete curb does not give the appearance of being adequately bound into wall.[76]

Both the newly constructed Nez Perce Creek Bridge and the Firehole River Bridge have the combination of the concrete curb with the masonry walls.

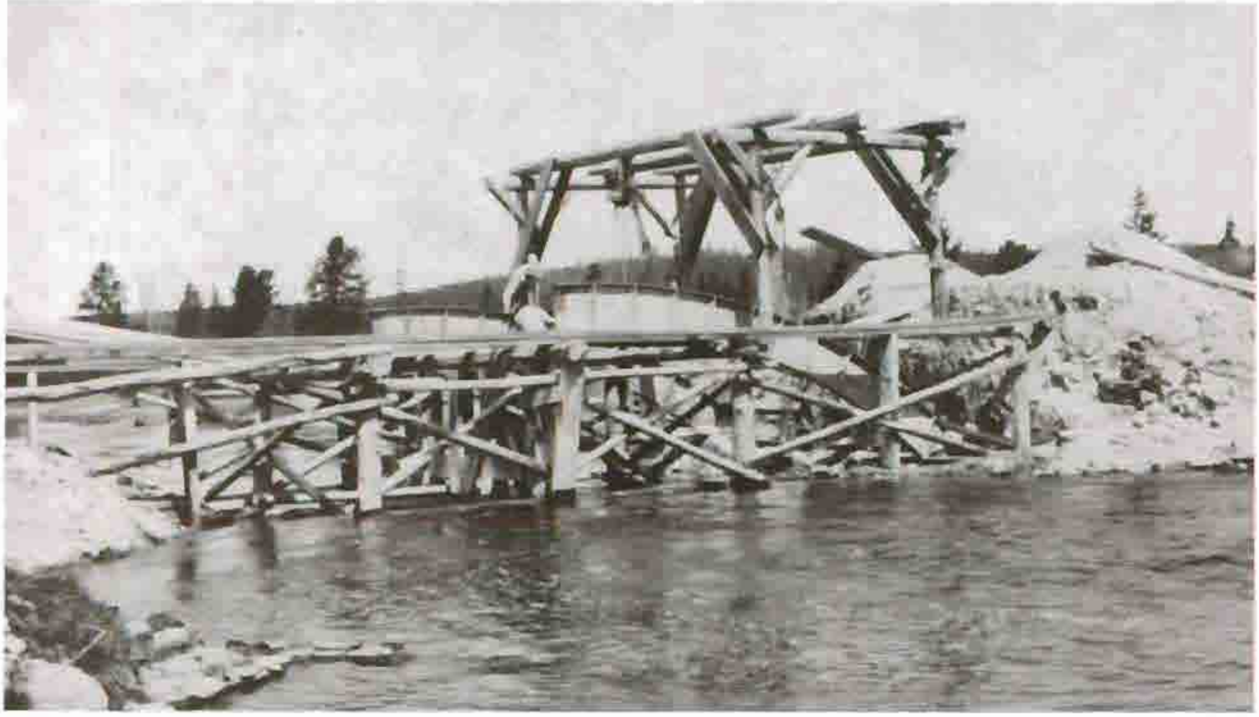
The next major project on this road section was the relocation of approximately 2 1/2 miles of road between a point on the Grand Loop Road immediately north of Madison Junction to a point on the Grand Loop Road near the Firehole Cascades. The old road, which is along the Firehole River through a narrow canyon, was first constructed by the Army engineers, but abandoned in 1910 because of construction costs and the very heavy character of the work. In 1925, National Park Service day labor forces resumed construction on the section and it was eventually surfaced by the Bureau of Public Roads in 1931. The 1938 Preliminary Location Survey proposed the construction of a new bypass road to alleviate the serious bottleneck imposed by the narrow road through the Firehole Canyon. The engineers specified that the new bypass be built on the same standards as the rest of the Grand Loop Road. Upon completion, the old road could be used as a scenic drive.[77] This report resulted in preliminary plans, however, the construction did not occur for several years. In 1949, a 38 miles chip sealing project on the Mammoth Hot Springs to Firehole Canyon road and a grading and base surfacing project in the Firehole Canyon began.[78]

Many improvements, such as widening the roadways and bituminous surfacing, were made on the Madison Junction to Old Faithful section during the 1960s. A number of remanents of old roads were obliterated and the scenic loop roads were resurfaced and improvements made to the shoulders. Rock work was repaired after the 1959 earthquake.[79]

Along Firehole River, ca. 1900
Courtesy Yellowstone National Park Archives



Firehole River Bridge No. 5, North of Old Faithful
Courtesy Yellowstone National Park Archives



Firehole River Bridge, 1913
Courtesy Yellowstone National Park Archives

Firehole River Bridge, 1931
Courtesy Yellowstone National Park Archives

Nez Perce Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Firehole River Bridge, Near Morning Glory Pool, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

OLD FAITHFUL TO WEST THUMB

Army Engineering Officer William Craighill became the first person to survey the Old Faithful to West Thumb route. Not knowing the precise route that the road would take, Craighill had the crews working from each end. Before the road was completed, Craighill was replaced by a significant figure in the park's history, Lt. Hiram Chittenden. One of Chittenden's first assignments was to complete Craighill's project, the construction of the road from Old Faithful to West Thumb road. In 1891, Congress required that the route be built by the shortest practicable route.[80]

Thus, Chittenden's recommended route, which closely paralleled today's road, did not skirt Shoshone Lake as Captain Kingman proposed, but instead crossed Isa Lake and crossed the Continental Divide twice. According to a Yellowstone National Park historian, Aubrey Haines, Chittenden discovered that the crew on the Old Faithful end were following the old Norris trail. "That was Mr. Lamartine's idea of locating a road--to follow a trail with all its irregularities and excuses of gradients, regardless of what improvements could be made by something of a survey." Haines wrote that "Chittenden found it necessary to do the locating himself, working alternately at the two ends of the line with a hand level, a five foot staff, and the assistance of two laborers."[81] The road, completed during the summer of 1892, is one-third shorter than Kingman's proposed route via Shoshone Lake.[82]

In 1891 or 1892, a pole bents and stringers trestle bridge was constructed to span a ravine 1 1/2 miles from West Thumb and the Log Cabin Bridge across Herron Creek was built. The Log Cabin Bridge consisted of "two piers built up of logs resembling a log cabin, hence its name. There are also two wooden abutments. The spaces between the piers are spanned by stringers of white pine logs."[83]

The Grand Loop was finally completed in 1905. In 1908, a new, small bridge was built on the flat near DeLacy Creek and repairs were made to the bridges over Herron Creek and DeLacy Creek.[84] In 1909, Engineering Officer Wildurr Willing, made a thorough inspection of the bridges in the Park. He recommended that the trestle bridge, 1 1/2 miles from West Thumb, be replaced with a low truss, pin connected steel span, 60 feet in length, which would rest on concrete abutments. He called for the replacement of the Log Cabin Bridge with a 60 feet steel arch span with steel approaches at either end. Due to the fact that at one end of the bridge the road makes a sudden turn, that end had to be widened "so as to permit the four-horse teams to swing onto the bridge with ease." Another trestle bridge, 60 feet in length and constructed of pole bents and stringers, which spanned a ravine 1 mile west of West Thumb, was scheduled to be replaced by a 4 feet culvert pipe.[85] It was replaced in 1913 by a concrete culvert and earthfilled wooden crib.[86] In 1912 a road assessment was conducted to determine the suitability from an engineering standpoint, of the system for the introduction of automobile traffic in the Park. The Army Corps Officer Captain Knight, concluded that it would be better if the existing system were reconstructed than creating a separate system for motorized vehicles as some had suggested. Not much work was done on the Old Faithful to West Thumb Road but a 25 feet long bridge had been constructed in 1911 (exact location not known).[87] In 1915, three concrete culverts from 4 to 6 feet spans and been built along Spring Creek and the foundation for three more, plus several galvanized culverts had been put in along the road segment. These replaced older wooden ones.[88]

In 1926, a Park report suggested that the wooden bridge just south of Old Faithful be replaced with a concrete structure and that all of the Dry Creek culverts have their capacity increased. The report also called for the installation of metal culverts for that section of the road.[89]

Intensive reconnaissance surveys of this segment were completed by Worth Ross in 1927 and by A. C. Stinson in 1934 at the request of Superintendent Roger Toll. Toll urged for a speedy completion of the survey with expectations of going into construction the following year. Records for 1934 recall that this segment, which was, and is, an integral part of the Grand Loop system, was the "lowest type and poorest main road in the Park."[90]

The Bureau of Public Roads engineers felt that the road was far below the standards of the roads elsewhere in the Park. During 1934, the road was being traveled by approximately 250 cars daily, whereas the approximate daily use for other segments was 500 cars daily. These figures were based on records of previous years indicating 50,000 cars entering the park during the 100-day season. Officials felt that the low usage of this segment was no doubt due to the one-way traffic regulations and the poor condition of the road.

A $10,000 allotment for the 1934 survey was approved; the survey began July 5, 1934. The 15-man crew completed the staked lines survey October 22, 1934. Later, an additional $4,000 was approved for the survey project. The surveying crew found the crooked and narrow one-lane road following , "most of the devious windings of the water courses, which it employs in the ascent to and descent from the two crossings of the Continental Divide. The road employs a great many sharp curves and a few sketches of excessive grades . . . ." [91] The road width varied from 12-15 feet to 18-20 feet. The wider width sections were found in the flatter country and also at the beginning of the ascent to Craig Pass which also has some of the rockiest sections of the route. Less rocky country, but very crooked alignment was found in the lower section of Dry Creek, while the upper section of Dry Creek was described as "rolling hilly country of less rugged nature." The descent road from the second Continental Divide crossing to West Thumb ranged from gentle to very steep slopes as one neared Yellowstone Lake. The survey team reported that the earlier work had been designed to incorporate a "fine view" of the Yellowstone Lake at one of the very sharp curves and further down the road, an overlook was built for a view of Duck Lake, a spring-fed lake lying between the bluffs and Yellowstone Lake.

At the conclusion of the survey, the Bureau of Public Roads made seven different proposals, some of which proposed similar alignments, but proposed different methods to overcome specific problem areas. The selected proposed route was a compromise between the National Park Service, who imposed strict guidelines concerning landscape, design, vistas, and the use of the segment for interpretation, and the Bureau of Public Roads whose aim was to find the most suitable ground for a modern highway. The 1934 survey report recommended some new road construction, some incorporation of the earlier road, and the use of a 24 inch culvert as an equalizer between the two lakes (Isa Lake) with the road running on the left side of the first lake and the right side of the second lake. It proposed parking spaces at Shoshone Point for views of Shoshone Lake and the Teton Mountains, at Mt. View where selected clearing would provide fine views of mountain peaks, and Yellowstone Lake. Other vistas considered on this segment were views of Flat Mountain at the south end of Yellowstone Lake, the Trident in the southeastern section of the park, and views of Yellowstone Lake. The report stated, ". . . This is a magnificent and worthwhile view (Yellowstone Lake) and should be preserved." The engineer admitted that another approach to West Thumb was more favorable and less expensive but "does not develop this view, and, although occupying better exposure, results in probably a little less satisfactory alignment."[92]

The proposed route shaved 2.7 miles off the earlier route. The length of the 1934 route was 17 miles, the route crossed the Firehole River and four creeks. The report recommended concrete box culverts for the creeks and remaining drainage cared for by corrugated, metal pipes or in high erosion areas, paved inverts for some of the pipes. The Park afforded one of the major concessioner, W. M. Nichols, president of Yellowstone Park Hotel Company, to comment on the proposed new alignment. He suggested that the old section through the Spring Creek Canyon, which he considered "one of the prettiest short trips on the Loop", might be also retained as a one-way east bound road. He stated that "As for our own buses, it would make a delightful trip, because, as you know, the buses have their tops down most of the time, and people can view scenery even in a narrow canyon like Spring Creek.[93]

Prior to the 1934 survey, the discussion of road width was an important topic and one of disagreement between the Bureau of Public Roads and the National Park Service. In a 1931 letter, the Bureau's district engineer discussed the construction width, shoulder-to-shoulder for all sections of the Grand Loop Road. The National Park Service reacted by telegram and called it "a matter of over-design." After several conversations and the Bureau's reason for the greater width, the 28-feet width was accepted and some projects proceeded using the 28-feet standard. In a February 12, 1934, letter from Superintendent Toll to the director of the National Park Service, Toll questioned whether a recognized agreement on the 28-feet width existed.[94] The previous 24-feet accepted standard for all park was raised to 28-feet for the Grand Loop Road and to 26-feet for the entrance roads.

By 1936 and 10 years after the initial road survey, 200 miles of the park road system had been improved to a drain and grade standard. Approximately 100 miles had been base course surfaced which consisted of crushed rock, spread the full width of the graded section to a compacted thickness carrying from 4 to 9 inches depending on subgrade conditions. Approximately 50 miles had a bituminous treated surface which was 20 feet wide with a 2 1/2 inch minimum compacted thickness with a seal coat and a wearing surface of stone chips. This treatment was the desired ultimate completed surfacing for all of the roads. Approximately 30 miles was under construction for bituminous surfacing; 19 major bridges including the new

Golden Gate Viaduct were either completed or near completion. With approximately 60 percent of the project completed the total cost including 1936 work in progress was $7,000,000. However, the Old Faithful to West Thumb segment was not completed.[95]

Refinements of the details and revisions of the 1934 report and recommendations began almost immediately after the publication of the report. In fact, in the published report, the author acknowledges the cooperation of Superintendent Toll, but indicates that they had "less effective" cooperation with the landscape division of the National Park Service.[96] Perhaps this hint of "less effective" cooperation with the landscape division is a sign of the importance of the landscape division's input toward the completion of the park's road system to park standards. One of the requests from Sanford Hill, resident landscape architect, was that "the cleanup of old logs and down timber along the small creeks and particularly along Isa Lake be held to the minimum. We feel that the cleanup along these streams would tend to destroy a natural condition, and also destroy a natural check on erosion."[97]

Very early in the park road development history, the concern for visual quality, interpretive values, and the limited destruction to the landscape is evidenced in U. S. Army Corps of Engineer's Captain Kingman's standards and it was continued through the 1920s, 1930s, and 1940s period. The landscape architects in the branch of plans and design of the National Park Service collaborated with the engineers of the Bureau of Public Roads during the survey, and throughout the planning and design stages of construction. The Park's resident landscape architect monitored the actual construction and supervised the development and construction of landscape features. Among the examples throughout the park of a landscape architects input are the roadside pullouts, trails, and the cut and fill slopes which were rounded and other special design features. "The rounding of tops of cut slopes and the flattening of cut and fill slopes in earth material" had long been standard practice for the National Park Service road design. In the Rocky Mountain West, the state highway departments adopted the same practice. Another landscape problem was the rehabilitation of abandoned roads, a problem which existed on the Old Faithful to West Thumb segment. The problem was addressed by reversing the construction procedures and "placing the materials from fills back into the cuts and attempting to reestablish the original contour and topography of the terrain."[98] In wooded areas, much tree planting was done and in barren areas, the old roads were covered with duff and top-soil to promote vegetative cover and prevent erosion.

Travel on this segment of the Grand Loop had increased to nearly 1,200 cars daily. The new alignment at a point just east of Isa Lake followed the old road, swinging north, crossing Herron Creek, and down to DeLacy Creek crossing on a high fill to Shoshone Point. A parking area was constructed at Shoshone Point to enable the visitors to experience the beautiful view of Shoshone Lake with the Teton Mountains as a backdrop on the horizon. From the parking area, the new road followed the older road until leaving the old alignment and headed to Dry Creek continuing in a southeasterly direction "along the west slopes of Dry Creek and DeLacy Creek basins to the rim of the Continental Divide then the descent into the West Thumb. As the road descends on a combination of tangent and very light curves, the mountains to the east become visible. As the road passes through a triple compound curve to the right, one could see

Yellowstone Lake just before reaching West Thumb. This view was intended to take in not just Yellowstone Lake, but the lake's islands and the Absaroka Range. It was during this approximate time that the steel Herron Creek bridge was removed and culvert work was done at DeLacy Creek. Log guardrails were constructed on both segments. At one point on the road the landscape architects had a hand-placed embankment tree well put around a Lodge pole pine tree just on the edge of the road.[99]

The grading project continued from 1935 to 1938, with contractors under the supervision of the Public Roads Administration completing the job. Combined with the final costs on the surfacing which was completed in July, 1941, the total for the 17.083 miles was $359,949.75 or approximately $21,000 per mile. At its completion, the engineers recommended centerline striping over the entire 17 miles plus road with double-line striping for curves. The engineers felt that the maintenance work would be reduced if the gutters were paved and other roadside measures taken. The engineers felt that "No unusual or difficult engineering problems were encountered . . . ."[100]

In 1944 the road project was considered 67% finished with some miscellaneous minor work and the bituminous surfacing yet to be completed. By October 1947 the major construction project was completed. The road, in 1947, was considered the heaviest traveled in the park carrying between 3100 and 3800 vehicles per day during July and August.

By 1945, seeding of the roadsides had been completed, but the planting of trees, as specified in the contract, had not been done. The contract called for an unspecified number of 2-year old pine and fir seedling stock trees and additional number of trees up to 8 feet in height. The National Park Service felt that some natural reseeding of lodgepole pines had already begun and that any transplanted stock would have to come from within the Park.[101]

In 1947, work on completing the surfacing of the road continued. Using material from the following sites, McLaughlin, Incorporated of Great Falls, Montana, began work on June 15, 1947:

Plant mix aggregate -- Stockpile at Dry Creek pit 4 1/2 miles
east of project.
Cover aggregate ------ Stockpile at Old Faithful-originally
produced from Basalt rock slide 2 1/2 miles east of West Yellowstone
Concrete aggregate --- Sand from pit left of Sta. 342
Sec. 1-C2, Gravel from Yellowstone River at Livingston
Topsoil -------------- Pit on old road 5 1/2 miles east of project.
Liquid Asphaltic ----- Rusky Oil Company refinery, Cody, Wyoming.
C.G.S.M. Pipe -------- Armco pipe from Hardesty Manufacturing
Company, Denver, Colorado

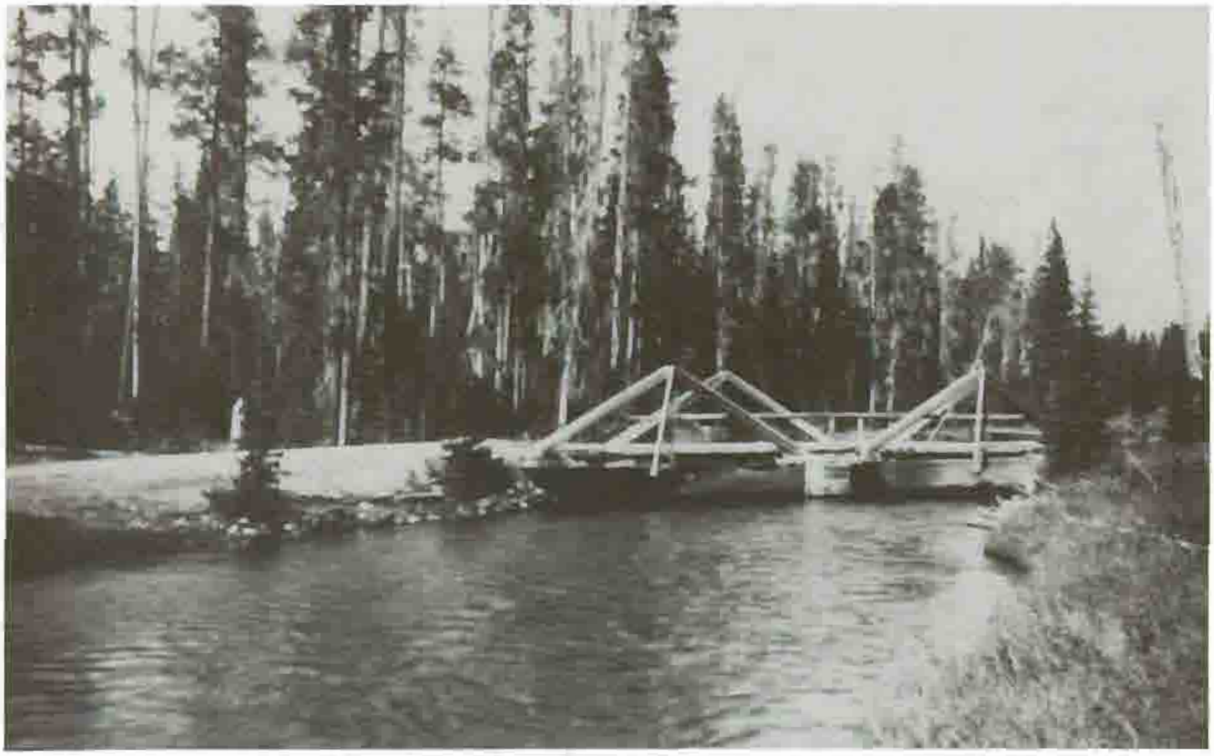
When the project was completed the following materials were stockpiled for use by the maintenance crews

1850 tons plant mix -- at Dry Creek pit
165 tons 2" base course - at Dry Creek pit
700 tons 3/4" cover aggregate - at Dry Creek pit
85 tons 3/8" cover aggregate - along road 6 miles east of
Old Faithful, and at Old Faithful power house.[102]

The new contractor used the same road camp, that was approximately at the midway point of the project, that the previous contractor, Peter Kiewit had used in the early 1940s. Part of this final work was the surfacing and finishing of the parking area on the east side of Isa Lake Bridge. The finished work included a boulder pavement guide marker between the traffic lane and the parking area. The guide marker at the Kepler Cascade parking area, completed at the same time, was a black, 1" chip material.

During the 1950s, 1,000 linear feet of log guardrail was replaced with guide posts.[103] The entire road section was rebuilt in the late 1980s.

Road at Isa Lake, 1912
Courtesy Yellowstone National Park Archives



Firehole River Bridge, Upper Basin to West Thumb Road, 1912
Courtesy Yellowstone National Park Archives

1 to 2 Milepost on Old Faithful to West Thumb Road, 1912
Courtesy Yellowstone National Park Archives

Old Faithful to West Thumb Road, 1989
Courtesy Yellowstone National Park Archives

Firehole River Bridge at Junction of Firehole River and Spring Creek, 1912
Courtesy Yellowstone National Park Archives

Firehole River Bridge Near Spring Creek
Courtesy Yellowstone National Park Archives

Culvert on Old Faithful to West Thumb Road, 1913
Courtesy Yellowstone National Park Archives

Culvert on Old Faithful to West Thumb Road, 1989
Courtesy Yellowstone National Park Archives

Culvert on Old Faithful to West Thumb Road, 1989
Courtesy Yellowstone National Park Archives

Isa Lake Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Isa Lake Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

WEST THUMB TO LAKE JUNCTION

One of the prominent but hidden features of this road section is the geologic feature, the Natural Bridge. In Philetus Norris' survey for possible routes in this area, he found the bridge to be his answer for bypassing the sandy spits, ponds, and numerous gullies near Bridge Bay. The bridge showed evidence of its use as a long-time game trail and Norris felt that as soon as funds became available, he would prepare the bridge for tourist use. In his 1880 report to the secretary of the interior, Norris described the area:

> What is now the bridge was once the brink of a cataract nearly one hundred feet high, over a ledge of peculiarly hard, durable, variegated trachyte upheaval to the vertical across the stream. Directly across this ledge countless ages of erosion have formed first a shallow, trough-like channel; then, or simultaneously with this channel, a vertical orifice, several feet long by one foot wide, between the strata, some two feet from the brink. There is farther upstream . . . one of the finest archways I have ever seen, has about ten feet of stone support for a carriage way above, and about thirty feet of waterway beneath. The chasm is fully spanned by the bridge, which, by measurement, I found to be twenty-nine feet long, and including the above mentioned vertical orifice, ten feet high above the top of the arch, and forty-one feet to the bedrock of the chasm, which, at this point is a rapidly deepening cascade. As the two outside layers of the vertical orifice, as well as the ancient channel, can readily be filled or floored with timbers. . . . This route will be on of the most traveled, and this natural bridge one day be crossed by thousands of pilgrims to this wonderland.[104]

Historical records indicate that the road across the Natural Bridge was not built by Norris and the travelers continued to use the Mary Mountain route to Yellowstone Lake until 1891 when a road followed the shore for much of the way from West Thumb to the lake outlet. In 1895, Captain Anderson completed a road from the Lake Hotel to the Natural Bridge.[105] In 1899, Hiram Chittenden began to plan the construction of 8 miles of road across the peninsula to replace the 12 miles of road built in 1891. The 1891 road that followed the shore had been severely eroded by the lake and had been abandoned and the portion that passed through the wooded section had been constructed over uneven and rough ground. Chittenden believed that this road was "the most monotonous drive in the park"[106] and that the road he planned would reduce the distance by four miles, it would be a better road and that the road would offer the visitors a view of the Natural Bridge. Chittenden estimated that the new road would cost approximately $2,000 per mile or a total of $16,000. In 1902, the new road was "put over the mountain by way of the natural bridge and the knotted woods" and the old section along the shore was abandoned.[107] In 1908, the road was surfaced and ditched and the 1909 report listed the road as in "very good condition."[108]

In 1923, the route from Lake Junction to West Thumb was evaluated again. The National Park Service's engineering division found the:

> existing road between Arnica Creek and Bridge Bay passes over high divide, necessitating a hard climb on one side and an equally difficult descent on the other. This 9 miles section is entirely void of scenic attractions and is a difficult piece of road to maintain because of steep grades and the absence of water for sprinkling. It is proposed to reconstruct the old original road along the shore of the lake, making an attractive drive on practically a water grade, and abandon the present road over the hill. . . . This crew (Cosey's Crew) is now moving to West Thumb to rebuild the log bulkhead along the lake shore. They should also place culverts and make fills in places of the three log bridges between West Thumb and Arnica Creek.[109]

Two years later, this section of road was included as part of the first 3-year improvement program with the intentions for this portion to be completed in 1925. In a letter to the director, Albright described the project:

> I have discussed this project very thoroughly with our engineers and we have reached the conclusion that we can do this work cheaper by force account. If this was a case of constructing an entirely new road, there would be no question but what is ought to be done by contract. However, it is purely a matter of reconstruction. The old original road between Thumb and Lake Hotel followed the Lake shore quite closely as you note from old maps. In 1901 this road was abandoned when the cut-off road was built across the mountains. This cut-off road was apparently built to shorten the distance, but in order to make the change it was necessary to construct a highway with grades running up to 16 percent. The road possesses no scenic qualities whatever, has many sharp turns and narrow places where cars cannot pass and as I have just stated a maximum grade 16 percent. When the old road was abandoned in 1901, it was usable for several years, apparently was used; however, gradually the culverts and bridges which were of wood decayed and for the past 20 years the road has been impassable except to saddle horses and pedestrians. I have been over the road several times and there are many miles that are in excellent condition today; all these stretches of road will require widening and installation of drainage structures which, under our plans, will be galvanized iron culverts of proper sizes. We expect to do away with the two or three bridges by putting in culverts and making fills. In three places the road will be realigned in order to give better scenic effects of Lake Yellowstone, but these stretches are short.[110]

By 1926, the reconstruction of the 11 miles stretch along Yellowstone Lake between Bridge Bay and West Thumb replaced the steep, narrow, and uninteresting section that went over the hill. A 3/4 mile section at Bluff Point had been widened.[111] Major landscape improvements were made to this section as part of the parkwide road cleanup project funded by John D. Rockefeller, Jr.[112]

The road which had been brought to the standard of the other main park roads, with the exception of side drainages, was oiled in 1928, and a new 2 inch oil top placed upon it during 1931. The 1931 oiling expedited the necessity for improvements to the side drainages to lower the water table under the road to avert corrugation from capillary action.[113]

In 1935 a field survey was completed for this road section, however no more major work was done until the Mission 66 period other than replacing 1,500 linear feet of guardrail with guideposts.[114] The Final Construction Report for work on this section during 1960-61 listed the project as:

> The major improvement on this project begins at the Natural Bridge Road, approximately four miles south of Lake Junction, at Station 888, elevation 7753, and extends northerly 3414.82 feet to Station 922, elevation 7759. At Station 894+50, the road crosses the inlet to the Bridge Bay Lagoon on a 237 feet 8 inches three-span steel welded plate girder structure. All of the main improvement are on new alignment except for the last 200' to 300' on the north and where a tie is made to the existing Grand Loop Road. Immediately to the south, the project abuts the Bridge Bay-Arnica Creek project, which is now under construction. To the north of the project is a section extending to Lake Junction, approximately 3 miles long, which is still unimproved to Mission 66 standards.[115]

Other work completed on the project was the construction of spur roads, one extending 2,000 feet to the west end of the Bridge Bay Lagoon and another extending 400 feet to a future lake front parking area for fishermen's use. By the end of 1963, Long Construction Company of Billings, Montana, had completed the work totaling $861,986.23. This section of road had received clearing, grading, an emulsified stabilized base course, a wearing surface of plant mix base course, bituminous and concrete curbs for traffic and water control, and a box culvert on Bridge Creek. The old Gull Point by-pass section was converted to a fishermen access and the construction of the Lake by-pass was begun in late 1969.[116]

View of Natural Bridge, 1989
Courtesy Yellowstone National Park Archives

Bridge Bay
Courtesy Yellowstone National Park Archives

LAKE JUNCTION TO TOWER JUNCTION

The first superintendent of Yellowstone National Park, Nathanial P. Langford, planned the present circuit system (the Grand Loop Road) soon after taking his position in 1872. His idea for a route through this section of the park called for the wagon-road to follow the Yellowstone River northward from its outlet to the Yellowstone Falls, past Mount Washburn and on to Tower Falls. Then Capt. William Jones' 1873 survey for a wagon-road route from Camp Brown in northwestern Wyoming to Fort Ellis, Montana, recommended that the route follow the Upper Yellowstone River, via Yellowstone Lake, to Tower Junction and on to Gardiner, Montana through Mammoth Hot Springs.[117] The Park received no appropriation until 1878, and by that time, the second superintendent, Philetus Norris had to use the first appropriation for the construction of the road south from Mammoth Hot Springs. However, Superintendent Norris, who spent part of 1878 exploring this section of the Park, described the difficulties of finding a suitable route:

> From the falls of Tower Creek I explored its canon and the canon and valley of Antelope Creek above it, the timbered plateau between them, and also that between the latter and the Grand Canyon. I found the latter very elevated, but open, smooth, and grassy, with a fine lake upon its summit, mainly an excellent route, with magnificent scenery along the yawning, sulphur scented and stained canon, for some 6 or 8 miles, and past the ruins of an ancient once loopholed, earth-roofed block-house some 16 by 20 feet in diameter and of unknown origin, to a dense forest at the foot of a bald rocky spur of Mount Washburn. . . . a careful exploration of the first one from its towering front in nearly a foot of newly fallen snow, through a belt of dense pine, fir, and cedars to near the main mountain, resulted in there finding a pass excellent for a bridle-path, and practicable for a wagon-road, at a much lower altitude than the old route. . . . I there, in the gathering twilight, thankfully enjoyed the greeting shout and blazing camp-fire of my men, just safely arrived with the welcome intelligence that they had found a route in all respects preferable to that over the mountain to Cascade Creek. . . . As before stated, portions of any possible route upon either side of the Grand Canyon between the forks and the falls of the Yellowstone will be elevated and expensive especially for a wagon road. That upon the eastern side of the canon is utterly impracticable that within it, unknown but doubtless mainly so, while the two remaining that I explored is the shortest, least elevated, and the easiest of construction, in fact, in all respects so preferable that I have no question of its adoption for all purposes other than a lofty, bridle-path lookout, for which purpose a portion of the old route, a branch from the new one over Mount Washburn or both will be ever desirable. Not only was the route thus found less rugged and difficult than feared, but also the Grand Canyon was shorter and especially its lower portion less deep and yawning than has been considered. Still it is especially from its yellow and crimson geysers to the falls, beautiful and grand beyond conception, a leading wonder of the park, and of the world, every way worthy of a route along or as near as possible to its misty and sulphur-tinted walls.[118]

The next year, 1879, Norris and his crew improved an existing trail from the outlet at Yellowstone Lake to the east canyon of the Gardner River, via the Mud Volcano, Sulphur Mountain, Great Falls and Canyon of the Yellowstone, Mount Washburn, Tower Falls, and the Forks of the Yellowstone. The abundance of snow prevented Norris from completing a trail along the rim of the Grand Canyon of the Yellowstone, which he continued to feel was the "true one" for a wagon-road or bridle-trail to the eastern spurs of Mount Washburn, instead of over it.[119]

In 1880, several bridges were completed in the Park, including ones over Tower Creek, Cascade Creek, and other creeks near the Great Falls of the Yellowstone.[120] The following year, two bridges were built on Alum Creek, two bridges over Sage Creek and two bridges over Hot Spring Creek.[121] These bridge projects were part of Norris' overall project of completing the Mammoth Hot Springs to the West Entrance route via Tower Falls, Yellowstone Lake, the geyser basins, and the forks of the Firehole River. Norris knew that the road between Tower Falls and the mouth of Alum Creek would be costly to build. Together with the abysmal Tower Creek Canyon, the ascent of Mount Washburn via Rowland's Pass, the extensive need of rock-work, culverts, and timber cutting, grading, and bridging along the route, Norris calculated that an appropriation of at least an additional $10,000 to supplement the regular appropriation might cover the cost of the road. The use of this amount would not allow for any other construction projects elsewhere in the park.[122]

Finding the construction of the section along the bank of the Yellowstone River as costly as Norris predicted, his successor, P. H. Conger, completed a three mile section of road along the bank of the Yellowstone River near the falls and canyon. This provided the tourists with safer and more comfortable access to the wonders.[123]

Compared to the road work between Mammoth Hot Springs and Madison Junction, very little work was done on this section after the U. S. Army Corps of Engineers assumed the responsibility for road construction and improvement in 1883. By 1885, $25,000 had been spent on the construction of a road from the Yellowstone Falls via the east trail over Mount Washburn to Yancey's on the Mammoth Hot Springs Road. In 1887, the road from the Yellowstone Falls to Yellowstone Lake was described as "not ordinarily in condition for travel before about the middle of July, the altitude being such as to prevent the early melting of the snow." [124]

During 1888, the engineers recommended that the 14 miles of rough road from Yellowstone Lake along the Yellowstone River to the Grand Canyon of the Yellowstone be improved and completed and a new 20 mile road from the Grand Canyon to Yancey's be built. In the 1889 report to the secretary of war, Major Allen noted the bridges in the park. Among those listed were a 115 feet trestle, with a 14-feet-wide roadway and 30 feet above the low water at the middle point near Yellowstone Falls and a 40 feet, one span, King and Queen post-truss bridge with a trestle approach of 30 feet over Cascade Creek. The height above the low water was 20 feet.[125]

The road from the Grand Canyon of the Yellowstone to West Thumb via Yellowstone Lake was one of Lt. Hiram Chittenden's first projects after he assumed the responsibility of the road improvement and construction in the Park in 1891. By 1892, the 52-mile road from the Grand Canyon to the Upper Geyser Basin via Yellowstone Lake, which opened during the fall of 1891, was in good condition.[126] In 1893, work continued on the road that passed near the Upper Falls and a road near the Grand Canyon at Inspiration Point was opened.[127] The next year the crews completed an arch bridge near the Upper Falls and the following year, 1895, a new road was built from the brink of the Grand Canyon to Inspiration Point, via a point over the Lower Falls, and a new road from just south of Alum Creek around Sulphur Mountain, joining the old road near Antelope Creek.[128]

In 1896, Capt. George Anderson, the Park superintendent, engaged the chief engineer of the Northern Pacific Railway, to develop plans for an iron bridge across the Yellowstone River above the Upper Falls. Determined that the visitors should be able to view the Grand Canyon from the eastern bank, Anderson decided that if the cost were not excessive, he would have an attractive iron bridge built.[129]

Hiram Chittenden returned to Yellowstone in 1899 to resume the responsibility for the road construction projects. In his 1899 report, Chittenden described the road along Yellowstone River:

> This length of 15 miles is one of the best-graded roads in the park, carefully laid out by instrumental survey and equal in this respect to any road in the world; but the material of which it is made is for the most part utterly worthless. The road becomes practically impassable in wet weather and well nigh intolerable from dust in dry weather. It must be surfaced with rock or gravel. The work is urgently needed and should be done during the next season. . . . This road [new road on right of Grand Canyon] is to connect with the bridge and give access to the right bank of Grand Canyon for about 3 miles below bridge. The present road is one of the hardest to maintain in the park. It has steep grades, is very narrow and is held up by loose retaining walls which are constantly caving in. The material is also very bad and cuts all to pieces in wet weather. It is proposed to bridge Cascade Creek farther upstream and carry the road to the hotel at a higher level. This work will greatly relieve the task of maintenance in this vicinity.[130]

During the summer of 1903, two crews constructed approximately 5 miles of well-graded road, a portion of the road was near the Canyon Hotel and the other, near Tower Falls. The work near Tower Falls, which extended into the winter, was of "a very heavy character" as part of the road lies under an overhanging cliff. Chittenden described this segment as a "road of great scenic beauty."[131]

The construction season began late due to remaining snow and soaked ground, leaving few places for desirable camps. However, by the end of the 1904 season, a passable wagon-road on the canyon side was opened to within a mile beyond Dunraven Pass and 2 1/2 miles from the summit of Mount Washburn, but Chittenden urgently requested that more money be programmed for the final completion of the road. He stated in his report for 1904 that "This will be by far the finest road for scenery in the park", but "as it rests on the precipitous sides of the mountain it is important to expend considerably more money to increase its width and erect guard walls at dangerous places." Captain Chittenden feared that the stage companies would not use the single width road until it was completed. Chittenden found this particular project to be very difficult mainly due to the lack of desirable camping places, the high altitude, and the great proportion of work through rock.

One of Chittenden's major achievements, the Yellowstone River Bridge, later known as the Chittenden Bridge, was a steel and concrete bridge completed in 1903 with great difficulty. Chittenden felt that it's prominent location in the park merited the bridge be of an artistic design. For many years the idea of a bridge in this location had been contemplated, but lack of funds prevented its construction. Chittenden spent considerable time on the site selection. Not wanting to introduce an artificial structure at the most desirable and obvious site, the brink of the Upper Falls where the gap narrows to 50 feet, Chittenden chose a 120-feet span between two jutting rocks, about 1/2 mile above the Upper Falls at the rapids. Despite the volcanic rhyolite rock being of inferior quality for construction, Chittenden reported ". . . the fact that it has resisted for an indefinite geological period the action of the river, it must have considerable stability."[132]

Including dangerous rapids below, Chittenden had many obstacles to overcome. One of the most serious was the construction of the framework and related framing. All of the rough material was cut locally, but the finer lumber came from the Pacific Northwest. Using a small dynamo, which was borrowed from the hotel company, connected to the rock-crusher engine and a temporary plant to provide artificial light, the crews were able to complete the concrete work by working around the clock. Due to the position the bridge had in the public's eye and its unique construction difficulties, the owners of the Melan arch patent relinquished all royalty payments. Some of the material for this bridge as well as material for the others built that year came from the American Bridge Company.[133] After considerable controversy, the bridge was removed in 1962.

Before transferring to Mount Rainier National Park at the end of 1905, Major Chittenden summarized the state of the road system in the Park, and made sound recommendations for future work. For this section of the Grand Loop, Major Chittenden recommended:

> Lake Junction to Canyon Junction--Concrete culverts should replace the bridge over Sulphur Creek and the one over a stream to the south of Otter Creek. Eighteen-inch pipe culverts should replace two short bridges on the sidehill grade above the second milepost from the Grand Canyon. The Alum and Otter creek bridges should be rebuilt with shorter spans.
>
> Canyon Junction to Tower Junction--earthen embankments and pipe culverts should replace most of the temporary bridges on this route. In some cases, wooden cribs should support the lower side of the embankments. Chittenden believed that these timber

cribs when filled with rocks would last for twenty or thirty years. The Major suggested a possible change to the road location from about 1 1/4 miles south of Dunraven Pass to the top of the ridge, where the climb from the hotel at Canyon ends. The original intent was to build on a near level line, however, the surveyor who was told to run a constant grade between the two points, became leery after seeing that a swampy area lay in his path. Without permission he ran the line above the swamp resulting in a rise and fall of 70 feet on the line. Chittenden did not feel that the difference was that great but wrote, '. . . nevertheless, the location is not what was intended and not what it ought to be'.[134]

Other recommendations for this section called for:

> The little hill about 5 1/2 miles below the Lake Hotel and another hill a little farther down, where a branch of the Yellowstone flows around an island very close to the road and forms a fine trout pool should each be cut down about 10 feet. The considerable hill in road below the sixth milepost should be cut down to the level for the bench on which the road lies on either side of the hill. A strong timber crib should be built in the water's edge to support the road. . . . The side road from the steel-concrete bridge to Artist Point should be given extra width at the lower end, in order that coaches after unloading at the Point may return far enough to be out of each other's way while waiting for the passengers. All of the down timber in the narrow and picturesque valley near the Point gathered up and burned.[135]

In 1907, a survey for a new lower level road to connect Canyon and Tower Falls was undertaken since the existing road was not passable until the middle of July. The crews replaced railings on the bridge at Canyon Junction, replaced the bridge over Sulphur Creek with a iron culvert 3 feet in diameter and covered with fill 100 feet long and 14 feet deep, replaced the another bridge, 20 feet long, 2 1/2 miles south of Canyon with a culvert and necessary fill, and installed three culverts on the Canyon to Inspiration Point road.[136]

In 1912, the 60 feet Alum Creek bridge, with a sunken center pier was in very bad condition. A pile trestle bridge was suggested as its replacement. A pile trestle bridge consisting of pile bents and wooden stringers was recommended as a replacement for the 32 feet Otter Creek Bridge which was also in very poor condition. In 1913, a rock filled log crib was constructed at the canyon near the Upper Falls to replaced a retaining wall which had collapsed during the spring of 1912.[137]

Prior to the road improvements and construction program being turned over the newly created National Park Service, Capt. John Schultz summarized the condition of the Park's road in 1917. The Tower Falls to Lake Junction segment were described:

> Lake to Canyon road should be routed via Sulphur Mountain from Trout Creek. Sulphur Mountain is very interesting and should be shown to the passengers. This road is not more than a mile or so longer than the present road. There is an old road going this way

which is in very good condition and could be traveled if one or two culverts are replaced. This takes one farther into Hayden Valley, where elk are very often seen.

Bridge across Alum Creek a foot below the road bed and about four inches above the water level.

Road along the Yellowstone at the rapids and upper falls very narrow and dangerous. Heavy guard rail should be placed along there.

Approach to the concrete bridge from the opposite side of Yellowstone River in very bad condition.

Going from Canyon toward Dunraven Pass along the hillside half a mile before reaching the entrance of Dunraven Pass, the road should be graded to slope toward the bank and logs should be imbedded along the outer edge of the entire road from this point for about a mile.

Road over top of Mt. Washburn should be cleared of rocks small and large. It is very difficult for a large car to go up there at the present time and extremely hard on tires, as the road is practically covered for miles at a time with sharp stones which have blown onto it.

The last three miles before reaching Tower Falls the road is very rough and narrow and worn. Two or three severe chuck holes.[138]

The next major project for this road was a widening project over Dunraven Pass and at the Grand Canyon of the Yellowstone and the construction of stone parapets between the Upper Falls and the Canyon Bridge in 1921.[139]

Alum Creek Bridge, 1907
Courtesy Yellowstone National Park Archives

Antler Creek, 1989
Courtesy Yellowstone National Park Archives

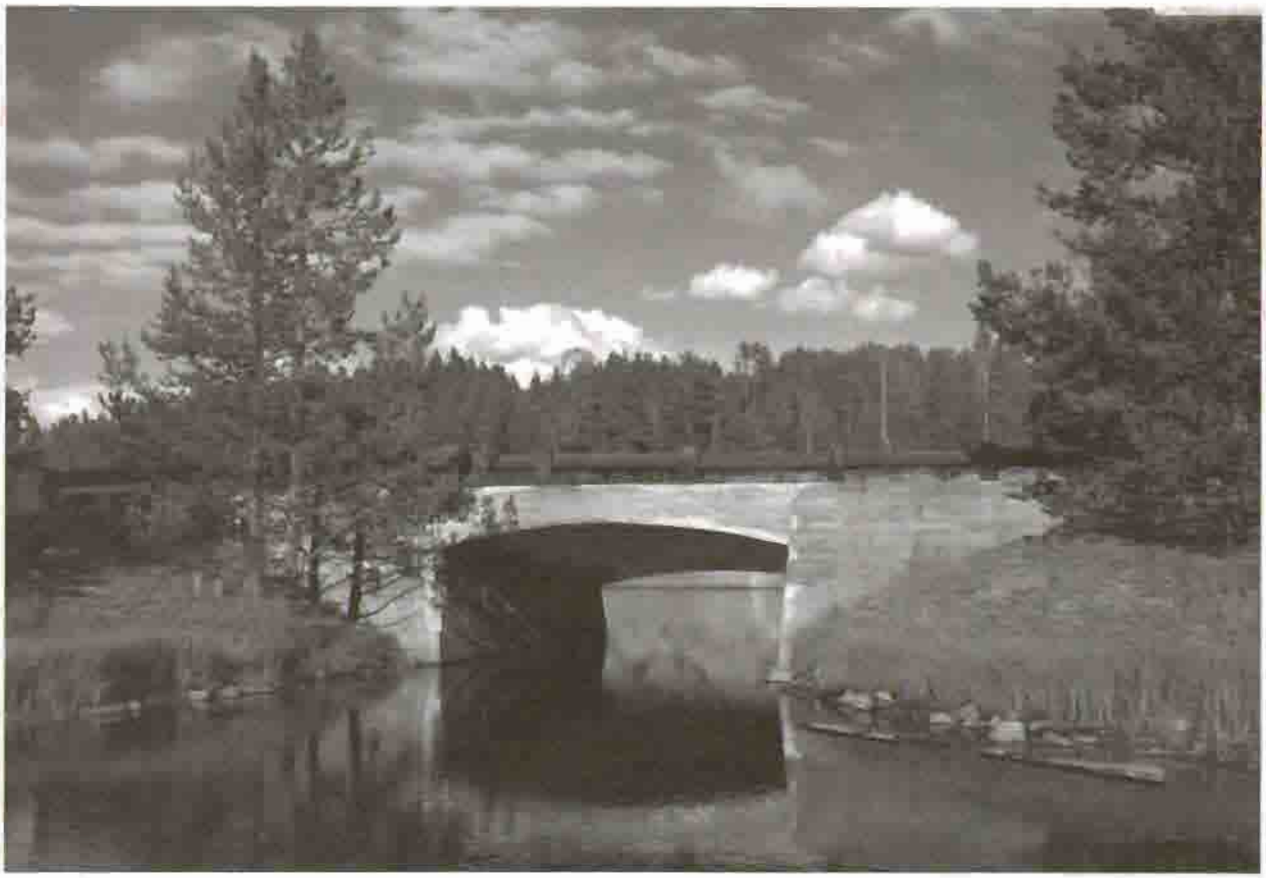
Yellowstone River Bridge Near Otter Creek, 1900
Courtesy Yellowstone National Park Archives

Retaining Wall Near 2 Milepost, Lake to Canyon Road, 1912
Courtesy Yellowstone National Park Archives

Snow Drift Near Trout Creek in Hayden Valley, Superintendent Horace Albright and Park Engineer A. W. Burney, 1923
Courtesy Yellowstone National Park Archives

Telephone Lines Along Lake to Canyon Road, 1925
Courtesy Yellowstone National Park Archives

Otter Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989



Otter Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Wooden Arch Bridge Near Canyon
Courtesy Yellowstone National Park Archives

Road at Overhanging Cliff Near Tower Junction, 1913
Courtesy Yellowstone National Park Archives

Tower Falls Log Bridge, 1932
Courtesy Yellowstone National Park Archives

Tower Junction to Canyon Junction

In the fall of 1926, E. E. Snyder of the Bureau of Public Roads made a reconnaissance survey for road improvements and construction of the Tower Junction to Canyon Junction section of the road, followed by a location survey by A.O. Stinson, of the Bureau of Public Roads, in the fall of 1929. The location survey revealed that the plans to use as much of the existing road between station 230 and 413 was not feasible. The National Park Service wanted to use the alignment of the old road for scenic reasons and to also maintain the Mt. Washburn connection. However, the Park officials agreed with the Bureau that few scenic views would be sacrificed by using a more direct and economical route at a lower elevation. Thus in May, 1930, another survey was completed. In August of 1930. Morrison-Knudsen Company of Boise, Idaho, received the contract and began work by August 9.

The contractor selected three camp sites, Camp "A", which accommodated 100 men, on the left of station 105, Camp "B", which accommodated 40 men, on the right of station 450, and Camp "C", which accommodated 60 men, on the left of station 740. The road camp buildings were constructed of rough pine, with heavy tar paper roofs and thin paper walls.

This construction project extended from a point 1/2 mile south of Tower Falls to a point 1 1/2 miles north of the Grand Canyon rim. The grades from station 0.00 to station 230 ranged from 2 to 7% where it goes over Dunraven Pass, then follows a near level grade along the flank of Mount Washburn, then goes from 4 to 6% grades, crossing over the ridge to Antelope Creek basin, terminating at Antelope Creek at the end of the project, station 839+75. Prior to this improvement, most of the traffic that entered the Park from the south and east entrances turned off at Canyon Junction to avoid the excessive grades and sharp curves on the narrow road. In 1930, the cutoff from Canyon Junction to Norris Junction was the major freight route from Mammoth Hot Springs.

The contract called for the construction of an earth graded 18 feet Standard Type 100 road and the installation of 4' x 4', 5' x 5', 6' x 6', and 8' x 8' concrete box culverts, 24", 30", and 36" corrugated galvanized metal pipe culverts, all of which were to have rustic cement rubble masonry headwalls. The contract also specified the construction of cement rubble masonry and wood guard railing.

A 1-Yd Northwest gas shovel, two 7-yd. LaTourneau Hydraulic scrapers, a scarifier and three 60 Caterpillar tractors began work on September 3. A 60 Caterpillar and cables lowered materials for the 6' x 6' box culvert down the mountainside at station 194+50. Five wood-burning stoves were fired up upon the arrival of cold nights and before closing down for the winter on November 14, the Caterpillars and scrapers had to clear a road through the snow for the men to leave in their trucks and cars. During the winter, a watchman was left at Camp "A" and one at Camp "C".

Work resumed on May 19, 1931. The snow was still 3 to 5 feet deep between stations 230 and 538, but the contractor was able to open ditches and get his equipment prepared. Between stations 833 and 836, the crews built hand-laid rock embankment on a 1 1/4 slope which merged into the newly built cement rubble masonry retaining walls of a 1/4 to 1 slope in such a manner that "it made an exceptionally neat appearing job for which there were many compliments." [140]

Six box culverts were installed on the segment, but no major structures were part of the project. The sand and gravel material for the box culverts came from a pit along the Yellowstone River about 12 miles from the project. The surfacing material for the section between stations 704 and 839 was obtained from a pit on the left of station 725. Other surfacing material came from the cut area between stations 109 and 112.

The grading project was completed ahead of schedule on September 15, 1931, despite 65 of the men being "drafted" by the National Park Service to fight the Heart Lake fire for a month during July and August of 1931.[141]

By the fall of 1933, the project was surfaced and the Tower Creek Bridge had been completed. Between the time of the grading and the final surfacing, this segment had experienced may slides and many of the fill areas had settled from one to two feet. Thus the beginning of the 1933, these problems had to be resolved. It became apparent that much of the segment needed additional drainage. The engineers realized in Yellowstone "the necessity for stage construction and the use of an oil processed crushed rock surface for a considerable period of time before the placing of a permanent surface."[142]

In early October, 1933 and a few days after the surfacing had been completed on the Tower Falls to Canyon Junction segment, a massive slide occurred on the vertical face of Overhanging Cliff near Tower Junction. Due to the instability of the formation and the risk to property and life, the slide removal and restoration was delayed until the next season. Plans had to be drawn to take off part of the cliff during the slide removal. S.J. Groves and Sons Company of Minneapolis, Minnesota, received the contract for the low bid of $11,435.00. Following the removal of the debris, the masonry guardrails and the hand laid rock embankment with masonry toe wall had to be reconstructed.[143] In 1935, more columnar basalt dropped into the ditch under Overhanging Cliff. The Bureau of Public Roads planned for one of their contractors to use the stone, however, the National Park Service wanted it left to protect the underlying gravel in hopes it would prevent further erosion and hence prevent more of the columnar basalt from falling. The National Park Service did allow the contractor to use the loose, talus slides just south of the Overhanging Cliff for use as surfacing aggregate.[144]

Also during 1935, time was spent trying to obliterate and improve old roads, including one between the Chittenden Bridge and Canyon Lodge and one north of Tower Falls and the southside of the first gulch east of Camp Roosevelt.[145]

The next major project on this stretch, planned prior to the beginning of World War II, but was not actually completed until 1949, was a grading and surfacing project in the vicinity of the connecting road leading to the rim of the Grand Canyon of the Yellowstone and the connecting road into Canyon Hotel and parking areas. Shortly thereafter, minor slides and one major slide involving about 4,000 cubic yards covered the new road between 13 and 18. The investigation into the cause of the major slide revealed that:

> numerous indications of previous land movements in the area immediately above and to the left of centerline of the new highway between stations 12 and 60. The main cause of these land movements appeared to be the extremely 'greasy' character of the soil, aggravated by water seeping from a series of ancient pits or 'Buffalo Wallows' above the new highway. It was at one these pits, approximately 175 feet left of the centerline of the new highway, that the major slide apparently originated. Test holes were drilled on a parallel line, approximately 200 ft. left of centerline, and entrapped water was encountered at a depth varying from 5 1/2 to 6 feet below the surface of the natural ground. This trapped water apparently seeped through a stratum of soft material overlying a stratum of hard clay. Corrected measures consisted of excavating a 400-foot-long trench to the depth of the hard material, installing 6-inch vitrified clay pipe and backfilling with previous sand backfill to a depth approximately 6 inches below natural ground surface. This was in turn covered with heavy rock to prevent surface erosion. The excavated material was shaped into a neatly rounded berm below the trench. This construction served the double purpose of removing the trapped water and also of conducting surface water away from cut slopes and roadway and depositing it in a natural drainage channel left of station 19. Excavated material from the slide was spread uniformly over the fill slopes between stations 6+50 and 12+50 of the Cascade Creek fill.[146]

At the completion, a standard 28-feet shoulder-to-shoulder grading was followed with 6 inches of crushed stone base course treated with MC-1 asphaltic prime. Many minor culverts were installed and the timber guardrail was replaced.[147]

In 1957, new guardrail was installed on the Tower Junction to Canyon Junction section and in 1960, the section was resurfaced and repairs were made to the earthquake (1959) damaged sections. More improvements were carried out in 1962 and in 1966, the Calcite Springs overlook and parking area was reconstructed. In 1985, 4,787 linear feet of wooden guardrail was installed between Dunraven Pass and Tower Junction and more repair to the rock wall along the roadside at Calcite Springs was done.[148]

Canyon Junction to Lake Junction

In 1931-32, a Location Survey Report was prepared for the Lake Junction and to Canyon Junction Road. The report found the Lake Junction to be "favorably situated with regard to traffic in either direction on the Grand Loop, but unfavorably located with respect to the development at Lake Lodge and Lake Hotel, . . . Tourists entering the Park via the East Entrance, may pass north of Lake Junction without being aware of the accommodations at these places".[149] The report described the road from Lake Junction northwards to Canyon Junction:

> average twenty feet in width and is partially surfaced and all treated with an oil dust palliative. The alignment and grade is fair throughout a large part of the distance, except for occasional dangerously sharp curves and steep grades which appear without warning other than road signs. The most dangerous part of the road is the so-called Trout Creek Hill descending Elk Antler Creek, a small creek seemingly in the Trout Creek valley. This hill combines a sudden excessive drop in grade, when driving northward on the road, with two sharp reverse curves on a steep slope just above the Yellowstone River.[150]

The report described the recently constructed low type load road up Otter Creek to the newly built Bear Feeding Grounds, however the report supported the reconstruction of the road to a higher standard. It also stated that the branch road over the Chittenden Bridge to Canyon Lodge on the east bank of the Yellowstone River was being improved at the time. The engineers found the beautiful, narrow Chittenden Bridge to be adequate for the present, however signs of disintegration were noted.[151]

The Inspiration Point Road from Canyon Hotel Junction had been improved to a higher standard and was deemed adequate for a number of years. Some of the improvements had included widening.[152]

Another Location Survey Report for possible relocation of portions of the Canyon Junction to Lake Junction section was completed in 1937. The report recognized that the construction of an 800 feet bridge over Cascade Creek would boost the expense of the project. In order to conform with the improved portions of the Grand Loop Road adjacent to this section, the report called for the section to be graded to a 28-feet shoulder to shoulder width with an ultimate surfaced width of 20 feet. Due to the poor subgrade materials along the entire route, subgrade reinforcement for a depth of 6 inches compacted would be necessary. The engineers suggested that this material could come from a quarry on Dunraven Pass.[153]

By 1939, no progress had been made on this section. The Bureau of Mines was consulted in regard to possible gas hazards on proposed bridge foundation sites in the Park. The Cascade Creek Bridge was one of the questionable proposed new bridge sites. The Bureau, who investigated the effect of sulphur compounds on various materials, concluded that ". . . it would not be sound engineering to set concrete piers or steel structures in or on the rhyolite formation investigated by them in the acid or sulphate areas of Yellowstone Park. Evidences points to the ultimate failure of concrete foundations in such locations due to one or all of several causes--subsidence, slides, and chemical action."[154]

All major work in the Park was suspended at the outbreak of World War II, and with the increased construction costs and several other unanticipated factors, the accepted designs did not consider some essentials. Drainage structures in necessary areas were eliminated, the rolled earth gutter section across the embankment at Cascade Creek was not adequate to prevent erosion, and many of the surfaced areas were not satisfactory. During the early 1950s, 2,000 linear feet of guardrail was replaced with guide posts and 5,000 linear feet of guardrail was treated with linseed oil.[155] More of the surfacing for the Grand Loop and the Canyon parking areas was done in 1952, with additional surfacing work being done in 1962. Also in 1962, 3,058 linear feet of guardrail was installed and work on done at Otter Creek. In 1985, 110 linear feet of new roadside concrete gravity wall with stone face veneer and masonry parapets, 35 feet of 6 inch asphalt curb, and 260 feet of 2 inch asphalt walk was put in at the Sulphur Caldron.[156]

Tower Junction to Mammoth Hot Springs

In Superintendent Philetus Norris' first report to the secretary of the interior in 1877, he deemed the construction of a wagon road from Mammoth Hot Springs to Henry's Lake via the Tower Falls, Mount Washburn, Cascades, Yellowstone Falls, the Lake, Firehole Basin, and the Nez Perce route through to the west side a "pressing necessity". Norris felt that this route could connect almost all of the major points of interest and the existing approach road into the Park.[157] The following year, Norris' top priority was the construction of a road from Mammoth Hot Springs to the Lower Geyser Basin however, a small crew did begin work on a new road on the Gardner River toward the Yellowstone Falls and Yellowstone Lake.[158] In 1879, the road crews improved the route from Mammoth Hot Springs to Yellowstone Lake via the Mud Volcano, Sulphur Mountain, the Falls, Mount Washburn, Tower Falls, the Forks of the Yellowstone, and the east canyon of the Gardner River.[159] Evidently not satisfied with the route from Mammoth Hot Springs via the Falls to Yellowstone Lake, Norris spent the last few days of the 1880 season exploring for a new and shorter route from the Cascades of the East Gardner, through a pass in the Stephens Range east of Thompson's Peak, and through another pass of the Washburn Range at the head of the a fork of Cascade Creek, west of Dunraven Pass. Bridges were constructed on several streams including branches of the Gardner River.[160] In 1881, Norris' assistant, C. M. Stephens, supervised the construction of a bridge over the East Fork of the Gardner River, at the head of the middle falls, one bridge at the head of the upper falls of the East Fork of the Gardner River, one bridge over the main Blacktail Deer Creek, and one bridge over Elk Creek near Dry Canyon.[161]

In 1887, the Army, who assumed the responsibility for road construction in 1883, described this section of the road and on to Cooke City over which all supplies for the mining camp are freighted as "rough and hilly country and throughout the greater portion of its extent is unimproved. Some slight grades have been made where it was absolutely necessary and a few crude bridges constructed. The road has been chiefly built and kept in repair by private enterprise and is by far the worst road in the Park, being will nigh impassable a large portion of the year. . . . In my last annual report I recommended the construction of a good road . . . to be continued down the Yellowstone to a junction with the present road to Cooke City, the latter road to be improved from the point of junction to Mammoth Hot Springs." [162]

In 1896, a survey was completed for a new improved route eastward from Mammoth Hot Springs.[163] The following year, the Army planned to build a new road section from Undine Falls on the East Gardner, on the south side of the canyon to Mammoth Hot Springs. The older mail route to Cooke City followed along the north side of the canyon which is "both difficult and dangerous for vehicles." The Army found that this section required "About one mile of the heaviest, most difficult and most expensive work, . . . requiring in one place a stone retaining wall and substantial danger guard . . . the remainder with the exception of the approaches to the proposed bridge across the Middle Gardner embraces no difficulties of importance."[164]

Another survey was made on a section of the Mammoth Hot Springs to Tower Falls road during April and May of 1902. The crew covered a six miles segment from Crescent Hill to a crossing of the Yellowstone and beyond. Captain Chittenden of the Army Corps of Engineers described the work in his report of 1902:

> The old road down into the valley while comparatively direct takes a drop of 1300 feet in about 3 miles and with grades corresponding and it was to eliminate these gradients that the new road was located and constructed. From Crescent Hill the location for the new road was carried well up on the side of the mountain to avoid drifting snow in the winter time. A 6% grade was used for 1,600 feet in gaining the summit. In getting down to the river from the summit at Crescent Hill and the Yellowstone River at the crossing was found to be 1,571 feet, while the distance was 5 miles. Immediately upon crossing the river a 10% grade for about 1300 feet was established in order to reach the high land above the river quickly and to avoid heavy rock work. The construction party consisting of 40 men and 10 teams with camp equipment left the Springs on the 10th of March and Crescent Hill was reached and camp established on the 13th. The instructions to the road crew were to construct a correct but narrow road down the mountain surveyed, the idea being that the road once established on proper lines could be brought up to the standard of the park roads at a later season. Considerable rock was encountered during the construction and to avoid work of this character as much as possible considerable cribbing was put in, 260 linear feet all told. The amount of solid rock handled was 2,176 yards costing $1395. The amount of loose rock handled was 3,643 cubic yards costing $1,092.90. The amount of earth handled was 17,709 cubic yards at

> a cost of $3,187.62. The right of way cleared of timber to an average width of 33 feet. All stumps were grubbed and the refuse either burned or hauled to one side. There was 14,800 linear feet of bridging built, including 80 linear feet of culverts, part of the lumber used was sawed on the ground. The balance was hewed logs and poles. The bridges are 16 feet wide. The cost of the 431 linear feet of bridging was $599.86 at the rate of $1.39 per linear foot. The cost amount given above does not include the subsistence of the men nor the prorated office expenses the party.[165]

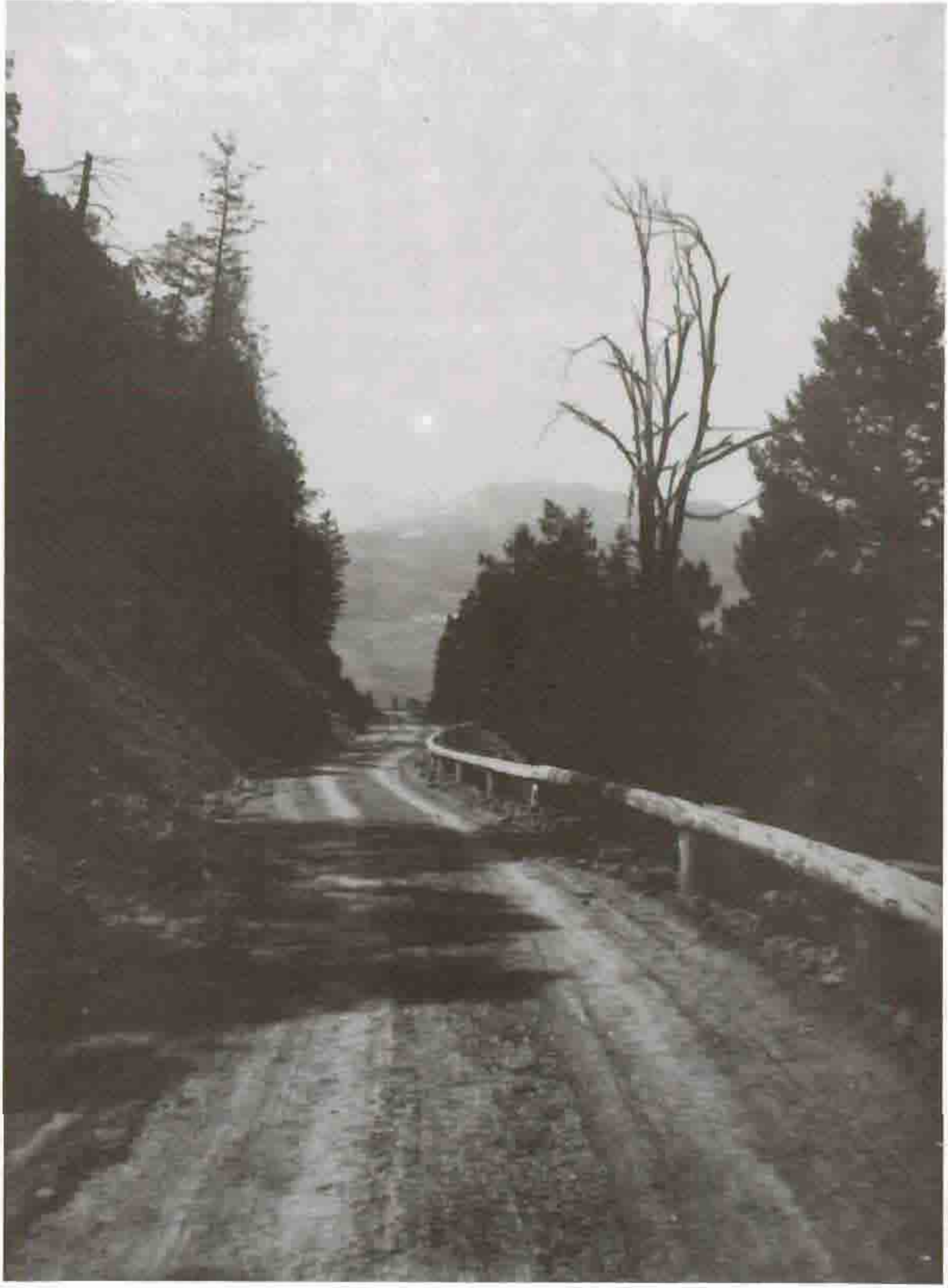
By 1903, grading had almost been completed on the road from Mammoth Hot Springs and three piers of the new high bridge for the Gardner River crossing had been placed. The steel for this bridge and eight others had been delivered from the American Bridge Company.[166] The next year a half mile section of the old road was rebuilt and rerouted to eliminate a dangerous segment near Ox Bow Creek and the Crescent Hill Canyon road was "widened to full width."[167]

The new 5-span steel-arch bridge over the Middle Gardner River, also described as the "new high bridge," was the largest bridge in the Park. Each span was 76 feet and the 2 approaches were each 15 feet, making a total length of 410 feet. The floor was 70 feet above the river surface. The construction of this bridge at this location eliminated nearly 2,000 feet of road and 60 feet rise and fall at this crossing of the river as compared with the old road.[168] During 1905, Captain Chittenden studied the possibility of rerouting at least 1,000 feet of the road near the head of the falls of the East Gardner River and at its crossing. Chittenden questioned the siting of the dangerous section which had been built eight years before. He felt that it probably should have been built on the lower location. Several very large slides during the winter of 1905-1906 destroyed large sections of retaining walls and the resulting condition of the road just reiterated Chittenden's position. The transportation companies also expressed their concern over the safety and condition of the road. The concessionaires felt that even if the retaining walls were rebuilt, the width of the road made it too dangerous for four-line teams to pass safely. Chittenden knew that in order to make the road safe, the road would have to be widened. This would be a costly procedure as a considerable distance of widening would be through solid rock with a depth of 20 feet or more. Thus, Chittenden recommended a new lower route which would be more satisfactory. His successor, Lieutenant Peek, agreed with this recommendation, however lack of funds prevented any action in 1906.[169] Numerous bad slides occurred on the road about 3 1/2 miles east of Mammoth Hot Springs during 1907. The bad conditions in this section of the road reenforced Lieutenant Peek and Major Chittenden's decision to reroute the road to better ground and also to avert a long grade.[170]

A period of inactivity followed for the next few years. Chittenden and Peek's recommendation was tabled, but the "high" bridge was repainted in 1913 as part of a parkwide bridge improvement program.[171] The next major road program affecting this section came after the Bureau of Public Roads assumed road construction responsibility in 1926.[172]

Among the first reconnaissance surveys planned by the National Park Service for the Bureau of Public Roads, was the Mammoth Hot Springs to Tower Junction segment.[173] Location surveys for the road were made in 1930 and in 1932. In 1933, Emergency Conservation Work funds employed local men to work on the Mammoth Hot Springs to Tower Junction project. The men worked well into the winter on this segment nearly completing the grading between Tower Junction and Lava Creek.[174] The grading and surfacing were handled under several contracts with the bituminous surfacing completed in 1936. Attention and study had been given to the "high bridge site" as early as 1929. A well known Landscape Architect Gilmore Clark, of the New York Westchester County Park Development included his assessment of the bridge site in his "Mammoth Plan". Clark agreed with the proponents of a "high bridge" plan as it was suitable from a landscape viewpoint. The Bureau of Public Roads ran differing alternate lines and figured several cost estimates for the bridge location. Finally in 1935, all interested parties mutually agreed that the "high bridge" should be constructed.[175]

During the construction of the "high bridge," the Gardner River Bridge, the road crews obliterated many of the old road scars from the various routes, some dating to the 1880s.[176]



Road Near Undine Falls, 1925
Courtesy Yellowstone National Park Archives

Lava Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Gardner River Bridge, 1917
Courtesy Yellowstone National Park Archives

Gardner River Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Norris Junction to Canyon Junction

During 1885 and 1886, James Blanding, Oscar Swanson and the road overseer, Ed Lamartine began construction of the first road from Norris Geyser Basin to Canyon.[177] In 1887, $12,000 was spent on finishing the 12 mile road, which had only been graded for the first 8 miles east of Norris.[178]

By the end of the century, Army Corps officer Hiram Chittenden considered the reconstruction of this section of road "of pressing importance." He described the road as having:

> three of the worst and most dangerous hills on the entire system. . .. The Virginia Cascade hill is a positive menace to the lives of travelers. Several accidents have occurred here, . . . Stage drivers are often compelled to make passengers alight and walk down the hill. The Devil's Elbow--a very short turn of nearly 80 degrees is another dangerous place. Blanding Hill is a long, difficult, and dangerous ascent which is impossible to maintain in good condition. The long hill descending into the valley of the Yellowstone is composed of wretched material, which so cuts up in wet weather as to be impossible of ascent by loaded wagons. The dense forests on top of the plateau retain the snow so late that it has to be shoveled out every spring at great expense. It is proposed to cut out some of the hills, reduce the grades on others, surface the bad stretches and clear the timber away on the north side of the road so as to let the sun in. . . . It is estimated to cost as much as an entire relocation or about $2,000 per mile for 10 miles.[179]

In 1903, Chittenden relocated the most dangerous section, eliminating the bad hills and the dangerous curve, the Devil's Elbow by carving a road into the face of the cliff. In addition to achieving a safer route, "this road had materially added to the scenic effect of this canyon."[180]

In Hiram Chittenden's assessment of the roads in the Park just prior to his transfer to Mount Rainier National Park, in 1905, he called the Norris Junction to Canyon "the least satisfactory road in the park." Despite correcting the most dangerous curves, eliminating the bad hills, clearing timber for 30 feet on the south side of the road, he recommended:

> To further improve this road and produce the best practicable solution of a very difficult problem, the remaining hills and hollows should be graded out, the roadbed should be built up more deeply with the native material, so that there will be a heavier cushion over the underlying rock, and the entire road should be sprinkled if possible so as to hold the surface from disintegration in extremely dry weather. With these measures taken it is believed that the road can be kept in fair condition. The cost of transporting crushed rock or gravel from any available quarries is too great to be considered for the greater portion of the road.[181]

Road Near Virginia Cascades on Gibbon River, 1900
Courtesy Yellowstone National Park Archives

The 1909 spring snow, which laid very deep on the road, caused significant damage to the road despite the struggle by the road crews to drain it. Two crews ditched and graded the hills and made necessary gravel fills so that at the end of the 1909 fiscal year, the Army engineering officer considered the road to be in "very good condition."[182]

The entire road was graded in 1911 and numerous culverts and one bridge were repaired. Two years later, the retaining wall at Virginia Cascades had been destroyed as a result of severe weather conditions. The crews repaired two bad washout sections and they constructed a dry-rubble guard wall. Part of the road section was resurfaced with local materials.[183]

In 1914, a new route was suggested for the stretch of road from Canyon west to the Virginia Cascades. The road would leave the Canyon area, proceed to Cascade Creek to Grebe Lake, following the Gibbon River into Virginia Canyon. All of the transportation companies operating in the Park endorsed the new route, despite the fact that it would be 6 1/2 miles longer than the old route. Other factors favored the route--nearness to water for sprinkling and traveling along a river is generally more scenic.[184] However, permitting automobiles to enter the Park the following summer prompted the Park to reverse their plans for the new route.

> It is recommended that this work be not done for the reason that automobiles have been authorized to use the park, beginning August 1, 1915, and that undoubtedly automobiles will increase to the point where animal transportation will be the exception and not the rule. Since considerable increases in distance and grades is of little consequence to automobiles and as the road from Mammoth Hot Springs to Canyon by way of Dunraven Pass or Mt. Washburn and Tower Falls is one of the scenic routes in the park, all automobiles will take it, so that within five years the Norris to Grand Canyon will be used only for freighting, which will probably be mostly automobile trucks and occasionally by persons in autos and carriages who desire for one reason or another to make a short cut. Therefore while the construction of this new road would be a vast improvement in grades, ease of maintenance and scenic value, over the present road it would be still only a connecting road between the east and west roads of the main belt line, and used only incidently the moment autos became general.[185]

In 1926, another survey of the road conditions stated that extensive reconstruction was needed on this section. Many places needed widening, many grades needed improvements, and "numerous sags and humps" needed elimination. The report called for the installation of metal culverts, construction of "substantial retaining wall and parapet at Virginia Cascade" and surfacing the road with crushed rock and oil treatment.[186]

This section received more attention in 1934, in the planning of a new junction at Norris. The Park and Bureau officials felt that the road should be moved approximately 15 feet to take "develop the views of the Cascades and the Canyon to the best possible advantage." No precise location was decided and no substantial work was initiated.[187]

Five years later, no major work had been done and the condition of the road became a discussion point at the congressional appropriation hearings. Arthur Demary, associate director of the National Park Service, stated:

> this road section has been purposely kept in a low-class secondary condition and tourist traffic over it discouraged as much as possible. About five years ago we laid down a substantial oil mat in place of the dust oiling treatment which we had been carrying on annually. This improved surface proved a temptation to speeds higher than the grade and alignment could safely carry, hence our justification for allowing a measure of surface deterioration, but it is not felt that this had contributed to the traffic hazard if the restricted speed regulations are observed.[188]

Demaray explained to the congressional committee that it would be a number of years before any major reconstruction or rerouting would be done, but with some additional funding he proposed a betterment program for an interim solution. The temporary measure would include:

> cutting down of several blind vertical curves that have been the contributing cause of the majority of accidents on this road, widening the cross section in cuts too narrow for safe passage, stabilization of the wet grade in the last mile into Canyon Junction, and complete oil treatment of most of the section. The surplus material from excavation of the vertical curves would be used to raise the grade on poorly drained sections and some additional material would have to be hauled in for grade raising and select surfacing material.[189]

America's entry into World War II prevented only the most minimal road construction or maintenance in the Park, thus the reconstruction of this section was delayed again. Only a hot spot was repaired by covering it with a concrete slab during the 1940s.

At the end of the decade, the South Entrance Road and this section were deemed to be in the worst condition of the whole system.[190]

In 1952, a Location Survey Report was completed by the Bureau of Public Roads, but it would be September, 1966, before this road section was completed. The 38-feet wide road had a 1 1/2 inches thick bituminous base covering 30 feet. This project also included the Norris by-pass and road obliteration.[191] The road has been resurfaced in recent years.

ENDNOTES

1. P.W. Norris, *Report Upon the Yellowstone National Park for the Year 1877, to the Secretary of the Interior* (Washington D.C.: Government Printing Office, 1877), 841. P.W. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior* (Washington D.C.: Government Printing Office, 1878), 979.

2. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior*, 979-980.

3. Herman Haupt, *The Yellowstone National Park* (New York: J.M. Stoddart Co., 1883), 49.

4. Norris, 980

5. P.W. Norris, *Report Upon the Yellowstone National Park for the Year 1879, to the Secretary of the Interior*, (Washington D.C.: Government Printing Office, 1879), 7.

6. P.W. Norris, *Annual Report of the Superintendent of Yellowstone National Park for the Year 1880* (Washington D.C.: Government Printing Office, 1881), 13.

7. P.H. Conger, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior for the Year 1882* (Washington D.C.: Government Printing Office, 1882), 5.

8. Conger, *Annual Report of the Superintendent of Yellowstone National Park to the Secretary of the Interior for the Year 1882*, 6.

9. Dan Kingman, "Construction of Roads and Bridges in Yellowstone National Park," quoted in *Annual Report of Capt. Clinton B. Sears, Corps of Engineers, for the fiscal year ending* June 30, 1887.

10. Kingman Report

11. Ibid.

12. Captain Moses Harris, *Annual Report of the Superintendent of Yellowstone National Park for the Year 1888*, 7 and 12.

13. Maj. Charles J. Allen, *Annual Report of Maj. Charles J. Allen, Corps of Engineers, Officer in Charge, for the Fiscal Year Ending June 30. 1889* (Washington D.C.: Government Printing Office, 1889), 2863.

14. Captain F. Q. Boutelle, *Report of the Superintendent of the Yellowstone National Park* (Washington D.C.: Government Printing Office, 1890), 8 and 9.

15. Capt. George Anderson, *Report of the Acting Superintendent of Yellowstone National Park to the Secretary of the Interior, 1895* (Washington D.C.: Government Printing Office, 1895), 8.

16. Hiram Chittenden, "Roads in Yellowstone National Park," Senate Document 226, 50th Congress, 1st Session. Acting Secretary of War Transmitting in Response to Resolution of the Senate of March 12, 1900.

17. Hiram Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Road from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming and Erection of Monument to Sergeant Charles Floyd in the Charge of Hiram Chittenden,*

Captain, Corps of Engineers, Appendixes FFF, III, and JJJ *of the Annual Report of the Chief of Engineers for 1901* (Washington D.C.: Government Printing Office, 1901), 3780.

18. Hiram Chittenden and John Mills, *Annual Report Upon the Construction, Repair and Maintenance of Roads and Bridges In the Yellowstone National Park and the Road Into Mount Rainier National Park; Survey for Wagon Road From Valdes to Fort Egbert, Alaska, and Survey for Military Trail Between Yukon River and Coldfoot, Alaska,* Appendixes FFF and KKK *of the Annual Report of the Chief of Engineers for 1904* (Washington D.C.: Government Printing Office, 1904), 4174. Hiram Chittenden and John Mills, *Annual Report Upon the Construction, Repair and Maintenance of Roads and Bridges In the Yellowstone National Park and the Road Into Mount Rainier National Park* (Washington D.C.: Government Printing Office, 1905), 2811.

19. For a detailed history of the Golden Gate Viaduct, see HAER NO. WY-46 report, Yellowstone National Park.

20. Hiram Chittenden and John Mills, *Annual Reports Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and the Road Into Mount Rainier National Park,* Appendixes FFF and KKK *of the Annual Report of the Chief of Engineers for* 1905, 2820.

21. Ernest Peek, *Annual Report of the Chief of Engineers for 1907* (Washington D.C.: Government Printing Office, 1907), 2821, 2466 and 2467.

22. Ernest Peek, *Annual Report of the Chief of Engineers for 1908* (Washington D. C.: Government Printing Office, 1908), 2547.

23. Wildurr Willing, "Report of Inspection of Bridges in the Yellowstone National Park, made September 24, 25, and 26, 1909, with recommendations by request of Capt. Wildurr Willing, Corps of Engineers, U.S.A."

24. 1st Lt. Wildurr Willing and Maj. C. W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park,"* Appendixes GGG and HHH for 1909 (Washington D.C.: Government Printing Office, 1909), 2511.

25. Capt. C. H. Knight, Maj. J. B. Cavanaugh, and Maj. Jay J. Morrow, *Report of the Chief of Engineers for 1912* (Washington D.C.: Government Printing Office, 1912), 3031.

26. Capt. C. H. Knight to Chief Engineer, Army Corps of Engineers, 12 February 1912. Yellowstone National Park Archives, Yellowstone National Park.

27. Capt. C. H. Knight to Chief Engineer, Army Corps of Engineers, 19 February 1912. Yellowstone National Park Archives, Yellowstone National Park.

28. Maj. Amos Fries, "Report to the Chief of Engineers for October, 1914."

29. Maj. Amos A.Fries and Maj. Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; and Report Upon Crater Lake National Park,* Appendixes EEE and FFF (Washington D.C.: Government Printing Office, 1914), 3393-3395.

30. Chester Lindsley , Office of Superintendent, Yellowstone National Park to Capt. John Schultz, 9 October 1917. Yellowstone National Park Archives, Yellowstone National Park.

31. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and Travel Season 1921* (Washington D.C.: Government Printing Office, 1921), 169.

32. C. A. Lord, "Final Report Mammoth-Norris Road-Project #502."

33. Lord, "Final Report Mammoth-Norris Road-Project #502."

34. Unnamed document, but probably a Location Survey report for the Obsidian Cliff to Mammoth Hot Springs road section. Yellowstone National Park, File No. 332.1 Firehole-Cascade-Old Faithful Section 1-C-2. Yellowstone National Park Archives.

35. C.F. Capes, "Final Construction Report Project 1-A1, A3, Grading Mammoth Terraces - Obsidian Cliff Section, Grand Loop National Park Highway Yellowstone National Park Wyoming, June 19. 1933."

36. The following quoted material is from the Landscape Architect report of July, 1932 by Kenneth C. McCarter and Frank Mattson:

> July 6 - Permission was given to Mr. Anderson of the B.P.R.to use the material which had been stocked-piled near Sta. 70 for top dressing on the elimination of old borrow pits.
>
> Mr. McCarter located a borrow pit at sta. 300. Many borrow sites have been prospected on this job which have proved worthless, in one instance the material which had been borrowed had the tendency to air-slake after being put into the road. Much boulders or "nigger-heads" generally develop after the pits are opened which cannot be used in the base of the shallow fill across Swan Lake Flats. The relocation between sta. 300 and 315 to avoid the double crossing of the Mammoth water supply concrete pipe line was recommended by McCarter. The proposed location turns slightly to the left, following closer to the natural fringe of trees and then reverses with easy curvature to the right and ties in with the main line again. This change obliterates much of the old road by following the present road more closely which is very desirable from the landscaping viewpoint.
>
> July 10 - Mr. Toll phoned Mr. Wiggins regarding the waterline at the borrow pit at sta. 370. Mr. Wiggins believed the pipe to be about 16 ft. underground. If 2 ft. of covering were left over the pipe it would be satisfactory to Mr. Wiggins to excavate the dike. July 12 - Mr. Anderson, B.P.R., resident engineer, asked for a relocation of borrow. The pit which had been prospected behind the old barns at the south end of Swan Lake Flats proved inadequate and of undesirable material.
>
> July 13 - Mr. Wiggins does not favor the suggestion of cutting the water pipe line at the borrow pit at sta. 370 and use the marsh as a channel from there to Rustic Falls. His reasons were that the water would spread over the marsh and form a wallow for elk. Channeling would probably cause ice problems and flooding.
>
> July 14 - The removal of the dike which supports the water pipe is still the controlling factor in the obliteration of this most unsightly borrow pit. It was decided that further borrow outside of the dike could be obtained with the prospect of future replacement of the pipe line. When the pipe line is replaced it can be located in the toe of slope of the road and the dike can be smoothed out. This will permit the blending of the slopes of the borrow pit into the side slopes of the marsh. The dike will then be the only unnatural feature remaining. . . . McCarter recommends that when the entire line is replaced that the line through the dike also be replaced for emergency purposes and that the dike be eliminated. The pipe line proved to be about two feet below the surface so the dike could not be partially excavated. It will be rounded off and sloped to fit the new conditions as well as possible.

37. Capes, "Final Construction Report (1931-32) Project 1-A 1, A-3, Grading. Mammoth Terraces-Obsidian Cliff, Grand Loop Project Yellowstone National Park Wyoming."

38. Kenneth McCarter and Frank Mattson, Landscape Architects Reports, July, 1932.

39. McCarter and Mattson, Landscape Architect Reports for July, 1932.

40. C.A. Lord, "Final Report Mammoth Terraces-Obsidian Cliff, Post Construction Project #558, 1933."

41. E.O. Anderson, "Final Construction Report, 1933-1934 on Project NE 1-A1, A3, A4, A5 Surfacing, Grand Loop Highway, Yellowstone National Park, Wyoming, January 11, 1935." Equipment used on this contract included the following:

1 - 1/2 yard Speeder gas shovel
1 - 1 1/4 yard Bucyrus-Erie gas shovel
1 - 60 Caterpillar tractor with bulldozer
1 - 30 Caterpillar tractor with fresno
9 - 3 1/2 ton dump trucks
1 - 3/4 ton truck
1 - 1/2 ton truck
2 - 310 compressors
2 - 15 x 36 Universal crushers
1 - 95 HP Allis-Chalmers engine
1 - 120 HP Waukesha engine
1 - Pioneer-Duplex crushing, screening, and loading plant
1 - 10 ton roller
1 - Auto patrols (10 foot blade)
1 - Tool car.

42. Anderson, "Final Construction Report, 1933-34 on Project NR 1-A1, A3, A4, As Surfacing, Grand Loop Highway, Yellowstone National Park, Wyoming, January 11, 1935."

43. E. O. Anderson, "Final Construction Report, 1935 on Project NR 1-A1, A3, A4, A5, Oiling , 1-A2, B, and C-1, Seal Goat, Grand Loop Highway, Yellowstone National Park, Wyoming, January 11, 1936." This project required the following major equipment:

1 Pioneer Duplex crushing and screening plant
1 Madson oil mixing plant
1 Diesel Caterpillar tractor
1 Diesel Auto Patrol (12' blade)
6 3-ton dump trucks
1 3-ton hoist truck
3 1 1/2-ton dump trucks
1 1 1/2-ton flat bed truck
1 welder truck
1 roller
1 distributor
1 sweeper
1 stone chip spreader

44. Anderson, "Final Construction Report, 1935 on Project NR 1-A1, A3, A5, Oiling, !-A2, B and C-1, Seal Coat, Grand Loop Highway, Yellowstone National Park, Wyoming, January 11, 1936." The bituminous surfacing had a thickness of 3 inches loose and a width of 22 feet. It was constructed on 5 inches loose thickness of crushed rock base course which had been placed the previous year. A prime coat of Liquid Asphaltic Road Material, type MC-1 was used on the base course where needed, however most of it was in excellent condition, thus little priming was

needed. Crushed gravel consisting of fairly hard rhyolite boulders and pebbles with sand filter and a small amount of dirt was the aggregate. The bituminous material, which consisted of liquid Asphaltic Road Material, type NC-4 was added into the mixture at a temperature of 175 degrees, then transported to the road at a temperature of 210 degrees or more. The material set up very quickly. A seal coat, which consisted of Liquid Asphaltic Road Material, type RC-1, was then covered with a cover of stone chips which had been crushed to a maximum size of 5/8 inch from basalt slide rock. The color to the chips was a blue gray which lightened the road surface for night driving.

45. E. O. Anderson, "Final Construction Report (1948-49) on Grand Loop National Highway-Wyoming, Project 1-A. B. C-1 Reseal, Yellowstone National Park, State of Wyoming, February 8, 1950."

46. "Final Construction Report (1965-1966) on Yellowstone National Park Project 1-A(1), B(1) and 12(1), Grading and Bituminous Stabilized Base, Grand Loop and Norris-Canyon Cutoff, Yellowstone National Park, State of Wyoming." This report gives very good details of the types materials and equipment used on this project.

47. Robert R. O'Brien, "The Yellowstone National Park Road System: Past, Present, and Future," (Ph.D. Diss. University of Washington, 1964).

48. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior*,979.

49. Norris, *Report of the Superintendent of the Yellowstone National Park for the Year 1880, 13.*

50. John Hartman to Secretary of the Interior Teller, 20 August 1883. Yellowstone National Park Archives, Yellowstone National Park.

51. Kingman Report 1885

52. Kingman report, 1885.

53. Ibid.

54. *Report of the Secretary of War Being Part of The Messages and Documents Communicated to the Houses of Congress and The Beginning of The First Session of the Fiftieth Congress in 4 Volumes, Volume II - in four parts, Part IV* (Washington D.C.: Government Printing Office, 1889), *Annual Report of Major Charles J. Allen, Corps of Engineers, Officer in Charge, for the Fiscal Year Ending June 30, 1889, 2863.*

55. George S. Anderson, *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1892* (Washington D.C.: Government Printing Office, 1892), 3 and 5.

56. Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior for 1895, 8.*

57. Colonel S.B.M. Young, 3rd Cavalry, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1897* (Washington D.C.: Government Printing Office, 1897), 4.

58. Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sergeant Charles Floyd in the Charge of Hiram Chittenden, Captain, Corps of Engineers,* Appendixes FFF, KKK, and JJJ *of the Annual Report of the Chief of Engineers for 1903* (Washington, D.C: Government Printing Office, 1903), 2893.

59. Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park in the Charge of Hiram Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for 1905, 2810. Chittenden, Annual Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and the Roads Into Mount Rainier National Park,* Appendixes GGG and JJJ *of the Annual Report of the Chief Engineers for 1906* (Washington D.C.: Government Printing Office, 1906), 2255.

60. Peek, *Annual Report of the Chief of Engineers for 1907, 2,463.*

61. Peek, *Annual Report of the Chief of Engineers for* 1908, 2,544 and 2,545.

62. Willing, "Report of Inspection of Bridges in the Yellowstone National Park, made September 24, 25, and 26, 1909, with recommendations by request of Capt. Wildurr Willing, Corps of Engineers, U.S.A."

63. Capt. C. H. Knight, Maj. J.B. Cavanaugh and Maj. Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Roads Into Mount Rainier National Park,* Appendixes HHH and III, 3,031-3,032.

Horace Albright to Henry Jacoby, 30 October 1923. Yellowstone National Park Archives, Yellowstone National Park.

64. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919* (Washington D.C.: Government Printing Office, 1919), 25-26.

65. Lt. Col. Amos Fries and Col. George Winn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park* (Washington D.C.: Government Printing Office, 1917), 3748-3749.

66. Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921, 167.*

67. Stephen Mather, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1925* (Washington D.C.: Government Printing Office 1925), 78-79.

68. Stephen Mather, *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1926* (Washington D.C.: Government Printing Office, 1926), 56.

69. A.W. Burney, Assistant Engineer, "Report of Work Done on Projects No. 6 and 9, Yellowstone National Park, July 2, 1925." C.A. Lord, "Madison Junction-Old Faithful Project 1C (503) (525.1), 1930." Yellowstone National Park Archives, Box, Construction of Roads, FY 1926.

70. Lord, "Madison Junction-Old Faithful Project 1C (503) (525.1), 1930."

71. C.A. Lord, "Final Report Project #525.9, Loop Betterment, (Old Faithful 5 Milepost)."

72. C.A. Lord, "Final Report Project #530, Madison-Norris Oiling, Cleanup, Bridge Removal 1930."

73. "Reconnaissance Report-1931, Route 1. Firehole Cascades-Old Faithful Project, Section 1-C of the Grand Loop, Yellowstone National Park, Wyoming."

74. C.F. Capes, "Location Survey Report, 1932 on Firehole Cascades - Old Faithful Section of Grand Loop Highway, Yellowstone National Park, Wyoming, April 14, 1934." F.C. Ammann, "Final Construction Report (1934-35) Project N.R. 1-C-2 Grading of the Grand Loop Highway, Yellowstone National Park, Wyoming, April 18, 1936."

75. Yellowstone National Park official (unnamed) to Mr. Thomas Vint, Branch of Plans and Design, National Park Service, 18 September 1935. Yellowstone National Park Archives, Yellowstone National Park.

76. Ibid.

77. T.A. Smith, "Preliminary Location Survey Report on Grand Loop Highway Firehole River Cascades to Madison Junction 1-C1 Relocation Yellowstone National Park, Wyoming, 1938, January 16, 1939."

78. "Annual Report of the Superintendent of Yellowstone National Park for 1949."

79. Fixed Property Records for Yellowstone National Park, Rocky Mountain Regional Office, National Park Service, Denver, Colorado.

80. W. A. Jones, *Construction and Improvements of Roads and Bridges in the Yellowstone National Park, in Appendix of the Annual Report of the Chief of Engineers for 1891* (Washington D.C.: Government Printing Office, 1891) 3932.

81. Aubrey Haines, *The Yellowstone Story,* (Boulder: Colorado Associated Press, 1977), Vol. II. 218.

82. Robert R. O'Brien, *"The Yellowstone National Park Road System: Past, Present, and Future,"* (Ph.D Diss., University of Washington, Seattle, Washington, 1964), 106.

83. Willing, "Report of Inspection of Bridges in the Yellowstone National Park, Made September 24, 25, and 26th, 1909, With Recommendations by Request of Capt. Wildurr Willing, Corps of Engineers, U. S. A."

84. Capt. Ernest Peek and Maj. Hiram Chittenden, *Report on the Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park* (Washington D. C.: Government Printing Office, 1908), 2544

85. Willing.

86. Capt. C. H. Knight, Maj. J. B. Cavanaugh and Maj. Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park. Report Upon the Road Into Mount Rainier National Park. Report Upon Crater Lake National Park (Washington D. C.: Government Printing Office, 1913), 3268.*

87. "Summary of Necessary Improvements ending June 30, 1912."

88. "Report Upon Operations for May 1915," 9.

89. "Tentative Suggestions for Improvements to Park Roads, 1926."

90. A. C. Stinson, "Location Survey Report, 1934 on the Old Faithful-West Thumb Road Section D, Route 1, Grand Loop Highway. Yellowstone National Park Wyoming." United States Department of Agriculture, Bureau of Public Roads District No. 3, October 4, 1935. p. 2. File Box: Roads. Grand Loop 1931-42. 1971. Yellowstone National Park Archives, Yellowstone National Park.

91. Stinson, 5.

92. Ibid, 9-10.

93. Letter to Mr. Baggley, acting superintendent, Yellowstone National Park from Mr. W. M. Nichols, President Yellowstone Park Company, 28 August 1934. I have found no evidence that this section of road was regularly used after the completion of the new road.

94. Ibid, 15.

95. Ibid, 15.

96. Ibid, 27-28.

97. Memorandum to Mr. C. F. Capes, Bureau of Public Roads from Sanford Hill, Resident Landscape Architect, 2 June 1936. Yellowstone National Park Archives, Yellowstone National Park.

98. Capes, "Highway Improvements in Yellowstone National Park."

99. F. E. Ammann, "Final Construction Report (1936-37-38) Grand Loop, Yellowstone National Park Project 1-D2 Grading Yellowstone National Park," Public Roads Administration, D-3 Federal Works Agency. Office of Maintenance Division, Yellowstone National Park.

100. C. F. Capes, "Final Construction Report (1939-40) on Grand Loop National Park Highway, Project 1-D2, E2, pt. C2, Bit. Surfacing Yellowstone National Park, State of Wyoming." Office of Maintenance Division. Yellowstone National Park.

101. Letter to B. W. Matteson, District Engineer, Public Roads Administration from Lawrence Merriam, Regional Director, Region Two, National Park Service, 5 June 1945. Yellowstone National Park Archives, Yellowstone National Park.

102. E. H. Cowan, "Final Construction Report (1947) on Grand Loop National Park Highway Project 1-D1, D3 Bit. Surfacing Yellowstone National Park, Wyoming." Office of Maintenance Division. Yellowstone National Park.

103. Superintendent Yellowstone National Park to Regional Director, Region 2, National Park Service. 17 March 1950. National Archives and Records Center, Denver, Colorado. Yellowstone File Box: 25. Folder:630-01 Major Road Programs.

104. Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880,* 23.

105. Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1895, 8.*

106. Hiram Chittenden, "Roads in Yellowstone National Park," - Senate, 226, 50th Congress, 1st Session. Acting Secretary of War Transmitting in Response to Resolution of the Senate of March 12, 1900, Letter from Chief of Engineers, U.S.A., Together with the Copies of Originals of All Reports Relating to the Present Condition and

Aggregate Plans for the Development of the System of Roads in the Yellowstone National Park. Horace Albright, Superintendent, Yellowstone National Park, to T. E. Hofer, 16 October 1926. Yellowstone National Park Archives, Yellowstone National Park.

107. Albright to Hofer, 16 October 1926. Yellowstone National Park Archives, Yellowstone National Park.

108. Willing and Kurz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park,* Appendixes GGG and HHH, 2511.

109. "Report of Proposed Projects for 1923." This report was attached to a memorandum from Assistant Park Engineer Burney to Superintendent Horace Albright, 21 August 1923. Yellowstone National Park Archives, Yellowstone National Park.

110. Horace Albright, Superintendent of Yellowstone National Park, to Stephen Mather, Director of the National Park Service, 2 June 1925. Yellowstone National Park Archives, Yellowstone National Park.

111. Arno B. Cammerer to Thomas MacDonald, 11 September 1926. File Box: - Roads, General Correspondence 1919-1926, File - Roads, Correspondence May-December 1926, Yellowstone National Park Archives, Yellowstone National Park.

112. Horace Albright, "Report on Roadside Cleanup, Yellowstone National Park 1927," Record Group III 2 E, Box 83, File 774, Rockefeller Archive Center, Tarrytown, New York.

113. Guy Edwards, Assistant Superintendent, Yellowstone National Park, to Horace Albright, Director, National Park Service, 10 November, 1932. Yellowstone National Park Archives, Yellowstone National Park.

114. Superintendent Yellowstone National Park to Regional Director, National Park Service. 17 March 1950. National Archives and Records Center, Denver, Colorado. Yellowstone File Box 25, Folder 630-01. Major Road Programs.

115. "Final Construction Report (1960-61) Project 1-E, Bridge and Approaches, Grand Loop, Yellowstone National Park, Wyoming." Office of Maintenance Division. Yellowstone National Park.

116. "Narrative Statement for Completion Report for Route 12-E Arnica Creek-Bridge Bay Road, Contract No. 14-10-0100-1242 Work Order No. R-39-Yel-BPR." Arnica Creek - Bridge Bay 1E Folder. Yellowstone National Park Archives, Yellowstone National Park. Jack K. Anderson, Superintendent Yellowstone National Park to John Amerman, Yellowstone National Park Company. 11 June 1969. Yellowstone National Park Archives, Yellowstone National Park.

117. William A. Jones, *Report Upon the Reconnaissance of Northwestern Wyoming Including Yellowstone National Park Made In the Summer of 1873* (Washington D.C.: Government Printing Office, 1875), 58.

118. Norris, *Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior,* 983-984.

119. Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1879, to the Secretary of the Interior.*

120. Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880, 38.*

121. Norris, *Fifth Report of the Superintendent of the Yellowstone National Park, September, 1881, 69-70.*

122. Norris, *Fifth Annual Report of the Superintendent of the Yellowstone National Park, September,* 1881.

123. Conger, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior for the Year 1882, 6.*

124. *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Two Houses of Congress in Four Volumes* (Washington D.C.: Government Printing Office, 1887), Appendix AAA, *Annual Report of Capt. Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887,* 3138-3139.

125. *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Houses of Congress and The Beginning of The First Session of The Fiftieth Congress in 4 Volumes, Volume II - in four parts, Part IV, Annual Report of Maj. Charles J. Allen, Corps of Engineers, Officer in Charge, for the Fiscal Year Ending June 30, 1889,* 2857-2859.

126. George Anderson, *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1892, 3 and 5.*

127. Anderson, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1893* (Washington D.C.: Government Printing Office, 1893), 8.

128. Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1895, 8.*

129. Anderson, *Report of the Officer in Charge of Construction and Maintenance of Roads, Etc., in the Yellowstone National Park to the Secretary of War, 1896* (Washington D.C.: Government Printing Office, 1896), 5.

130. Hiram Chittenden, "Roads In Yellowstone National Park."

131. Hiram Chittenden, *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers for 1903* , 2891.

132. "Technical Report Upon the Improvement of Yellowstone National Park, 1904," 58. This document does not list an author, however, it is presumed to have been written by Captain Hiram Chittenden.

133. "Technical Report . . .1904," 58.

134. Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for 1905,* 2818.

135. Ibid, 2818.

136. Ernest Peek, *Annual Report of the Chief of Engineers for 1907,* 2664.

137. Capt. C. H. Knight, Maj. J. B. Cavanaugh, and Maj. Jerry J. Morrow, *Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park,* Appendixes EEE and FFF, 3269.

138. Chester Lindsley from Capt. John Schultz, 17 October, 1917. Yellowstone National Park Archives, Yellowstone National Park.

139. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921*, 167.

140. "Final Construction Report, 1930-1931, on Canyon Junction-Tower Junction Project, 1-G-1 Grading, Yellowstone National Park, State of Wyoming, January 30, 1932."

141. Ibid.

142. F.A. Kittredge, Chief Engineer, National Park Service, to Director of the National Park Service, September 5, 1933. File 332.1, Box-Road Construction, 1933, Yellowstone National Park Archives, Yellowstone National Park.

143. H.E. Dalton, "Final Construction Report (1934) on Grand Loop, Slide Removal Section NR 1-G2, Yellowstone National Park, Wyoming, March 4, 1935."

144. C.F. Capes to Mr. Russell, Bureau of Public Roads, August 31, 1935. Yellowstone National Park Archives, Yellowstone National Park.

145. Roger Toll, Superintendent of Yellowstone National Park to C.F. Capes, Bureau of Public Roads, 23 October, 1935. Memorandum from Roger Toll to Mr. Emmert, Yellowstone National Park, 3 September, 1935. Yellowstone National Park Archives, Yellowstone National Park.

146. James Smith, "Final Construction Report (1948-49) on Grand Loop National Park Highway Project 1-F3, G4 Grading and Base Surfacing Yellowstone National Park, State of Wyoming, March 2, 1950." This report contains good information on the disturbance to the ground in Canyon Junction area. It contains copies of good photographs of the land fill near Cascade Creek. Office of Maintenance Division. Yellowstone National Park.

147. Ibid.

148. Real Property Record for Tower Creek Bridge, Yellowstone National Park, National Park Service, Rocky Mountain Regional Office, Denver, Colorado.

149. A.O. Stinson, "Location Survey Report 1931-32 on Bridge Bay - Inspiration Point Survey including Section F and parts of Sections E and G of Route I, the Grand Loop System, and a part of Section D of Route 5, the East Entrance Highway, Yellowstone National Park, Wyoming, January 20, 1934." File Box: Roads. Grand Loop 1931-1942, 1971. Yellowstone National Park Archives. Yellowstone National Park.

150. Ibid. This report contains very good detailed information regarding the condition of this road section, segment by segment.

151. Ibid.

152. Ibid.

153. Robert Bond, "Preliminary Location Survey Report on Relocation of Portions of Sections 1-F, 1-G Grand Loop Highway, Yellowstone National Park, Wyoming 1937, February 26, 1938." File Box: Roads. Grand Loop 1931-1942. 1971. Yellowstone National Park Archives. Yellowstone National Park.

154. Excerpt from Report on "Investigation of Gas Hazards Proposed Bridge Foundation Sites in Yellowstone National Park" by S.H. Ash District Engineer, Bureau of Mines, and W.W. Kessler. 1939. Pg. 79. File Box 40, Yellowstone National Park, Canyon Junction Vicinity - Cascade Creek, Part 2 January 1, 1940 to December 31, 1943. National Archives and Records Center, Denver, Colorado.

155. Memorandum to Regional Director, Region Two, National Park Service, from Superintendent, Yellowstone National Park. 8 June 1950. Superintendent to Regional Director, Region Two, National Park Service. 17 March 1950. National Archives and Records Center, Denver, Colorado. Pg. 79. Yellowstone File Box 25. Folder: 630-01, Major Road Programs.

156. Real Property Record for Tower Creek, Yellowstone National Park, National Park Service, Rocky Mountain Regional Office, Denver, Colorado.

157. Norris, *Report Upon the Yellowstone National Park to the Secretary of the Interior for the Year 1877, 843-844.*

158. Norris, *Report Upon the Yellowstone National Park, for the year 1878, to the Secretary of the Interior, 984.*

159. Norris, *Report Upon the Yellowstone National Park for the Year 1879, 6-7.*

160. Norris. *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880,* 10, 38.

161. Norris. *Fifth Annual Report of the Superintendent of the Yellowstone National Park by P. W. Norris, Superintendent*, 9, 69-70.

162. Capt. Moses Harris, U. S. Army, *Annual Report of the Superintendent of the Yellowstone National Park, 1887* (Washington D. C.: Government Printing Office, 1887), 9.

163. Capt. George Anderson to Secretary of War, Monthly Report, July 3, 1897.

164. *"Report from Col. S. M. Young, Acting Superintendent, Yellowstone National Park to Quartermaster General, U. S. Army, August 13, 1897."*

165. Capt. Hiram Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges* in the *Annual Report of the Chief of Engineers for 1902,* Appendixes FFF and III (Washington D. C.: Government Printing Office, 1902), 3045-46

166. Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges In The Yellowstone National Park and Construction of Military Road from Fort Washakie To Mouth of Buffalo Fork of Snake River, Wyoming,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for 1903,* 2893.

167. Chittenden, *Annual Report Upon the Construction, Repair and Maintenance of Roads and Bridges In The Yellowstone National Park,* Appendixes FFF and KKK of the *Annual Report of the Chief of Engineers for 1904, 4173. According to Lee Whittlesey's Yellowstone Place Names,* Oxbow Creek flows north to the Yellowstone River from above Phantom Lake. In 1878, Ferdinand Hayden named the creek, "Geode Creek", but the name was officially switched to Oxbow Creek between 1915 and 1921.

168. Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repairs and Maintenance of Roads and Bridges* in the *Annual Report of the Chief of Engineers for 1904,* Appendixes FFF and KKK.

169. Capt. Hiram Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repairs and Maintenance of Roads and Bridges. Annual Report of the Chief of Engineers for 1905,* Appendix FFF, 2818-2819. Maj. Hiram Chittenden, 1st. Lt. Ernest Peek, Maj. John Mills, and 1st Lt. Francis Pope. *Annual Reports Upon the Construction, Repairs, and Maintenance of Roads and Bridges In The Yellowstone National Park and the Roads Into Mount Rainier National Park,* Appendixes GGG and JJJ *of the Annual Report of the Chief of Engineers for 1906, 2257.*

170. 1st Lt. Ernest Peek and Maj. Hiram Chittenden, *Report Upon The Construction, Repairs, and Maintenance of Roads and Bridges In The Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park* (Washington D. C.: Government Printing Office, 1907.), 2465.

171. Capt. C. H. Knight. "Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges." in the *Annual Report of the Chief of Engineers, 1913,* Appendix EEE.

172. A discussion of the entire Gardiner, Montana to Cooke City, Montana road can be found in the History of the Northeast Entrance Road. This history describes the interaction between the National Park Service and private industry over the construction and maintenance of this road. Part of the discussion involves the Mammoth Hot Springs to Tower Falls segment.

173. Arno B. Cammerer to Thomas McDonald, 11 September 1926, File Box: Roads, General Correspondence 1919-1926, File, Roads Correspondence May-December 1926, Yellowstone National Park Archives, Yellowstone National Park.

174. "Annual Report of the Superintendent of Yellowstone National Park for 1933."

175. The existing road to Tower Falls from Mammoth Hot Springs is unsatisfactory as to both gradient and alignment. Its point of departure from the Mammoth area, however, is from a satisfactory and logical point which is retained in the proposed plan. I carefully inspected the routes proposed by the Bureau of Public Roads engineers as well as the existing road. I do not approve of the location recommended by them on the north side of Gardner River and Lava Creek for the following reasons:

1. a new wide scar would be created on the slopes of Mt. Evarts which would take many years to heal
2. because there is no timber growth on the south slope of Mt. Evarts the entire road would always be in full view from many points
3. a switchback is necessary and would require exceedingly heavy construction on the steep slopes
4. the fine views of Mt. Evarts and those down the Gardner River Valley now obtained on the existing road, would be lost on the proposed location.

After studying the problem and discussing it with Chief Landscape Architect Vint, I recommend that the new road to Tower Junction be constructed along the south side of Lava Creek utilizing as much of the existing alignment as may be practicable. At a point about 1/4 mile down stream on the Gardiner River from the present steel bridge, a new high level bridge could be erected, if necessary constructed on a grade. This structure would be entirely satisfactory if built of steel, preferably with open, fully centered arches, and then painted gray to harmonize with the color of the existing rock outcrops. If a switchback was found to be necessary between the bridge over the Gardner River and Undine Falls, there is a wide stretch of land between Lava Creek and the existing road, which would lend itself well for such a purpose. The south bank of Lava Creek is well wooded and the road from the bridge to Undine Falls would be hidden from view and at the same time views from it are obtained of Mt. Evarts, the distant mountains down the Gardner River Valley, and the Hot Springs formations at Mammoth Hot Springs. Mr. Vint advised me, upon his arrival at Mammoth Hot Springs that he had previously worked out such a scheme as I have recommended and he concurred in my views.

Report by Clark Gilmore, Landscape Architect, Westchester County Park Development, New York, to Horace Albright, Director of the National Park Service, June, 1930.
C. F. Capes, "Final Survey Report (1937) 1-H3 Bridge Investigation and Design Grand Loop Highway Yellowstone National Park, Wyoming." File Box: Roads. Grand Loop. 1931-1942. 1971. Yellowstone National Park Archives. Yellowstone National Park.

176. C. S. Cape, "Progress Report, Season of 1939 on Public Administration Activities on the Yellowstone National Park Highway System, Yellowstone National Park, Wyoming. Federal Works Agency Public Roads Administration District No. 3. December 18, 1939." Technical Information Center, Denver Service Center, National Park Service, Denver, Colorado.

177. Lee H. Whittlesey, *Yellowstone Place Names* (Helena, Montana: Montana Historical Society Press, 1988), 26.

178. *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Two Houses of Congress in Four Volumes* (Washington D. C.: Government Printing Office, 1887), Appendix AAA, *Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887,* 3138-3139.

179. Hiram Chittenden, *Improvement of the Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges Annual Report of the Chief of Engineers for 1899,* Appendix EEE (Washington D. C.: Government Printing Office, 1899).

180. Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges (Annual Report of the Chief of Engineers for 1903,* Appendix GGG), 2890.

181. Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges (Annual Report of the Chief of Engineers for 1905,* Appendix FFF), 2819.

182. Willing and Kutz, *Report Upon the Construction, Repair and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road into Mount Rainier National Park,* Appendixes GGG and HHH, 2511.

183. Clarence Knight, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges. Annual Report of the Chief of Engineers, 1911,* Appendix GGG. (Washington D. C.: Government Printing Office, 1911) 3031. Clarence Knight, "Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges." *Annual Report of the Chief of Engineers, 1913,* Appendix FFF. (Washington D. C.: Government Printing Office, 1913), 3269-3270.

184. Amos Fries, Major, Army Corps of Engineer, to Acting Superintendent Col. Lloyd Brett, 11 September 1914. Yellowstone National Park Archives, Yellowstone National Park.

185. Amos Fries, Major, Army Corps of Engineers, to Chief of Engineers, Army Corps of Engineers, 5 May 1915. Yellowstone National Park Archives, Yellowstone National Park.

186. "Tentative Suggestions for Improvement to Park Roads," n.d. File: General Road, 1925-26. Yellowstone National Park Archives, Yellowstone National Park.

187. "Monthly Narrative Report for September 28 to October 28, 1934." "Report to the Chief Architect for June 25 to July 25, 1934." Yellowstone National Park Archives, Yellowstone National Park.

188. Edmund Rogers, Superintendent, Yellowstone National Park, to Arno Cammerer, Director, National Park Service, 18 May 1939. Yellowstone National Park Archives, Yellowstone National Park.

189. Ibid.

190. "Annual Report of the Superintendent of Yellowstone National Park for 1948." "Annual Report of the Superintendent of Yellowstone National Park, 1949."

191. "Final Construction Report (1965-1966) on Yellowstone National Park Project 1-A(1), B(1), and 12(1) Grading and Bituminous Stabilized Base. Grand Loop and Norris-Canyon Cutoff. Yellowstone National Park. State of Wyoming." Division of Maintenance. Yellowstone National Park.

Chapter XIII

HISTORY OF NORTH ENTRANCE ROAD

A route from the Upper Yellowstone Valley to Mammoth Hot Springs area existed prior to the creation of Yellowstone National Park in 1872, but it would be many years before the route could be called a road. In 1879, Superintendent Philetus Norris termed "a portion of the canon of the main Gardiner [sic], and all of those of the west and middle branches, are utterly impassable for even a bridle path."[1] Two different routes left the mouth of the Gardner River for the springs, but neither were passable, and Norris did not want to expend much valuable money on their improvement. He spent considerable time trying to site a suitable location. "In this I finally succeeded, and without sharp curvatures, carried a line of easy grades for some 3 miles, and with only a moderate amount of bridging, constructed a road much shorter and in all respects superior to what could have ever been made upon either of the other routes at manifold its cost."[2] Norris avoided the Gardner River Canyon and constructed a road in the approximate location as the older tourist route.

The North Entrance remained the most popular entrance into the Park, and the usage was increased after the Northern Pacific Railroad completed their line to near Gardiner, Montana in 1883. One of the first jobs the Army Corps of Engineers undertook was the improvement to the four miles section of road between Gardiner, Montana and Mammoth Hot Springs costing about $50. After filling the ruts and removing the stumps on the old road, Lt. Dan Kingman recommended abandoning the route for a new one, following the Gardner River through the canyon. The steep inclines of the old road presented many problems particularly to the freighters and especially in wet weather.[3]

Kingman knew that the canyon route, with its exceptional obstacles, would be expensive to construct and estimated that it would cost approximately $2,000 per mile, which is more than double what it would cost in other areas of the Park. During 1883, he spent $5,740 and estimated an additional $3,000 would be needed to complete the job. Before the crews stopped for the winter, an excellent road had been constructed up to the point of the rock work. Kingman hoped to complete the entire project before the first visitors arrived the following spring.[4]

In the Annual Report for 1889, several bridges, without specific locations, spanning the Gardner River were listed

> three spans of 33 feet--no truss
> three spans of 32 feet--King post
> one span of 28 feet, a coulee--no truss
> two spans of 40 feet and 20 feet --King and Queen post[5]

During 1901 and 1902, Hiram Chittenden supervised work on the road and in 1903, one his major achievements, the construction of the North Entrance Arch was completed. Chittenden felt that the heavily traveled, highly visible northern park entrance at Gardiner deserved an impressive entrance gate. The Northern Pacific Railway's train station, designed by Robert Reamer, had been completed adjacent to the park boundary on the western edge of Gardiner and the new route into the park was scheduled for construction. The railroad and the wagon roads ended in two loops, with the train station placed in between. One side of the station was used to unload the passengers and the other side, for the conveyance of carriages. On the carriage driveway side, an artificial pond was constructed. Approximately 30 feet above the train station grounds, Chittenden constructed the entrance arch. The corner stone for the entrance arch was laid in a ceremony attended by President Theodore Roosevelt on April 24, 1903, and the first visitors passed through the arch on September 1, 1903.[6]

By 1903, the Army road was widened to 25 feet, the grades had been reduced to 8%, and the road had been surfaced with gravel or macadam. All of the old wooden culverts had been replaced with vitrified clay-pipe or cast-iron culverts. The four crossings of the Gardner River were bridged with steel structures set on monolithic concrete abutments.[7]

During the autumn of 1906, a dry slide occurred near the first bridge from Gardiner, followed my more sliding during the winter. Another slide developed 1 1/2 miles further down the road which was removed by sluicing. Other 1907 spring damage was described:

> Next to the slides the most expensive work has been in keeping the road from being washed out. Large boulders aggregating more than 200 tons, fell in a section of the Gardiner [sic] River less than 150 feet in length, one boulder alone weighing approximately 75 tons. This rock had to be removed in order to keep the road from being washed out. Upward of 20 breaks in the wall occurred in the vicinity of 1 1/2 miles from Gardiner. The wall along the river is a dry wall and the water rushing down washes out the material behind the rocks and below the water. The result is that the road is all undermining along the wall, which always gives away during high water, when it is most difficult to repair. . . . On one occasion it was necessary to take a few men available and work two days and a night save, for a few hours in the early morning. Too much stress cannot be laid upon the fact of these dry walls must be replaced by those laid in mortar. . . . I am firmly of the opinion that if the water in the Gardner River is as high next summer as it has been this season, that someday the road will be so washed out as to require using the old road from Gardiner to Mammoth Hot Springs which runs over the hills and which has not been used for 12 years or more.[8]

Severe damage and deterioration effected this section of road for many years. The following excerpts from reveal the extent of the problem.

> 1908-- . . .considerable work was again required at the slide in the bend about 1 1/2 miles from Gardiner, which has been troublesome for more than a year. An additional 2,000 yards or more of earth were removed and it was thought that with the quantity removed a year ago, it was secure but proved again troublesome on account of the numerous openings which are in the sidehill. A few yards below this slide difficulty was again experienced during high water in keeping the road from being washed out. The wall at this point was faced with planks which were held in place by large steel bars. This section probably a stretch of 100 yards of dry rubble, should be laid in mortar this season.

> 1909-- . . .Trouble was again encountered at the slide on the Mammoth Hot Springs to Gardiner road about 1 1/2 miles from Gardiner. It was necessary to remove about 500 yards of earth which slipped into the road from the steep hillside. Efforts have been made to eradicate the troublesome spring here by diverting the small stream on the hill above but so far no marked results have been secured. The retaining wall in the bend of the Gardner River at this point was rebuilt in March 1909, but a portion of it, as well as parts of the old wall, both below and above the bend were washed out by the very high water in the Gardner River in the early part of June. The water at this bend has quite a fall and strikes the wall at right angles. The road was saved by the construction of a revetment of logs and sand bags held by heavy iron bars at those points where the retaining wall gave way. It will be necessary to either relocate the road at this point or to construct a substantial wall of masonry or concrete.

> 1911-- . . .A concrete retaining wall, 487 feet long was constructed about 3 1/2 miles from Mammoth Hot Springs. This is the first concrete revetment wall constructed in the park. . . . the dry rubble wall along the Gardner River is in bad condition.

> 1912-- . . .I think it well to call your attention to the condition of the road between here and Gardiner. The heavy teams hauling in your winter supply of coal so shook the road at the dangerous and narrow part that a section of it fell into the river, leaving a roadway of only about 3 feet in width for a distance of about 12 feet.

The bridge, about 1 1/2 miles from Mammoth Hot Springs, 48 feet long and 16 feet wide, consists of four stringers carrying a pole floor. The two outside stringers are in fairly good condition, but the middle ones are in an advanced state of decay. Two braces, each 22 feet long and 10 inches in diameter are necessary to keep the abutments from sliding down hill towards each other. About 100 feet of side-hill grading opposite the lake is needed. Near Gardiner a 10 feet culvert is to be built as there is no timber within two miles of this point, the culvert can be built of rock, leaving spaces wide enough to carry the stream of water.

. . . there is a sliding bank above the road caused by seepage water from a lake some distance back from the road. Steps were taken last fall to divert the drainage of the country behind the lake and to drain the lake. The sliding bank, for a distance of about 1,000 feet had, last summer and fall, covered about half of the road and will have to be cleared out next summer. Along this sliding bank and in the near vicinity the retaining wall along the river is in bad condition and about 1,000 feet of concrete wall, 9 feet high is needed. Last fall, this road was nearly closed by the sliding bank.

. . . the past week of warm weather and rains has caused the Gardner River to rise rapidly and it is now washing away the earth and the stone retaining wall. I expect the road to go any day. Authority granted to expend 500 dollars park revenue for repairs to old trail, commencing Mammoth Hotel running due north and entering Park road about alfalfa field, ...

This wagon trail was practically impassable for any class of vehicles on account of earth slides, boulders, broken culverts and an unserviceable bridge. The work done consisted of dismantling the old wooden bridge and the construction of a timber bridge with a span of 25 feet and 12 feet approach at each end. This bridge spans a ravine about 25 feet deep. All other culverts and bridges were built of rough timber, these varied in length from 4 to 16 feet. Many boulders were removed from the road by blasting and excavating, plowing was done where necessary and the entire length of trail was graded. Widening was also done in many places, leaving this trail in good condition for light vehicle traffic.

1913-- . . .A 24 inch metal culvert 130 feet long was placed at the entrance arch to carry the spring flood water. Six hundred and fifty feet of retaining wall, built of rubble laid in cement mortar was constructed along the Gardner River and the old dry rubble wall was patched in numerous places. High water in the spring of 1913 developed several new bad places in the wall and several hundred feet of wall along this road will be replaced during the coming year. . . . The road was widened at several places, the gravel bank near Gardiner was sloped back, a retaining wall was built along the slide at the two mile post, and a large part of the slide removed, and practically the entire road regraveled.

1915-- . . .slide is located just above the 2 mile post from Gardiner and a length along the road of nearly 800 feet. Sluicing was begun with the pump installed last fall and a few days later with water from a lake nearly 200 feet above the road at the slide. . . .During the month, one-half mile, between the Entrance Arch and freight road, was completed and oiled with a light layer of sand and gravel on top. . . .[9]

Throughout the summer of 1917, the crews worked diligently to keep the canyon road open, but the 1918 spring thaw caused extensive damage to one mile of the road. One of the last projects, the Army Corps of Engineers supervised before turning over the road construction and improvements to the newly created National Park Service, was making improvements to the old wagon or freight road as it had to be used while the main road could be reconstructed.[10]

Despite recommendations from the Army Corps of Engineers that the entrance road be reconstructed over the hill, National Park Service Director Stephen Mather favored reconstruction through the canyon. In fact, he called the construction of a new road through the Gardner River Canyon the first important engineering project undertaken by the newly formed engineering division.[11] However, the annual reports for the next few years indicate that mostly improvements and not reconstruction were undertaken. In 1920 considerable graveling, some grading and log cribbing was placed to prevent washing out by flood waters. In 1921, 1,300 cubic yards of material was moved from the slide area which had moved 15 feet during the past year. In 1923, about 400 feet of road near the 2 mile post was widened and 1700 cubic yards of rock was blasted from the sandstone cliffs above roadway.[12]

In August and September of 1921, a new stone building to house rangers assigned to checking traffic at the North Entrance was built. The new building replaced an "unsightly tent arrangement" near the Arch. The building, which was compatible in design and material, to the basaltic rock arch, was 15 feet by 16 feet, with walls 24 inches thick. The masonry walls were 8 feet 6 inches in height with 2 logs 7 inches in diameter resting upon them. The dovetailed log constructed gables were covered with a cedar shake roof. The porch was constructed of flagstones embedded in cement mortar.[13]

During the 1930s, several plans for the road's relocation and/or reconstruction were discussed.[14] In March 1937, a fire destroyed the checking station near the North Entrance Arch. A temporary station was built several hundred feet east of the burned station.[15]

On August 18, 1941, a severe storm hit the northern part of the Park. The North Entrance Road was closed for several hours because of several slides and washouts. Many of the culverts were blocked with debris. Gas shovels and patrol graders were used by the maintenance crew over the following ten days to put the road in good order.[16]

As a result of the 1959 earthquake, some repair work was done in July of 1962, but the major work done on this road section was part of the Mission 66 project during the 1960s. In addition to surfacing and constructing new guard rails, two new bridges were built to span the Gardner River.[17]

Road Through Gardner River Canyon, 1912
Courtesy Yellowstone National Park Archives

Hill Road Realignment, Gardiner to Mammoth Hot Springs, 1918
Courtesy Yellowstone National Park Archives

Middle Gardner River Bridge, Early 1900s
Courtesy Yellowstone National Park Archives

Lower Gardner River Bridge, 1905
Courtesy Yellowstone National Park Archives

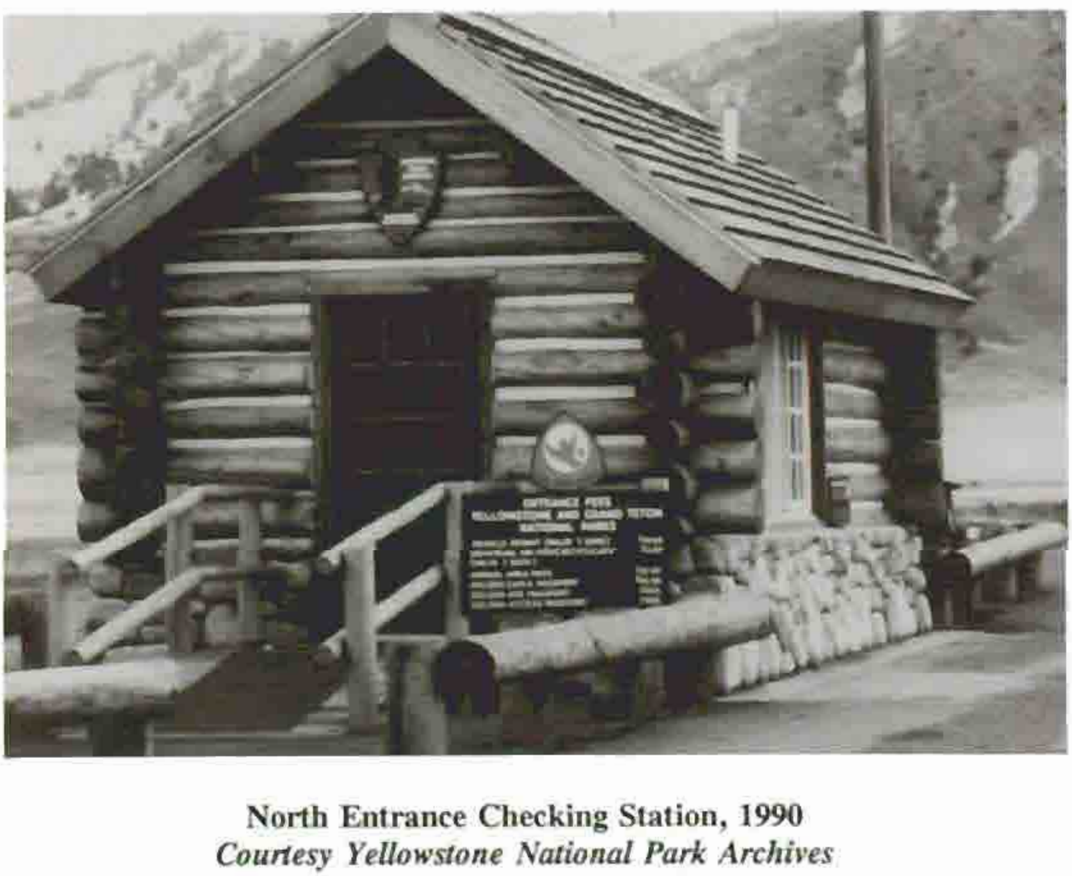
North Entrance Checking Station, 1922
Courtesy Yellowstone National Park Archives

North Entrance Checking Station, 1936
Courtesy Yellowstone National Park Archives

North Entrance Checking Station (Temporary), 1937
Courtesy Yellowstone National Park Archives

North Entrance Checking Station, 1938.
(Remodeled after Fire of March 1937)
Courtesy Yellowstone National Park Archives

North Entrance Checking Station, 1949
Courtesy Yellowstone National Park Archives



North Entrance Checking Station, 1990
Courtesy Yellowstone National Park Archives

ENDNOTES

1. Philetus Norris, *Report Upon the Yellowstone National Park for the Year 1879* (Washington D. C.: Government Printing Office, 1880), 3-4.

2. Norris, *Report Upon the Yellowstone National Park for the Year 1879.*

3. Kingman Report for 1883, 11-12.

4. Ibid.

5. *Report of the Secretary of War Being Part of the Messages and Documents Communicated To The Houses of Congress and The Beginning of The First Session of The Fiftieth Congress in 4 Volumes, Volume II - in fours parts, Part IV* (Washington D. C.: Government Printing Office, 1889), "Annual Report of Maj. Charles J. Allen, Corps of Engineers, Officer in Charge, for the Fiscal Year Ending June 30, 1889," 2863.

6. Hiram Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes FFF and KKK *of the Annual Report of the Chief of Engineers for 1904* (Washington D. C.: Government Printing Office, 1904), 2889.

7. Hiram Chittenden, *Annual Report Upon the Construction, Repairs and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Roads from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming, and Erection of Monument to Sgt. Charles Floyd in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for 1903* (Washington D. C.: Government Printing Office, 1903), 2890.

8. Ernest Peek, *Annual Report of the Chief of Engineers for 1907* (Washington D. C.: Government Printing Office, 1907), 2468.

9. Ernest Peek, *Annual Report of the Chief of Engineers for 1908* (Washington D. C.: Government Printing Office, 1908), 2547. "Report of Inspection of Bridges in the Yellowstone National Park, made September 24, 25, 26, 1909," with recommendations by request of Capt. Wildurr Willing, Corps of Engineers, U. S. A. C. H. Knight, C. W. Kutz, and Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park and Report Upon the Crater Lake National Park* (Washington D. C.: Government Printing Office, 1911), 3030-3031. H. W. Child, President Yellowstone Park Transportation Company, to Acting Superintendent, Yellowstone National Park, 2 May 1912. William Nespital, "Notes on the Condition of the Old Road from Mammoth Hot Springs to Gardiner," April 10, 1912. C. W. Knight, Army Corps Engineering Officer, to Chief of Engineers, Army Corps of Engineers, 19 February 1912. Lt. Col. Brett, Superintendent, Yellowstone National Park, to Secretary of the Interior, 14 May 1912. Lt. Col. Brett, Superintendent, Yellowstone National Park, to Secretary of the Interior, 20 May 1912. "Report of Work Repairing Old Wagon Trail between Mammoth Hot Springs to Gardiner," May 27 to June 21, 1912. Lt. Col. Brett, Superintendent, Yellowstone National Park, to Secretary of the Interior, 22 June 1912. C. H. Knight, J. B. Cavanaugh, and J. J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park,* Appendixes EEE and FFF (Washington D. C.: Government Printing Office, 1913), 3269-3270. "Report for November, 1915."

10. G. E. Verrill and George Zuin, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park,* Appendixes EEE and FFF (Washington D. C.: Government Printing Office, 1918), 1977-80.

11. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919* (Washington D. C.: Government Printing Office, 1919), 46-47.

12. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921* (Washington D. C.: Government Printing Office, 1921), 209. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921* (Washington D. C.: Government Printing Office, 1921), 165. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1923 and the Travel Season 1923* (Washington D. C.: Government Printing Office, 1923), 116.

13. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921.*

14. One of the proposals was from Gilmore Clark, Landscape Architect from Westchester County, New York who developed a Mammoth Plan.

> The alternative of leaving Mammoth Hot Springs at the northeast corner or through the Transportation Company Grounds and following the hillside in the vicinity of the old high-line road to Gardiner was investigated by logging with automobile and on foot with Abney, although no staked line was run. This proposed route would leave Mammoth Hot Springs from behind the two storage sheds of the Transportation and descend along the east exposed hillside on 2% and 3% grades for the first two miles. This 2 mile point would be directly above a small lake and the purpose of using light descending grades to this point is to make use of the most stable ground and cross the drainage area above the lake in the most desirable place. From this point to the North Entrance approximately 2.5 miles it is necessary to continue on a 5% descending grade as much of the distance as practicable and the line would be then fairly rough, rolling country which would require considerable curvature some of which would approach the minimum radii. a sustained 5% grade for the last 2.5 miles will reach the elevation of the North Entrance without employing development, but some of the country, particularly in the last mile, would necessitate curvature which might almost resemble switchbacks. This route is the shortest and most direct route possible between Mammoth and Gardiner. Running in approximately a due north and south direction, it lies principally on east exposure and almost entirely thru open sagebrush country. Where the line would fall on north exposure or around points with northeast exposure, it would doubtless be subject to deep snow drifts but probably of little more consequence that what would occur on the canyon route as the difference in elevation is not great. This line would pass above the treacherous unstable, shifting ground which is caused principally by seepage from the lake which was mentioned below the two mile point. This line offers the opportunity, when considered with certain alternates of the other entrances to Mammoth Hot Springs, of bringing traffic into Mammoth Hot Springs before making junction with another entrance road of connecting with Mammoth Hot Springs at the logical geographic location, thereby affording the unacquainted tourist an exit from Mammoth Hot Springs in the direction he desires to go.

"Report to Horace Albright by Gilmore Clark, June, 1930."

15. Howard Gregg, "Monthly Narrative Report to the Chief Architect," December 20, 1937 to January 20, 1938. File Box 10, Yellowstone National Park. National Archives and Records Center, Denver, Colorado.

16. Phillip Wohlbrandt, Park Engineer, "Final Report, Project No. 508, Flood Damage, Reconstruction of Mammoth-Gardiner Road, April, 21, 1943."

17. Fixed Property Records for Yellowstone National Park, National Park Service, Rocky Mountain Regional Office files, Denver, Colorado.

Chapter XIV

HISTORY OF NORTHEAST ENTRANCE ROAD

Prior to the creation of Yellowstone National Park, miners began exploring and settling in the Upper Yellowstone Valley, an area extending from present-day Livingston, Montana, to the northern boundary of Yellowstone National Park at Gardiner, Montana. Miners who had worked the Idaho gold fields moved on to Montana after news of John White's gold strike on Grasshopper Creek (Bannock) in 1862. The following year Thomas Curry's discovery of gold near Emigrant Gulch in the Upper Yellowstone Valley brought a rush of miners to the area. The strikes also brought miners to the southern part of the Upper Yellowstone Valley. The town of Jardine, Montana grew out of the success of the Bear Creek discoveries.[1]

In the late 1860s, more mining activity developed along Crevice Creek and eastward toward Lake Abundance and down into the Clarks Fork Valley. In 1870, silver and lead deposits were discovered in the Cooke City, Montana area, soon to be named the New World Mining District.[2] Some of the men associated with other aspects of Yellowstone history, A. Bart Henderson, Frederick Bottler, Adam "Horn" Miller and others, explored and traveled around the Lamar River, Slough Creek and Soda Butte Creek country, In fact, the extinct hot spring travertine cone and the nearby creek, were named "Soda Butte" by the 1870 prospecting party consisting of Henderson, Miller and James Gourley.

As the mining activity increased in the New World Mining District, an enterprising middle-age Scot, John H. "Yellowstone Jack" Baronett, gave up prospecting and pursued "mining the miners" by controlling the only known good bridge site on the route from the Upper Yellowstone Valley to the New World Mining District.[3] In the spring of 1871, Baronett began building a bridge near the confluence of the Yellowstone with the east fork of the Yellowstone, the Lamar River. After cutting out a trail on either embankment, he built "a timber pier . . . upon a huge boulder amidst the roaring torrent and covering it with huge cross-timbers formed a good footbridge for men and mules . . . ." Nearby he built a cabin.[4]

Baronett's site was well chosen as the Yellowstone was only approximately 100 feet wide at that point and the "rocky bank on the east side formed a ready footing for that abutment, and a rocky ledge, just exposed near the west bank at low water, provided a footing for a rock-filled, log-crib pier 20 feet in height. Thus, the river was bridged with 2 spans, 1 of 60 feet and the other of 30 feet. The superstructure consisted of a 10-foot roadway carried on 3 stringers, which were in turn supported by a pair of queen-post trusses in each span. The timbers were all of square-hewn pine with a minimum of iron fastenings. . . . The cost of the work, including the house and outbuildings, is given as $4,000 . . . ."[5]

Thus the rough trail or "road from the Upper Yellowstone Valley to the Cooke City mines predates the creation of Yellowstone National Park. Dr. Ferdinand Hayden crossed the bridge just one month after Capt. John Barlow's 1871 expedition.[6] Dr. Hayden depicted the construction and the possibility of its future historic importance in his report:

> Just below the junction of the East Fork, a bridge was constructed across the Yellowstone about a year ago, to accommodate the miners bound for the "diggings" on Clark's Fork. It was evidently built with a considerable amount of labor and boldness, for the river flows with great rapidity along the narrow, rocky channel, and is about 200 feet in width. I make mention of this bridge in this connection from the fact that it is the first, and only one as yet which has been erected across the Yellowstone River, and may in the future assume some historical importance.[7]

Prior to 1877, only pack trains could manage the park "roads". But during 1877, the first wagons entered the park. One ox-drawn wagon, which left Gardiner for the Clark's Fork mines, had to be disassembled before it could be taken over the Baronett Bridge.[8] During 1877, Superintendent Philetus Norris searched the park for new road routes, including exploring in the Lamar Valley and the adjacent region south of the valley for possible routes through the Big Horn or Shoshone Range from the main branch of the Yellowstone. During the two week pursuit of Chief Joseph and the Nez Perce by Gen. O. O. Howard in the August of 1877, the Nez Perce partially destroyed the Baronett Bridge by burning the stringers near the east abutment.[9]

During 1878, Norris continued his exploration for new and improved routes in the park. Among those examined was a "route for approach and crossing of the main Yellowstone near the forks, far preferable to that of the Baronett Bridge, now so decayed and burned as to be very dangerous; or to the abutments of the miner's bridge commenced above it."[10] Norris stated that he assisted Baronett and his associate, John Ponsford in repairing the bridge after the burning, but even then he thought that it was unsafe. He urged the construction of the "heavy and expensive bridge over the main stream" for the wagons to reach the East Fork, Amethyst Mountain, and Soda Butte sections of the park and the smelting and mining camps of the Clark's Fork area.[11] Nevertheless, Norris also felt that Baronett should be compensated for his investment in an outright purchase or a lease. In 1879, two Montanans failed to gain permission from the Secretary of the Interior to build another bridge to replace the Baronett Bridge.

During 1880, John Ponsford offered to sell the bridge to the Interior Department and sought an inspection and report by an Interior official.[12] He received no reply.[13] In 1881, Baronett followed up with a proposal to the Interior Department to either "obtain a permit or license to maintain the bridge or sell to it to them." Baronett claimed that at "great cost he constructed a bridge on the Yellowstone to "enable the miners to go to and come from the Clark's Fork Mines. . . . that it was absolutely necessary for that purpose that without it mining could not have been carried on only a very short time each year." He stated that the bridge and adjacent buildings cost $4,000 and that it was kept as a toll bridge until 1877. He further claimed that since the principal users, who were the miners, were often unable to pay the toll, he was not able to keep up the needed repairs. Baronett maintained that General Howard ordered the dismantling of one of his buildings for use as building material for the first repair of the bridge. He further claimed that he kept the bridge in good repair until 1880, and at that time he spent an additional $2,000 putting in new stringers and iron floor braces. In concluding, Baronett advised the secretary that the bridge, which he now considered safe and in good condition, had been useful to the miners, the military and to the park staff. In his transmittal to the secretary, he included a postscript from Superintendent Norris which read "I am cognizant of the facts herein before stated (except as to the cost of the bridge) and recommend the same to your careful and favorable consideration."[14]

In the meantime, Norris improved the "road" from the forks of the Yellowstone to Soda Butte and began blazing Amethyst Mountain and the Fossil Forest for 30 miles to Pelican Creek and on to Yellowstone Lake. While Norris thought that the possible new route from Soda Butte to Yellowstone Lake would offer interesting viewing for visitors, he perceived that the high elevation would probably preclude a road in the near future.[15] Norris' explorations, which also encompassed the unusual Hoodoo regions on the east side of the Park prompted him to consider an extensive exploration of the east side and the possible repercussions of opening up that area of the park. One of the first considerations to be addressed was the question of toll roads and or toll bridges in the Park.[16]

After a more thorough examination of the Baronett Bridge, Clarence Stephens, Superintendent Norris' assistant decided that the bridge, which had been built for pack animals was too narrow for wagons and too light for the passage of heavy loads. He felt that the crossing at the narrow part of the canyon resulted in the approaches being narrow and steep with sharp curves. Norris determined that it would be less costly to build a new bridge further up the river using some of the timber and iron from the Baronett Bridge. He selected a spot where a small creek empties into the river from the west and on the road to Tower Falls. He also inspected the Soda Butte Creek area for a bridge site. He found a point, approximately 160 feet wide, bank to bank, at the mouth of the Soda Butte Creek that would command a grade but no rock work and no nearby timber. However he reported to Norris that available timber could be found higher up the stream.[17]

After the U.S. Army Corps of Engineers assumed the responsibility for road construction and improvement in the Park in 1883, the question of ownership and fee collection of the Baronett Bridge again became an issue. Lt. Dan Kingman wrote "I do not think it should be allowed in the National Park and it is for this reason that I recommend its purchase by the government."[18] During the first year of the Army's supervision, $12.00 worth of ditch and culvert work was done on the Clark's Fork road.

In 1885, Kingman reported that an unsafe and unsightly bridge had been built over the East Fork of the Yellowstone in 1884 by a private individual, but no toll was charged from this bridge.[19] In 1886, the acting secretary of the Interior responded to a congressional report on Yellowstone National Park in which he explicitly expressed the view that Congress should appropriate the sum of $1,500 for the purchase of the Baronett Bridge. He called it "not such a one as would have been built in the first instance by the Government, yet it answers all purposes." He explained that the Baronett and Ponsford had charged both private parties and government officials a fee to cross "There had undoubtedly been enough toll collected to pay for the bridge. It is an anomaly that a private toll bridge should be permitted in the National Park and there should be at once a stop put to the imposition of toll."[20]

The following year, the new superintendent Army officer, Moses Harris's report indicates that the Baronett Bridge was now under a partnership of John Ponsford and J. L. Sanborn. He revealed that "I have attempted no interference with the business as conducted by these parties, as it would seem business unmolested has given them a certain right of possession which should be settled by investigation and adjudgment. A statement of the fact that free travel through the National Park, the 'pleasure ground of the people', is obstructed by a toll-bridge, whether by authority or otherwise, should be sufficient to cause a remedy to be at once applied."[21] He described the road from the Baronett Bridge to the Cooke City mines as:

> The road over which all supplies for the mining camp of Cooke City are freighted is through a rough and hilly country and throughout the greater portion of its extent is unimproved. Some slight grades have been made where it was absolutely necessary and a few rude bridges constructed. The road has been chiefly built and kept in repair by private enterprise and is by far the worst road in the Park, being well . . . impassable a large portion of the year. Toll is very properly charged at Barronette's [sic] Bridge as it could not otherwise be kept in repair by private means. The bridge across the Lamar River is in very dilapidated condition and will probably not last more than a year or two longer. It would seem to be eminently proper that this road within the Park's limits, should be taken in charge by the Government, the Barronette's Bridge claim extinguished and the road kept in proper and safe condition for travel.[22]

Harris requested a $2,000 appropriation to settle the bridge claim.[23]

During the early 1890s, controversial discussions of building a railroad through the northeastern portion of the park induced the opponents of the line to convey the positive attributes of a "good commercial road" from Cooke City to Livingston, Montana.

> In the case of the wagon road every cent spent in its construction goes to people in that vicinity. The freight contracts would give employment to hundreds of persons and the raising of grain and hay for forage to hundreds more. The commercial business in wagons, supplies, and the like would materially enhance the prosperity of both Livingston and Cooke. In all respects the wagon road will be of more permanent benefit to these two towns and to the surrounding country than the railroad. The wagon road is something that can be had just as soon as the Government is relieved of the menacing spectra of the Segregation Bill. The railroad is to say the least a doubtful possibility. Very few believe that it will be built even if the right is obtained.[24]

Maj. Hiram Chittenden, the Army engineer, now in charge of road construction and improvements, described the mountain scenery in the northeast section as "unquestionably the most beautiful mountain scenery in the park." He felt that the road in this section should "receive early attention as a matter of justice to the Cooke City miners, even in advance of its use as a tourist route."[25]

In 1895, the Army began working on 5 to 6 miles of the road near the Cooke City end with grading completed as far west as Soda Butte Creek the following year. The old problem of the purchase of the Baronett Bridge persisted, however the proposition to use the appropriation for "improvement and protection " of the park presented Superintendent Anderson with a dilemma. He stated in his report of 1896 that "I could not assent for the reason that the old bridge is now in a state of decay and would not under any circumstances be considered as a work of 'improvement'. The claim for it and for its use for the last twenty-five years is however a just one."[26]

Capt. George Anderson, the military superintendent of the Park, reported that at least three miles of the old road between Soda Butte and Cooke City had been cut out by the newly constructed road. In his locational survey of the Soda Butte Canyon he "adhered to the principal of keeping the roadway on the north side of the stream, where the sun melts the snow out much earlier in the spring, thus making the road passable for a much longer season and avoiding the necessity of expensive and unreliable bridges. To do this, in some cases involved the building of roads through difficult country, where the cost of construction was considerably increased."[27] Anderson described the recently completed 5 mile section and additional 1 mile of grubbed and cleared section as "one of the most difficult pieces of road making in the park, as the line is crossed at very short intervals by gullies which at times carry large volumes of water from the canyon side. The completion of another mile of this road will cut out all that is worst of the old one and cover all that is most difficult of construction of the new."[28] Only two more additional miles of grading toward Yancey's was completed before lack of appropriation called a halt to the project.[29]

Many new bridges were built throughout the park in 1897, including the bridges over the Yellowstone and Lamar rivers. Again the need for the replacement of the old Baronett Bridge went to Washington[30]

A 1897 *Harper's Magazine* article described the Cooke City road:

> This road is fifty miles, which is used by teams for hauling ore and supplies and by camping parties who enter the Park at Cooke City, goes through some of the finest scenery in the country--great grassy uplands where the antelope and the deer and the elk roam and splendid rock mountains are eleven thousand feet high--crossing the Yellowstone and many clear and beautiful streams. This road is the worst road that I ever saw, horses and mules attempt to haul wagons over. Road-making is however carried on with a great deal of energy.[31]

In 1899, 15 miles of the new Cooke City Road still had to be built, but Army engineer Chittenden, who had returned for duty in Yellowstone, reported that the new section would not follow the old route, thus new bridges would also be necessary. He remarked that completion of the road would be "of the greatest usefulness also in patrolling and protecting the entire northern portion of the park, which is the most important game preserve on the reservation." He thought that the remaining work would be lighter in nature and only cost approximately $1,00 per mile.[32] Finally in 1899, a congressional act awarded "To C. J. Baronett, of Gardiner, Montana, five thousand dollars for the bridge known as 'Baronett's Bridge, over the Yellowstone River and the approaches thereto, in Yellowstone National Park".[33]

In 1901, $140.27 of repair work was done on the Baronett Bridge and some minor repair work was done on the road. Two years later a steel deck truss with a light metal lattice railing and a 130-foot span was built about a mile above the old Baronett Bridge. The bridge was based on a design by the American Bridge Company.[34] According to Hiram Chittenden, the Baronett Bridge was destroyed upon the completion of the new bridge.[35]

During 1908 and 1909, substantial work was carried out on the Soda Butte to the boundary section. The road, which was relocated to bypass two crossings of the river, cuts through a marshy, swampy, black loam area. Significant work was done at Jackson grade including building up sections of wall which had collapsed . The road crews removed several large overhanging rocks in the Lamar Canyon, the grade was raised 2-1/2 feet for an interval of 1250 feet, and a new retaining wall was built.[36]

By 1914, the "trail wagon road" was in better shape between the belt line (Grand Loop) junction and Soda Butte than the 20-mile stretch on the east boundary, this being due to the frequent travel to the Buffalo Farm and the Soda Butte Soldier Station.

Not much work was done on this road segment until 1914, when 35 culverts and 5 bridges were constructed. The most notable bridge was a new 38-foot, one center pier bridge over Soda Butte Creek. Maj. Amos Fries, the Army engineer officer in charge of road construction and improvement at the time, called "These culverts and bridges . . . the best and heaviest pole construction I have seen in the park".[37] The following year, the road crews completed some of the previous year's work, built five more bridges, more culverts, and did more shaping and grading in the Round Prairie area near the Pebble Creek.[38]

In March of 1915, and five months prior to the admittance of motorized vehicles to the Park, Robert McKay of the Buffalo Mining Company from nearby Cooke City submitted an application for permission to operate trucks and trailers over the park road between the rail head at Gardiner and Cooke City. McKay's application requested the right to transport ore, machinery, and supplies using 15 trucks and 25 trailers, each truck hauling 2 trailers. After reviewing McKay's proposal of improving the existing road, bridges and culverts between Cooke City and Soda Butte, constructing any needed turnouts as specified by the Army engineers, and making improvements on the Tower Falls to Mammoth Hot Springs section, the Department of Interior granted McKay's request. However, the necessary improvements for the road to be fit for motorized vehicles took all of the 1915 season.[39]

During the summer of 1915, McKay's road crews began about 3-1/2 miles from the northeast boundary, setting mileposts up for the first 8 miles within the Park. Nine bridges and 23 pole culverts with an average span of 5 feet were built. The crew first camped about 4 miles from the boundary then moved the camp to a location about 8 miles from the boundary. This portion of the road project was paid with government funds. This section of the road was also widened and surfaced. From a point about 8 miles in from the boundary a new road was constructed for about 3,800 feet around the Ash Grade with funds provided by McKay. The realignment around Ash Grade involved blasting 1,900 cubic yards of rock and 1,200 cubic yards of earth, gravel, and boulders. A ten feet span log bridge and 6 culverts of 3 to 4-1/2 spans were also built.[40] Toward the end of the summer more realignment work was done between Jackson Grade and Soda Butte Creek, on the hill between Fish Creek and Pebble Creek flat and between Soda Butte Soldier Station and the Buffalo Farm. The realigned sections were for the most part narrow. A two-span bridge with approaches, over Pebble Creek, had log cribbing filled with gravel. The new approaches connected with the old road. Light gravel was applied to the road between the Lamar River crossing and Fish Creek[41]

McKay, who spent $11,857.63 for the 1915 road work, failed to renew his privilege during 1916. The Western Smelting and Power Company of Livingston, Montana sought similar permission through their president, Dr. G. L. Taner, however, after failing to meet the conditions specified by the Department of Interior, mainly the contribution of $5,000.00 toward the improvements of the Gardiner to Cooke City road, their approved license expired at the end of 1916. During 1916, the only traffic over the road was Nels E. Soderholm, the mail carrier and merchant from Cooke City.[42]

In 1917, the Western Smelting and Power Company again requested permission for commercial use of the road without any contribution toward the road's maintenance or improvement. McKay again visited Washington, but this time he sought permission to build a railroad through the park to connect the existing terminus with the Cooke City mines. Permission was denied, but his second proposal was accepted, the construction of a metal-surfaced automobile road up the Yellowstone River to Tower Junction, up the Lamar Valley to Soda Butte Creek and on to Cooke City. The terms of the 1917 agreement, called for construction to begin within 2-years and completed as soon as possible with the contract expiring after 20 years. The secretary of the interior had the authority to regulate all traffic and fix the rates for the transportation of freight and passengers, $15.00 per ton each way for the transportation of freight and a sum not to exceed $6.00 each way for each passenger. Shortly thereafter, the United States entered World War I and McKay was not able to arrange the financing for the project. He was, however, granted the right to operate his vehicles over the road during 1917.[43] During the summer of 1917, road crews hired by the Yellowstone Mining Corporation of Livingston, Montana under the supervision of engineer Will Hartman spent an entire month, including Sundays, repairing the roads, bridges and culverts from Mammoth Hot Springs to Cooke City.

Using a crew of 15 to 18 men with 2, 4-horse teams and 1 single team and 2 saddle horses, the crew began at Mammoth Hot Springs. Some of the equipment was borrowed from the Army engineers and some furnished by R. I. McKay of Cooke City. Most of the work involved repairing broken and washed out culverts, opening old drains and installing some new ones, removing earth slides and rock slides, and opening the road for traffic. The work on this road segment was described as:

> Very little was done on that portion between the Yellowstone River bridge and the Lamar Canyon other than some dragging. In the Lamar Canyon about 2-1/2 days were put in removing slides and big rocks that had fallen down into the road. Some of these rocks were so large that they had to be broken with powder before they could be handled. There were also some very deep ruts washed on the hill in the canyon which were filled and the road leveled, new drainages made so as to better handle and surface water. Just east of the canyon several culverts were repaired and some had mud holes filled. . . . About 4 days were required to work that portion of the road from the Buffalo Corral to Soda Butte Station. Practically all of this time was used in hauling and placing large riprap on the Jackson Grade, which is a point opposite the junction of the Lamar River and Soda Butte Creek. The river at this point had washed out the old riprapping and cut into the road and as the road was quite narrow at that point and the river was at its highest water at the time, riprapping was necessary. About 200 tons of rock were used in repairing and making the road safe at this point. A couple of new culverts were also put in nearer to Soda Butte Station.
>
> Between Soda Butte Station and Tate Creek (sometimes called Pebble Creek) the Fish Creek grade had to be widened due to slides. High water on Pebble Creek threatened to take out the bridge there and nearly all of the west end of the bridge had been washed out so that it was impassible. This bridge had been built on open timber crib work which had been filled with the gravel from that creek bottom. The fine gravel had been washed out and there was nothing to hold the cribbing which were fast and undermining and washing away. We hauled about 50 tons of boulders and rock for riprapping and worked this in with brush and timber and finally turned the current and repaired the bridge to such an extent that it was passable and useable. About 3-1/2 days were put in on this bridge with the entire crew.
>
> From Pebble Creek to the east boundary of the park, the road was dragged, ruts and mud holes repaired, drained filled, drain ditches opened or constructed where needed most, and culverts and bridges repaired or built where necessary to make the road easily passable to traffic.[44]

In November, 1917, the Army district engineer, Maj. John Schultz wrote to Chester Lindsley, superintendent of the park, that his recent inspection of the Cooke City road revealed damage to some the smaller bridges particularly those on either side of the Buffalo Farm. He found the corduroy pole decking broken in some places which could have caused injury to the horses using the bridge. It was his opinion that the 7-ton freight trucks used by the Buffalo-Montana Mining Company and owned by R. I. McKay, were responsible for the damage. McKay did not want to take full responsibility for the damage and did not want to repair them at that time.[45]

Then in June of 1918, high freshets carried away the Pebble Creek Bridge, the Soda Butte Bridge, and the Lamar River Bridge. Almost immediately private citizens associated with Cooke City began making arrangements for the reconstruction of the Lamar River Bridge.[46] The high water in 1918 caused damage all over the Park.

During 1917 and 1918, the Department of Interior and the newly created National Park Service were beseeched by the local mining companies with several propositions and schemes for passage of commercial traffic through the park. Mather favored a scheme in which different companies would combine under one transportation company to build the road to Cooke City, particularly since McKay could not undertake the project alone. Mather called upon the mining men to set "all differences of opinion, jealousies, and prejudices be laid aside, and that all work together in the interest of Cooke City." Mather expressed the National Park Service's desire to work with the Cooke City interests while "zealously guarding Yellowstone National Park."[47]

During 1920 and 1921, the relations between the mining promoters and Horace Albright, superintendent of the park, and Stephen Mather, director of the National Park Service, took a different turn. In the request for a denial of the transfer of Robert McKay's franchise to construct a hard surface road from Gardiner to Cooke City to W. D. Marlow of Livingston, Montana, Albright outlined the slightly questionable motives of the mining operators:

1. McKay failed to meet the terms of the contract regarding the survey, planning, specifications, drawings, and construction of the road by the specified date. McKay only completed a survey from Gardiner to Tower Falls. The survey was discontinued due to nonpayment of the crew for expenses and wages.

2. McKay failed to post the required $25,000 bond.

3. Without an approved transfer of the franchise, Marlow claimed to have been meeting some of the financial obligations, however, Albright stated that some claimed that no one met the payroll.

4. The mining companies seemed to use the Department of the Interior's approval of the franchise in their promotion for the sale of the mining stocks. Albright felt that the Cooke City mining prospects were marginal and the use of the government for inflating their value was unethical. He felt on that alone, the franchise should be revoked.

5. The continual agitation for a railroad through the park was taken one step further under the guise of the first road survey from Gardiner to Tower Falls. The promoters who now offered the possibility of a rail connection to Gardiner, actually ordered the road survey to give a 2 percent grade and not to exceed 4 percent at any point. Albright perceived their motives and insisted that a heavier grade would have to be used, not only to offset the unusually high construction costs of such low grades, but to prevent the grade being ever used for a railroad.

6. The survey had been completed for the Cooke City to Red Lodge road. Albright felt that the National Park Service and the Department of Interior should encourage its construction. Not only would its completion relieve the commercial traffic through the Park, but it would also offer a new route for visitors from the Billings, Montana area.[48]

Evidently nothing transpired with McKay or Marlow after the 1920 transactions. In June 1921, Albright wrote to Mather that he thought:

> Some honest development work done in Cooke this summer . . . [might] involve some freighting, I think that we ought to let this be done without quibbling over details covering the maintenance of the road. A little honest development work would not involve more than fifty or sixty tons of freight. However, I think we can depend on some more of the crooked promoters getting to work before long, and in my opinion these people should be shown no consideration whatever.[49]

In 1929, former superintendent of the Park and now director of the National Park Service, Horace Albright explained to Wyoming Sen. Francis Warren, who had inquired about the road on behalf of mining interests, that with so little funding for the park roads, this road segment would probably not receive any attention until 1932 or 1933. He noted that the East Entrance Road from Cody would be finished first.[50]

Even though the Bureau of Public Roads began their extensive road program in the Park in 1926, the locational survey for the Northeast Entrance Road was not completed until the fall of 1933, which corresponded to the near completion of the Red Lodge to Cooke City Road, the fifth approach road to the Park. The first segment of this road to be reconstructed was the 13.052 miles between the boundary and the Soda Butte Ranger Station. Under the supervision of A. O. Stinson, both sides of Soda Butte Creek were studied and evaluated, with the east side of the creek being chosen due to Baronett Peak being more precipitous and located considerably closer to the proposed road than Abiathar Peak on the east. It was judged that Baronett Peak's exposure to the sun would result in "more rapid and destructive" spring runoff.[51]

Morrison-Knudsen Company received the grading contract for 10.529 miles of 24 feet shoulder to shoulder road for a contract amount of $185,675. Strong and Grant of Springville, Utah received the contract for the bridges on this segment, two over Soda Butte and one over Pebble Creek, for a contract amount of $68,837.00. In October of 1934, a slide of conglomerate rock occurred in Ice Box Canyon. After cleaning up the small rocks on the hillside and in the creek, the crew left two large stones on the roadside which appear to be a natural ledge as the tops of the rocks were approximately level with the road grade.[52] During the 1934 season, the National Park Service landscape architects felt that the newly constructed drainage ditches were both too deep and out of proportion to what was necessary. The park officials also opposed the construction of proposed dikes near Pebble Creek.[53]

In October, 1935, the 10.529 miles grading project was completed. Granite had been selected as the choice for the masonry headwalls that were placed on the C.G.M.P. culverts on this completed section.[54] Earlier that summer, survey work had been progressing on the western portion of the Northeast Entrance Road. It was during this portion of the project that the Wildlife Division requested that one alternative, placing the new alignment on a line north of Junction Butte and passing very close to Trumpeter Lake on the south side, be discarded. Roger Toll, the superintendent, notified the Bureau of Public Roads that "it is highly desirable to give as much protection to the family of trumpeter swans that have nested on this lake for several years. It is, therefore, desired not to construct the road near this lake."[55]

In 1936, grading and the construction of minor drainage structures on 7.679 miles of road west of the Soda Butte Ranger Station had been awarded to Peter Kiewett and Sons, Contractor. One of the problems on this segment was the selection of gravel borrows as the open country through which the road passed had high visibility from the road and any side hill excavations would promote extensive erosion. Thus, four borrows within the high water level of the Lamar River and Soda Butte Creek were selected. The intrusive telephone line, which had run along the lower side of the old road, was moved to a less objectionable location on the upper side of the road. [56] The grading of the 0.913 miles in Lamar Canyon began in 1937 and by October 1938, Max Keeney had started the surfacing of all three sections of the Northeast Entrance Road.[57] With the completion of the approach road from Red Lodge and the completion of the new entrance station in 1935, the traffic on this road segment increased. In fact, between 1936 and 1937, the Northeast Entrance Road had the biggest percentage increase over any other road segment in the park, 55 percent. The 1936 volume of vehicular traffic was 4,710 and increased to 7,320 the following year.[58]

During 1939, foundation investigations were completed for the proposed Lamar River Bridge and the landscape architects were kept busy with several problems. In addition to having "considerable difficulty with the stone wall in the Lamar Canyon.", three major and three minor structures on this road had been stained a brown or buff color resulting in a color that "was a very peculiar yellowish brown, entirely out of harmony with the immediate surroundings". According to the Public Roads Administration engineer, "a very pronounced improvement was made from the landscape viewpoint, but from an engineering point of view the durability of the surface was undoubtedly impaired by the removal of from 1/16 to 1/4-inch of the concrete from nearly the entire surface of the structure.[59] Also during the year, the grading project for the segment from the Lamar Canyon to Yellowstone was advertised for contract.

In 1940, the 335-foot bridge over the Lamar River was completed and the survey began for the crossing of the Yellowstone River on the Northeast Entrance Road. In trying to compromise on a satisfactory citing, the preferred alternatives was discarded due to the foundation investigations revealing the existence of excessive amounts of hydrogen sulphide gas. Two other locations were considered, one of which was recommended as solid rock underlies the site, forming a seemly foundation for the suggested continuous steel deck truss bridge.[60] However, the bridge construction was delayed and a new Yellowstone River Bridge was not constructed until 1963.[61]

Near the end of 1941 and just prior to the United States entry into World War II, the Northeast Entrance Road was virtually complete with the exception of the 5.5 miles of road between the newly completed Lamar River Bridge and the proposed Yellowstone River Bridge. The grading had been completed for this segment in 1940, but the bituminous surfacing had not been finished. The entrance road was 24 feet shoulder to shoulder on fills and 24 feet from gutter to gutter in cuts. The surfaced width was 20 feet. The construction of several roadside parking areas, the installation of hub-high log guardrails, log barriers and stone barriers were also scheduled as part of the project.[62] As with many other road projects in the park, work came to a halt or was at least cut back very heavily. It would be the 1960s before any more major work was done on this road section and the road could be called complete.

By 1945, the rotting log railings on the bridges on the Northeast Entrance Road prompted a discussion of possibly replacing the railings with National Park Service standard type steel railing currently being used on almost all of the newly built concrete bridges in the Park. Thomas Vint felt that "since the bridges are not designed for the new type steel railings and the log railing can easily and economically be replaced, he recommended rather than to change type at this time."[63]

By the 1960s, the traffic volume on this road was 485 vehicles per day with a projected figure of 1,300 by 1980. The Yellowstone River Bridge had been completed and the entire road had been brought to an acceptable standard. A new road had been constructed near the new Yellowstone River Bridge and the intersection at Tower Junction had been widened considerably.

Some concrete culverts and headwalls had been replaced with metal end sections. Improvements to the road in 1962 totaled $19,299.53 and 2,515 linear feet of guardrail had been installed for a total amount of $18,988.61. In 1966, $220,167.70 of work was done on the roads and bridges by Long Construction. In 1984, 3,220 linear feet of log guard rail was installed by Cannon Builders of Blackfoot, Idaho.[64]

In the 1986 Parkwide Engineering Study for this entrance road, the road was divided into three segments for evaluation. The first segment, 10.54 miles between the Tower Junction intersection and the Lamar Ranger Station, was described as having a roadway width, shoulder to shoulder, between 22 and 34 feet. The bituminous plant mix surfaced width was 22 feet. The condition of the roadway was listed as poor to fair. The shoulders ranged from 0 to 6 feet and the condition listed as poor.[65]

The roadside conditions were considered good. Two major structures are on this segment, the Yellowstone River Bridge (1963) and the Lamar River Bridge (1940). The second segment, 8.38 miles between the Lamar Ranger Station and the Pebble Creek Campground intersection, was described as having a roadway width shoulder to shoulder, between 22 and 26 feet. The bituminous plant mix surfaced width is 22 feet and the road condition was described as poor to fair. The shoulder width ranged from 0 to 2 feet with the condition listed as poor. There are no major structures on this segment.

The third segment, 9.69 miles between the Pebble Creek Campground intersection to the park boundary, was described as having a roadway width shoulder to shoulder, between 21 to 28 feet. The bituminous plant mix surfaced width was 20 to 24 feet. The shoulder width ranged from 0 to 2 feet and the condition was listed as poor. Six major structures are on this segment, the Pebble Creek Bridge, the Soda Creek Bridge #1, Soda Creek Bridge #2, and bridges at Stations 268+57, 243+51, and 198+85.

In 1986, the traffic volume on this entrance road was 1400 vehicles per day with a projection of an average daily traffic of 1800 vehicles by 2005.

Fording Pebble Creek, 1913
Courtesy Yellowstone National Park Archives

Pebble Creek Bridge, 1930
Courtesy Yellowstone National Park Archives

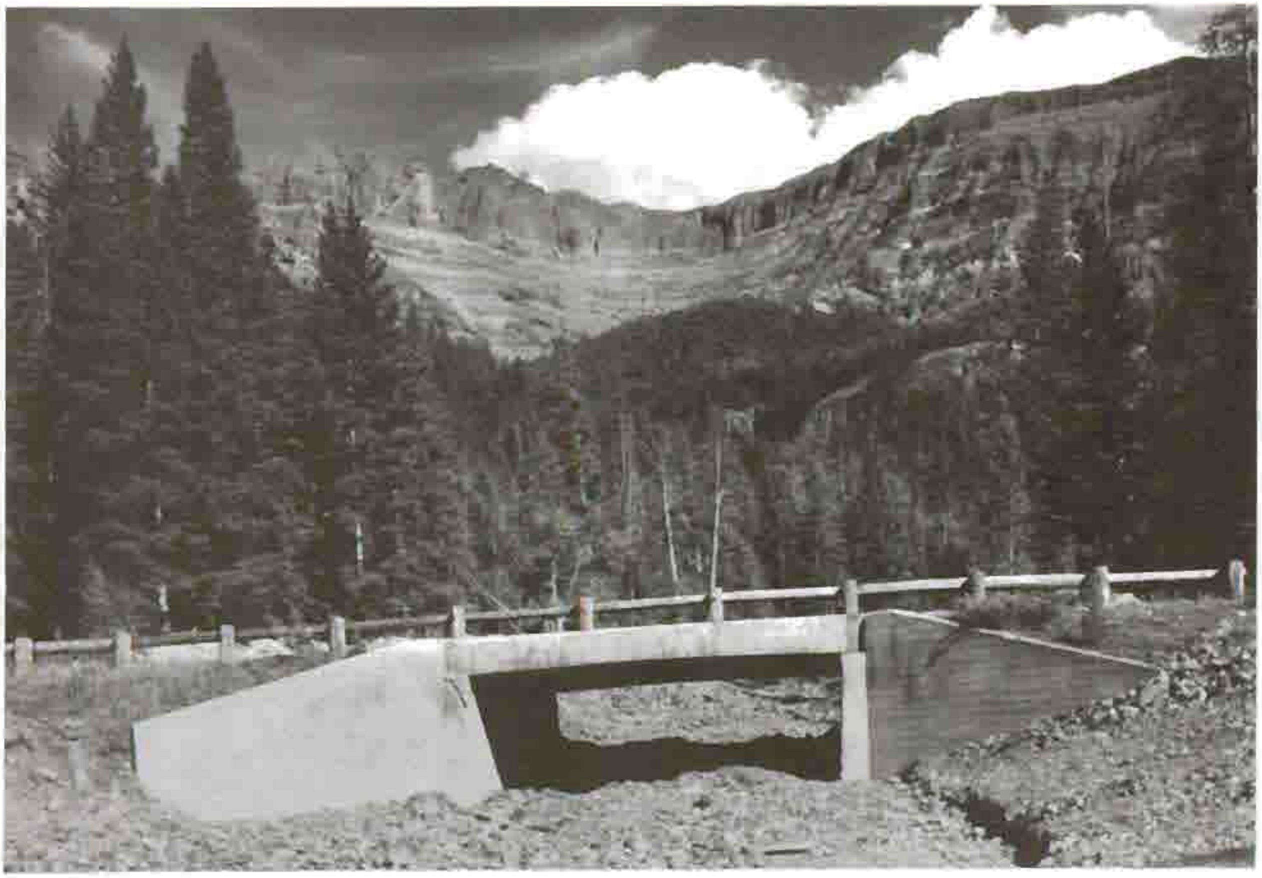
Pebble Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Lamar River Bridge, ca. 1900
Courtesy Yellowstone National Park Archives

Lamar River Bridge Broken by Overload, 1932
Courtesy Yellowstone National Park Archives

Lamar River Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

FHWA Creek Bridge
Courtesy Historic American Engineering Record, Jet Lowe, 1989



RWC Creek Bridge
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Soda Butte Creek Bridge
Courtesy Historic American Engineering Record, Jet Lowe

TLF Creek Bridge
Courtesy Historic American Engineering Record, Jet Lowe

Northeast Entrance Checking Station, 1935
Courtesy Yellowstone National Park Archives

ENDNOTES

1. K. Huppe, "Literature Search Emigrant-Gardiner 69 KV," Highland Technical Services, The Montana Power Company. March, 1988, 111.

2. A brief overview of the New World Mining District written in 1918 by Mr. J. T. Pardee. This document is included in material relating to Cooke City in the Archives at Yellowstone National Park.

3. According to the Lee Whittlesey's *Yellowstone Place Names,* John H. Baronett, who was born in Glencoe, Scotland, in about 1830, had "traveled in the South Pacific and the western America" before coming to the Yellowstone area in 1864. He guided and prospected in the Southwest and in Montana, including scouting for George Custer in 1868. Baronett is credited with finding the missing member of the Washburn expedition, Truman Everts, in 1870. Later, Baronett served several times as a guide for General Philip Sheridan on his trips to the Park. He was the "only member of the civilian police force to be retained when the army took over the Park in 1886. He was even considered for the superintendency of the Park in 1884. Baronett lived in Livingston until his death in 1901." Lee H. Whittlesey, *Yellowstone Place Names* (Helena, Montana: Montana Historical Society Press, 1988), 19.

In Aubrey Haines' classic *The Yellowstone Story,* he states that Baronett deserted a ship in China and made his way to the California gold fields. He also prospected in Australia and Africa and visited the Arctic on a whaling ship before returning to California in 1855. In addition to prospecting, he served as a courier for General Albert Sidney Johnston during the Mormon War, he joined the First Texas Cavalry during the Civil War and later served with the French under Maximilian in Mexico. In September of 1864, he returned to the Montana Territory crossing the Yellowstone Plateau and 2 years later he was on the 1866 Yellowstone Expedition. After serving with Custer on the Black Hills expedition, he returned to the Yellowstone country. After a long wait for compensation for his bridge from the Department of Interior, he was awarded $5,000. Haines states that he left the Yellowstone country with his money for an "expedition to Nome, Alaska during the last great gold rush. But his schooner and his hopes were both crushed in the arctic ice. Thereafter, the old man's health failed rapidly and he was last mentioned as an indigent at Tacoma, Washington, in late January or early February of 1901." Aubrey Haines, *The Yellowstone Story,* (Boulder, Colorado: Colorado Associated University Press, 1977), Vol. II, 446-447.

4. Richard A. Bartlett, *Yellowstone A Wilderness Besieged* (Tucson: University of Arizona Press, 1985), 118.

5. Aubrey L. Haines, "The Bridge That Jack Built", Yellowstone Nature Notes, Jan.-Feb. 1949, Vol. 21, 1-4.

6. Haines, *"The Bridge That Jack Built."*

7. F. V. Hayden, *Preliminary Report of the United States Geological Survey of Montana and Positions of Adjacent Territories Being a Fifth Annual Report of Progress by F. V. Hayden* (Washington D. C.: Government Printing Office 1872), 79.

8. Robert R. O'Brien, "The Yellowstone Road System. Past, Present, and Future,"(Ph.D. Diss., University of Washington, 1964).

9. A very good description of the 2-week pursuit of the Nez Perce Indians by Gen. O. O. Howard can be found in Aubrey Haines' *The Yellowstone Story,* 218-239, Volume I.

10. P. W. Norris, *Report Upon the Yellowstone National Park, to the Secretary of the Interior, for the Year 1878* (Washington D.C.: Government Printing Office, 1879), 986.

11. P. W. Norris, *Report Upon the Yellowstone National Park, to the Secretary of the Interior, for the Year 1879* (Washington D. C.: Government Printing Office, 1880), 22.

12. John Ponsford to Secretary of the Interior, 6 September 1880. Yellowstone National Park Archives, Yellowstone National Park.

13. John Ponsford to Secretary of the Interior, 22 October 1880. Yellowstone National Park Archives, Yellowstone National Park.

14. Ibid.

15. Norris, *Report Upon the Yellowstone National Park, to the Secretary of the Interior, for the Year 1879*, 19.

16. P. W. Norris, *Report Upon the Yellowstone National Park, to the Secretary of the Interior, for the Year 1880* (Washington D. C.: Government Printing Office, 1881), 25.

17. Clarence Stephens, Assistant Superintendent to Superintendent P. W. Norris, 2 November 1881. Yellowstone National Park Archives, Yellowstone National Park.

18. Dan C. Kingman, Notes on "Construction of Roads and Bridges in Yellowstone National Park", quoted in *Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887.*

19. Dan Kingman's report for 1885 which can be found in the Yellowstone National Park Library on microfilm. M63 R3. The site of this bridge is not located.

20. Transmittal letter of the *"Report of W. H. Phillips on the Yellowstone National Park."* 49th Congress, lst Session, Senate Executive Document No. 51.

21. Moses Harris, *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1887* (Washington D. C.: Government Printing Office), 1887, 7.

22. Harris, *Report of the Superintendent of Yellowstone National Park to the Secretary of the Interior, 1887, 12.*

23. Ibid, 13.

24. "A Standing Menace. Cooke City vs the National Park", *Forest and Stream,* December 8, 1892.

25. Maj. Hiram Chittenden to Maj. W. A. Jones, no specific date could be discerned, but it must be after November 16, 1892. Yellowstone National Park Archives, Yellowstone National Park.

26. George Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior 1895* (Washington D. C.: Government Printing Office, 1895), 11. George Anderson, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior 1896* (Washington D. C.: Government Printing Office, 1896), 13.

27. George Anderson, "Report, Office of Road Construction, November 9, 1896", *Annual Report of Superintendent Yellowstone National Park to the Secretary of the War for 1896.*

28. Anderson, *Annual Report of Superintendent Yellowstone National Park to the Secretary of War for 1896.*

29. Ibid.

30. Colonel S. B. M. Young, 3rd Cavalry, *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1897* (Washington D. C.: Government Printing Office, 1897).

31. Article in "Editor's Study" Column, *Harper's Magazine.* Vol. XCIV, January, 1897.

32. Hiram Chittenden, "Improvement of the Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges." *Annual Report of the Chief of Engineers for 1899,* Appendix EEE, (Washington D. C.: Government Printing Office, 1899), 12.

33. Aubrey Haines, "The Bridge That Jack Built," *Yellowstone Nature Notes*

34. Mr. K. S. Chamberlain, Division Engineer, Bureau of Public Roads, to Mr. Edmund Rogers, Superintendent, Yellowstone National Park, 6 September 1956. Yellowstone National Park Archives, Yellowstone National Park.

35. Capt. Hiram Chittenden and Maj. John Mills, *Annual Report Upon the Construction, Repair and Maintenance of Roads and Bridges In the Yellowstone National Park and the Road Into Mount Rainier National Park; Survey for Wagon Road From Valdez to Fort Egbert, Alaska, and Survey for Military Trail Between Yukon River and Coldfoot, Alaska,* Appendixes FFF and KKK *of the Annual Report of the Chief Engineer for 1904* (Washington D. C.: Government Printing Office, 1904), 4174. In Aubrey Haines' article *The Bridge That Jack Built,* he wrote, "Harry Trischman says that the old bridge was used by fishermen until 1905, but finally became so dangerous that it was necessary to burn it in that year." He also stated that the American Bridge Company built the new bridge on the site of the present crossing.

36. Capt. Ernest Peek and Maj. Hiram Chittenden, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park* (Washington D. C.: Government Printing Office, 1908), 2549. 1st Lt. Wildurr Willing and Maj. C. W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park* Appendixes GGG and HHH (Washington D. C.: Government Printing Office, 1909), 2511.

37. "Improvement of Yellowstone National Park Maintenance and Repairs, Report of Operations for October, 1914."

38. "Report on the Operations on Yellowstone National Park for May, 1915."

39. Stephen Mather, Director of the National Park Service to Sen. H. L. Myers, Chairman, Committee on Public Lands, 19 February 1918. Yellowstone National Park Archives, Yellowstone National Park.

40. "Report for July, 1915, Yellowstone National Park." "Report for August, 1915, Yellowstone National Park."

41. "Report for September, 1915 for Yellowstone National Park." "Report for November, 1915 for Yellowstone National Park."

42. Mather to Myers, February 19, 1918. Yellowstone National Park Archives, Yellowstone National Park.

43. Ibid.

44. Will Hartman, engineer, to E. B. Bubard, Manager Yellowstone Mining Company, 26 November 1917. Yellowstone National Park Archives, Yellowstone National Park.

45. Maj. John Schultz, Corps of Engineers, to Chester Lindsley, Superintendent, Yellowstone National Park, 9 November 1917. Yellowstone National Park Archives, Yellowstone National Park.

46. Maj. G. E. Verrill and Col. George Zinn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park* (Washington D. C.: Government Printing Office, 1918), 3835.

47. Verrill and Zinn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park,* 3835.

48. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, 14 October 1920. Yellowstone National Park Archives, Yellowstone National Park.

49. Horace Albright, Superintendent, Yellowstone National Park, to Stephen Mather, Director of the National Park Service, 3 June 1921. The records that were used for this study did not reveal any more contact with the mining companies, or reveal any more transactions with them. The gap in the records are therefore between 1921 and the mid-1920s. Yellowstone National Park Archives, Yellowstone National Park.

50. Horace Albright, Director of the National Park Service to Senator Francis Warren, March 6, 1929. Albright replaced Stephen Mather as director on 12 January 1929. Yellowstone National Park Archives, Yellowstone National Park.

51. L. Foreman, "Final Construction Report (1936) on Tower Junction - Cooke City Highway Project RTEC 8-A1, Small Bridges and Culverts, Yellowstone National Park, State of Wyoming. File 485 Yellowstone RTEC 8-A1. Accounts No. 2432. March 9, 1937." Yellowstone National Park Archives. Yellowstone National Park.

52. Frank Mattson, Associate Architect, Robert G. Hall, Jr. Landscape Architect, and Robert Albers, Jr. Architect, "Report to the Chief Architect Through The Superintendent of Yellowstone National Park for the Period - September 28 to October 28, 1934." History Files. Yellowstone National Park Archives. Yellowstone National Park.

53. Frank Mattson, Resident Landscape Architect, "Report to the Chief Architect Through Superintendent, Yellowstone National Park for Month of October, 1934." History Files. Yellowstone National Park Archives. Yellowstone National Park.

54. C. F. Capes, Bureau of Public Roads Engineer, "Monthly Narrative Report, Yellowstone National Park, Bureau of Public Roads District No. 3, June 30, 1935." History Files. Yellowstone National Park Archives. Yellowstone National Park.

55. Roger Toll, Superintendent, Yellowstone National Park, to C. F. Capes, Bureau of Public Roads, 26 September 1935. Yellowstone National Park Archives, Yellowstone National Park.

56. Sanford Hill, Resident Landscape Architect, Yellowstone National Park, "Monthly Narrative Report to Chief Architect Through the Superintendent on Major and Minor Roads and Trails and Projects Other Than E. C. W. for Yellowstone National Park Period: June 24th to July 25, 1936." R.G. 79. Yellowstone Box 10. National Archives and Records Center. Denver, Colorado.

57. Sanford Hill, Resident Landscape Architect and James Somerville, Assistant Landscape Architect, "Report on Yellowstone National Park, October 1938." R.G. 79. Yellowstone Box 10. National Archives and Records Center. Denver, Colorado.

58. C. F. Capes, "Traffic Survey Report Intra-Park Travel Season 1937, Yellowstone National Park, Wyoming. September 20, 1937."

59. Sanford Hill, "Narrative Report on Yellowstone National Park for June, 1939." O. D. Van Buskirk, Jr., "Final Report (1938-39) Tower Junction-Cooke City Project 8-A1 Bridge Betterments Yellowstone National Park Wyoming. Public Roads Administration, D-3." R.G. Yellowstone. Box 10. National Archives and Records Center, Denver, Colorado.

60. L. F. Copeland, "Report on Proposed Alternate Bridge Locations and Recommended Structure Types for the Crossing of the Yellowstone River Route 8, Northeast Entrance Yellowstone National Park." This report discusses in detail the problems and possible solutions for bridge construction in this location. For some reason, one of which is no doubt the delay in all road work because of World War II, the bridge was constructed until 1963. History File. Yellowstone National Park Archives, Yellowstone National Park.

61. "Final Construction Report (1961-1963) on Yellowstone National Park Project 8 Bridge and Approaches Northeast Entrance Yellowstone National Park Wyoming." Office of Maintenance Division. Yellowstone National Park.

62. C. F. Capes, "Final Survey and Design Report (1941) on Northeast Entrance Road 8-A4 National Park Project Yellowstone National Park State of Wyoming, November 28, 1941." Loose Folders. Yellowstone National Park Archives. Yellowstone National Park.

63. A.W. Burney, Acting Chief Engineer, Yellowstone National Park to Regional Director, Region 2, National Park Service. 2 April 1945. National Archives R.G. 79. Yellowstone Entry 7 Box 174.

64. "Final Construction Report (1963-1964) on Yellowstone National Park Project 8 Grading, Base and Bituminous Surfacing Northeast Entrance Road Yellowstone National Park Class 1 National Park Highway Park County State of Wyoming." "Real Property Records, Yellowstone National Park," Rocky Mountain Regional Office, National Park Service, Denver, Colorado. Office of Maintenance Division. Yellowstone National Park.

65. "Parkwide Road Engineering Study of the Yellowstone National Park Road System, Draft Report, October 1986," U.S. Department of Transportation, Federal Highway Administration, Vancouver, Washington, 1986. Volume I.

Chapter XV

HISTORY OF EAST ENTRANCE ROAD

Appropriations for the East Entrance Road were approved June 6, 1900 and March 3, 1901, with work beginning July 1, 1901 under the direction of Capt. Hiram Chittenden. After careful inspection of the two possible routes, Jones Pass and Sylvan Pass, both of which were considered "excessively difficult", the Sylvan Pass route was chosen. Several reconnaissance surveys were made on the Sylvan Pass route finding immense physical obstacles, but Captain Chittenden favored the selection because "The pass is one of great scenic beauty and will be an important addition to the attractions of the Park." The lower elevation, by 1000 feet, of this route over the higher Jones Pass route was also factored into the selection.[1]

With the termini of the route, the outlet of Yellowstone Lake and a point where the east entrance boundary crosses the Shoshone River, predetermined, the survey proposed a route which left a point 1/4 mile below the lake outlet in a straight line over flat ground through a forested area to the Pelican Creek valley. From that point the road went along the north bank of Indian Pond (also known for a number of decades as Squaw Lake) and on the west shore of Turbid Lake, crossing over a low pass east of Lake Butte between Bear and Cub Creeks. After crossing Cub Creek, above the hot springs, the road followed the slopes of the hills that divide the Cub and Clear creek valleys. On either side of Cub Creek, the road offered very good views of Lake Yellowstone. The route then ascended the Clear Creek valley on the creeks north bank to Sylvan Lake.[2]

Chittenden described the area in his report for 1901, "This place is one of scenic attractions unsurpassed in any part of the mountains. Sylvan Lake is a small but exceedingly beautiful sheet of water near the summit of the pass, which is about 2 miles farther east". From Sylvan Lake to the Pass, the road then traverses very difficult natural conditions for the pass is very narrow. Captain Chittenden called it ". . . unique among mountain passes in that it is almost entirely loosened from the cliffs on either side by the action of frost. This broken rock varies in size from fine pebbles to pieces a cubic yard in volume."[3] From the top of the pass, the route descended on an extreme grade down into the valley of the North Fork of the Middle Creek for approximately 4 miles to the junction with the main creek. From that point the survey suggested that the route follow along the north bank of the Middle Creek to its junction with the Shoshone River, approximately 7 miles east.

Despite very difficult natural conditions such as excessively steep slopes, unstable ground, prevalent avalanche and landslides conditions, and huge boulders in the route, Captain Chittenden believed that the "scenery along the entire valley of this stream is on the highest scale of grandeur and sublimity" outweighed the obstacles.

During the first construction season, the crews cleared a swath 30 feet wide and 12.3 miles long,from the lake outlet to a point 3/4 of a mile from the Cub Creek crossing. A total of 41 acres was cleared and in most cases the timber was "taken out of sight of the roadway." The grading from the lake outlet to near Indian Pond and on to the top of a ridge south of Turbid Lake, provided a passable road 9.6 miles in length. The grading project also included the construction of a causeway across Pelican Flats, which was 1,500 feet long, 18 feet wide, and 3 1/2 feet high. An approach to the Yellowstone River, 18 feet wide and 4 feet high with cribbing to the top, was also part of the project. Some the road projects were slowed due to the crews being pulled for two weeks of fighting forest fires.[4]

Early in the planning stage, a ferry site was chosen on the Yellowstone River, 1/4 mile from the lake outlet. Pile and timber approaches, which extended 2 feet on either side of the water line, were constructed in a position to point downstream at an angle of 3 degrees to the norm of the current. Later, construction began on a pile vent bridge, 360 feet long on earth approaches. The average penetration of the driven piles was 7 feet. In order to provide access for rowboat passage and to avert a heavy embankment on the eastern approach, the bridge's center was raised approximately 3 feet above the ends giving it a curved profile. The bridge was completed in 1902. The other substantial bridge completed that year was another pile bridge, 192 feet long over Pelican Creek. In addition to these two bridges, which Chittenden described as "plain structures", the crews, under the supervision of assistant engineer, S. F. Crecelius, built six other bridges over streams between Turbid Lake and Sylvan Pass, the longest of which crossed Cub Creek.[5]

The road opened to the public on July 10, 1903, but the excessively steep slope east of Sylvan Pass remained an important piece of unfinished work. In 1905, several wooden bridges were built along the route, including one over Grinnell Creek. The following year, an 150 feet wooden viaduct was completed on the difficult section east of Sylvan Pass. Chittenden described the construction of the viaduct "by which the road down the mountain on the east side of Sylvan Pass is made to pass over itself in order to secure the necessary reduction in grade".[6]

In addition to the 1909 construction of a new bridge at Turbid Lake and the construction of a 25 foot timber bridge at an unnamed location on the East Entrance Road in 1913, not much new construction was undertaken until 1916 and 1917.[7] By 1917 the wooden viaduct east of Sylvan Pass was replaced by a 60 feet span wooden bridge with a large rock fill at the west abutment. The Pelican Creek Bridge was partially refloored and many of the smaller bridges along the route received lesser repairs. Some widening and grading was done, as well as the installation of numerous galvanized-iron culverts.[8]

The Park received the first road paving appropriation for the Grand Loop in 1917, however, most of the money was returned to the general treasury as a result of the United States entry into World War I. Soon after the end of war, automobile travel to the park increased tremendously as reflected in the statistics for 1917--5,703 automobiles entered compared to 10,737 in 1919. This increase naturally would necessitate more road improvements.[9] In 1923, seven miles of road were widened and 3 miles were surfaced.[10]

During 1924 and 1925, there was much debate over the advantages and disadvantages of the Bureau of Public Roads taking over the responsibility of road improvement and road construction in the national parks. However, there was one agreement between the two groups in regards to road work in Yellowstone and that was the fact that the East Entrance Road from the Lake outlet to the East boundary would need complete reconstruction on most segments. A 1925 estimate for the reconstruction project was approximately $400,000.[11]

In 1926, the Bureau of Public Roads reached a working agreement with the National Park Service and construction of the East Entrance Road became one of the first projects under the new arrangement. As part of the agreement, the Bureau would provide all of the technical expertise and the National Park Service landscape architects would provide the design and special treatments pertaining to landscape architecture. The National Park Service and the Bureau worked closely in order for the road system including the bridges to harmonize with the natural features and surroundings.

The 1927 survey between Sylvan Pass and the Fishing Bridge suggested that the new road be relocated to take advantage of higher vistas including the Grand Teton in addition to the elimination of many sharp turns and curves.[12] During, July of 1928, the contractor, Morrison-Knudsen Company of Boise, Idaho, completed different stages of clearing, grubbing, grading, and surfacing. Cement rubble headwalls were installed by a masonry crew of one stone mason and two helpers.[13] The mason's work also included the construction of the Cub Creek Bridge.

On September 2, 1928, a heavily loaded and miscalculated shot went off causing significant damage to the standing timber on the hillside and even onto the opposite side of the canyon. Immediate cleanup was ordered, but a more abiding consequence resulted with the issuance of more stringent changes to the specifications.[14] The crews finished the 1928 construction season with more cleanup, plowing portions of the old 1901 road, dressing of the borrow pits and put finishing touches at points requested by Superintendent Albright and the park landscape architect.[15]

The following construction season, blasting procedures were carried out in a safer manner and precautions were taken to both protect the passing traffic and also to try to reduce the inconvenience to the visitors. Between 7 p.m. and 7 a.m., the East Entrance gate and a barricade at Fishing Bridge were padlocked to prevent nighttime travel. During the working hours, flagmen used a signal system at potential dangerous points. Extensive settlement occurred over the winter on the completed Cub Creek section. In one case the road settled as much as 3 1/2 feet and minor sliding occurred in several places.[16] Construction work, mostly grading, drainage and some surfacing, during the 1929 season concentrated in the eastern half of the road, between Sylvan Pass and the East Entrance. The grading on the East Entrance Road was considered by the Bureau officials to be "one the heaviest, per mile, grading jobs that will be had in Yellowstone and one which involved greater traffic hazards and difficulties than will usually be expected".[17] The mason and his crew completed cement rubble masonry work on the concrete box culverts and corrugated metal pipe culverts were installed as the drainage work demanded.[18]

Completing the surfacing on the segment lasted for the next few construction seasons. In 1934, construction began on the new Pelican Creek Bridge and the Sedge Creek Bridge.[19] By 1935, 25.64 miles of the 26 miles East Entrance Road had been completed. The remaining section, the approaches to the Fishing Bridge were completed and opened to travel on August 1, 1937.[20] By this time, the East Entrance Road was the most heavily traveled road in the park with 50,176 vehicles using it. The second heaviest volume of traffic was on the Lake Junction to Canyon segment with 43,645 vehicles.[21]

In 1939 and 1940, the road received a 6" depth of base course surface of crushed rock and gravel and a 2" top course of dense graded plant mix bituminous surfacing with a stone chip cover coat to the width of 22 feet with 1 foot shoulders. A short realignment was made at Steamboat Point to move the existing road off a thermal area to solid ground. The crushed rock used in the surfacing material came from flattening out slopes on Sylvan Pass; the medium quality bank gravel and the good quality lake shore gravel for aggregate came from two nearby pits. The binder material, which came from a pit near Sylvan Lake, was mixed with rock from Sylvan Pass and from a roadside cut at the east entrance to the spur road for Lake Butte.

The top course, which had been stockpiled and dried, was mixed with MC-3 outback asphalt at a Madison stationary mixing plant. The mixture was then spread by a paving machine at an average temperature of 200 degrees F. and was rolled with a 7-ton roller approximately 3 hours after being spread and then again the second day. Traffic flowed on lane after the first rolling. After 4 to 5 weeks the seal coat and a final layer of stone chips were applied then rolled with a 8 to 10 ton roller. The road was opened to traffic 24 hours after the last rolling. In addition to the surfacing, new parking areas, including a very large area just west of Fishing Bridge were constructed.

The contractor, Taggert Construction Company of Cody, Wyoming, brought the equipment and supplies in from Cody, as well as obtaining the asphaltic material from Cody area refineries. No great difficulties were encountered on this two year project and no major accidents occurred. Most of the skilled labor were hired from the Cody area; in 1939, the unskilled labor were hired from the National Reemployment Service office at Mammoth Hot Springs and in 1940, from the National Reemployment Service office in Cody. The 74 men crew were based at a camp located 1/2 mile north of Fishing Bridge and used the National Park Service mess hall at Lake and the contractor's at Pelican Creek.[22]

In the spring of 1941, Wyoming Congressman John J. McIntyre requested the National Park Service consider keeping the East Entrance Road open year round. In the National Park Service acting director's negative reply, he emphasized the severe winter road conditions on that segment and the extreme high costs of keeping that section of the park open. He stated that a 1940 study examined the feasibility of keeping the park roads open during the winter, but the high costs in addition to the severe weather conditions and the small numbers of winter visitors, compelled the National Park Service to deny opening up the Park for winter travel.[23]

The United States' entry into World War II brought major road projects to a halt and it would be the MISSION 66 period before the East Entrance Road underwent any major work. Up to 1960, $2,567,000.00 had been spent on the 26.3 miles East Entrance Road and 3.9 miles of parking area. In 1961, $8,343.46 was spent on bridge work and improvement. In 1962, $42,698.84 was spent on resurfacing, replacement of 1,540 feet of guardrail and work around Indian Pond.[24]

In 1963, a location survey was completed for the segment of the East Entrance Road beginning at a point 1,000 feet west of the Sylvan Pass summit to the east boundary of the Park and also including an 850 feet connection to U. S. Highway 14 and 20 in the Shoshone National Forest. In November, 1964, the contract was awarded to Cave Construction, Inc. of Great Falls, Montana. The project, which began on July 1, 1965, began with clearing, excavating and embankment construction. The crews excavated using 966 Caterpillar front-end leaders, Euclids, dump trucks and dozers. Tractor-drawn sheepsfoot or vibratory rollers were used for compaction, with the water needed for compaction of subgrade and base course being obtained from Middle Creek by the assistance of a portable water plant and tank trucks.

The material for the base course came from a talus slope south of Sylvan Pass summit. The placement of the bituminous preservative treatment was completed on August 18, 1966. In addition to road surfacing, 4,550 lineal feet of 18-inch trench was dug for the Mountain States Telephone Company's underground cable . Corrugated metal pipes, 18 inches to 30 inches in diameter, with concrete headwalls, drop inlets and metal end sections were installed to aid surface drainage. Two of the existing culverts were enlarged by using 10' by 5'3" structural plate arch pipes. Before the project ended, some grading, realignment, widening of the existing road, construction of a new entrance station and several parking areas were completed. The engineers reported that "no unusual engineering problems" were found on this project. The total cost of the project excluding the utility work amounted to $687,935.39. The work crews, who mostly came from the area, lived in trailer houses which were sited outside of the park, near Holm Lodge.

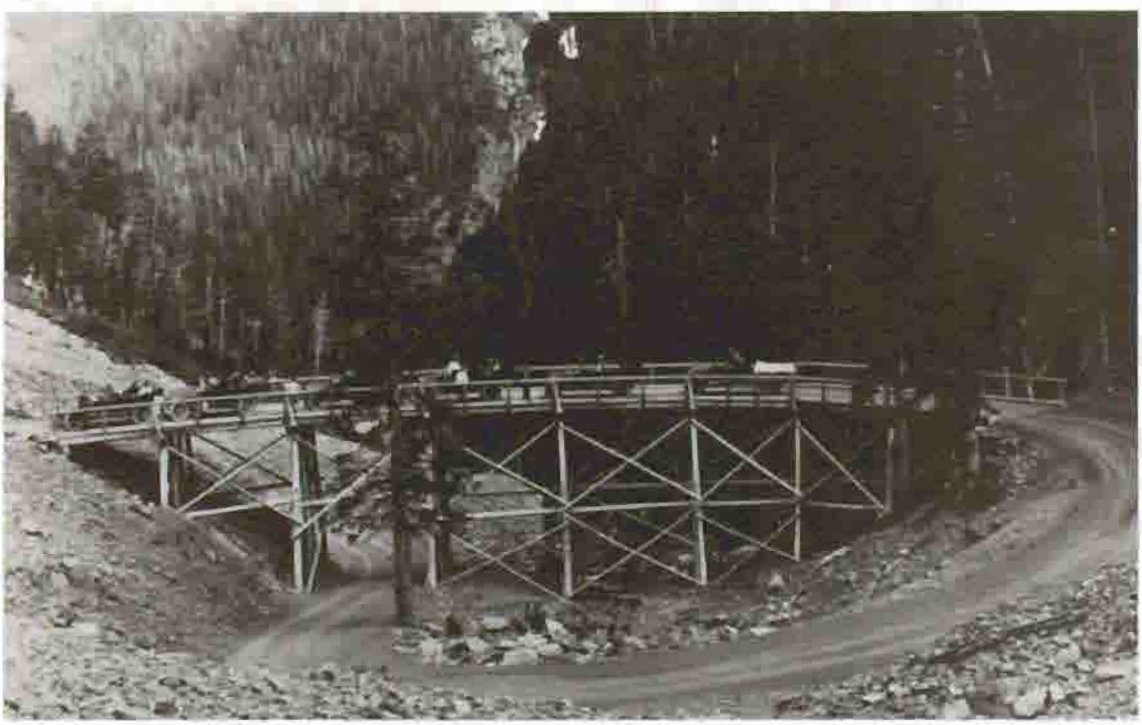
At the conclusion of the project, the engineers recommended a surfacing contract for the reshaping and permanent surfacing of the old roadway which had received damage from the heavy construction traffic. The engineers considered the old road to be in a hazardous condition.[25] In 1968, $847,078.11 was spent on the same section of road and on 8.053 miles of parking In 1969, $2,954.77 was spent on the same section. In 1970, $348,827.02 was spent on shoulder improvements and in 1976, $631,401.02 was spent on bituminous surfacing of previously constructed section from the East Entrance to Sylvan Pass. In 1983, $132,497.00 was spent on replacing the cable guardrail and in 1987, more guardrail work was completed for an a cost of $1,906.10. Thus as of 1987, $4,422,406.76 had been spent on the East Entrance Road. Extensive repair was done to 2,430 linear feet of masonry guardrail east of Sylvan Pass. Approximately 2,290 linear feet of wooden quardrail was replaced, including the rails on the Pelican Creek and Sedge Creek Bridges.[26]

Cub Creek Bridge, ca. 1900
Courtesy Yellowstone National Park Archives

Cub Creek Bridge, 1929
Courtesy Yellowstone National Park Archives

Cub Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe, 1989

Corkscrew Bridge, 1912
Courtesy Yellowstone National Park Archives



Corkscrew Bridge, 1917
First Cars on Wooden Structure
Courtesy Yellowstone National Park Archives

Corkscrew Bridge, 1922
Courtesy Yellowstone National Park Archives

Fishing Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe

Sedge Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe

Pelican Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe

East Entrance Checking Station, 1924
Courtesy Yellowstone National Park Archives

East Entrance Checking Station, 1929
Courtesy Yellowstone National Park Archives

East Entrance Checking Station, 1941
Courtesy Yellowstone National Park Archives

ENDNOTES

1. Hiram Chittenden, *Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park and Construction of Military Road from Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyoming and Erection of Monument to Sgt. Charles Floyd In the Charge of Hiram M. Chittenden, Captain, Corps of Engineers.* Appendixes FFF, III, and JJJ *of the Annual Report of Chief of Engineers for 1901* (Washington D.C.: Government Printing Office, 1901), 3794.

2. The segment of 1901 route from Turbid Lake to Sylvan Pass is roughly the same route as the designated pack trail route, ---.

3. Chittenden, 3780-82.

4. Ibid, 3794

5. Hiram M. Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges. Annual Report of the Chief of Engineers for 1902,* Appendix FFF (Washington D.C.: Government Printing Office, 1902), 3035.

6. Hiram M. Chittenden, and John Mills, *Annual Report Upon the Construction, Repair, and Maintenance of Roads and Bridges In the Yellowstone National Park and the Road Into Mount Rainier National Park; Survey for Wagon Road from Valdes to Fort Egbert, Alaska, and Survey for Military Trail Between Yukon River and Coldfoot, Alaska,* Appendixes FFF and DDD *of the Annual Report of the Chief of Engineers for 1905* (Washington D.C.: Government Printing Office, 1905), 2811.

Hiram M. Chittenden, Ernest Peek, John Mills, and Francis A. Pope, *Annual Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and the Road Into Mount Rainier National Park,* Appendixes GGG and JJJ *of the Annual Report of the Chief of Engineers for 1906* (Washington D.C.: Government Printing Office, 1906), 2255.

7. Wildurr Willing and C.W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park,* Appendixes GGG and HHH (Washington D.C.: Government Printing Office, 1909), 2510.

C. H. Knight, J.B. Cavanaugh, and Jay J. Morrow, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges In the Yellowstone National Park, Report Upon the Road Into Mount Rainier National Park. Report Upon Crater Lake National Park,* Appendixes EEE and FFF (Washington D.C.: Government Printing Office, 1913), 3269.

8. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1917* (Washington D.C.: Government Printing Office, 1917).

9. Secretary of the Interior Franklin Lane to Senator Francis Warren, 29 January 1920. Yellowstone National Park Archives, Yellowstone National Park.

10. "Proposed Road Projects for 1923." The document had no author or exact date.

11. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, Director of the National Park Service, 29 July 1925. Yellowstone National Park Archives, Yellowstone National Park.

12. *Sheridan Post Enterprise,* October 30, 1927.

13."Monthly Narrative Report, July 31, 1928 of Yellowstone National Park, District No. 3." File Box: Roads B.P.R. Yellowstone National Park Archives. Yellowstone National Park.

14. "Monthly Narrative Report September 30, 1928, Yellowstone National Park, District No. 3." File Box: Roads B.P.R. Yellowstone National Park Archives, Yellowstone National Park.

15."Monthly Narrative Report, September 30, 1928, Yellowstone National Park, District No. 3." File Box: Roads B.P.R. Yellowstone National Park Archives, Yellowstone National Park.

16."Monthly Narrative Report, June 30, 1929, Yellowstone National Park, District No. 3." File Box: Roads B.P.R. Yellowstone National Park Archives, Yellowstone National Park.

17."Monthly Narrative Report, July 31, 1930, Yellowstone National Park, District No. 3." File Box: Roads B.P.R. Yellowstone National Park Archives, Yellowstone National Park.

18."Monthly Narrative Report, October 31, 1929, Yellowstone National Park, District No. 3." File Box: Roads. B.P.R. Yellowstone National Park Archives, Yellowstone National Park.

19."Report to the Chief Architect through the Superintendent, Yellowstone National Park by Mr. Franklin Mattson, Landscape Architect, September 28 - October 28, 1934." Memorandum to C. Capes from Mr. Franklin Mattson, Landscape Architect, 1 August 1935. R.G. 79. Yellowstone. File Box: 10. National Archives and Records Center, Denver, Colorado.

20.E. H. Cowan, Chief Engineer. Inspector-Superintendent," Final Construction Report (1936-37) on Grand Loop 1-E1, Parking Area, and East Entrance (Fishing Bridge) 5-D1, part D2, Bridge, Approaches, Surface and Secondary Roads. Yellowstone National Park, Wyoming. U. S. Bureau of Public Roads, D-3." Loose Folder. Yellowstone National Park Archives. Yellowstone National Park.

21.C. Capes, "Traffic Survey Report Intra-Park Travel Season 1937, Yellowstone National Park, Wyoming, September 20, 1937." File Box 13. Yellowstone National park Archives. Yellowstone National Park.

22.E. H. Cowan, "Final Construction Report (1939-40) on Grand Loop National Park Project 1-E1, part F1, and East Entrance National Park Project 5-D1, D2, part C, Bituminous Surfacing Yellowstone National Park, State of Wyoming, March 11, 1941." File Box: Roads: Road System Reports 1931-1943. Yellowstone National Park Archives, Yellowstone National Park.

23. Acting Director, National Park Service, A. E. Demaray to Wyoming Congressman, John J. McIntyre, 22 April 1941. Yellowstone National Park Archives, Yellowstone National Park.

24. Real Property Records for Yellowstone National Park, East Entrance Road, Rocky Mountain Regional Office, National Park Service. The records do not detail the work other than in broad terms, i.e. resurfacing, improvements, etc.

25. "Final Construction Report (1965-1966) on Yellowstone National Park Project 5(1) East Entrance Yellowstone National Park, State of Wyoming." Office of Division of Maintenance. Yellowstone National Park.

26. Real Property Records for Yellowstone National Park, East Entrance Road. "Project Summary. East Entrance Guardrail. Yellowstone National Park." Division of Maintenance, Yellowstone National Park.

Chapter XVI

HISTORY OF SOUTH ENTRANCE ROAD

The idea for a South Entrance Road was first promoted by Capt. William A. Jones in his *Report Upon the Reconnaissance of Northwestern Wyoming Including Yellowstone National Park Made in the Summer of 1873,* but it would be the 1890s before any semblance of a road was built.[1] During the earliest years, most of the visitors arrived via the north and west entrances, but tourists began to use the South Entrance by 1890. With urging from the governor of Wyoming, a congressional appropriation of $15,000 was granted in 1892 for the construction of a road from the Upper Geyser Basin to the South boundary.[2]

By the turn of the century Army engineer Hiram Chittenden described the South Entrance Road as ". . . merely grubbed and cleared, with trees and stumps left in middle of roadway most of the distance. The whole road is in a wretched condition and a disgrace to the Government."[3] With a $20,000 appropriation, Chittenden began improvements on the stretch of road between Yellowstone Lake and the Snake River. "Good substantial bridges" were built to span the Lewis River and Crawfish Creek.[4] In 1902, 10 bridges and 40 culverts were built on the road, with the Lewis River and Crawfish Creek bridges considered the most important. The Lewis River Bridge was a 188 feet long wooden bridge resting upon crib piers and two crib abutments; the Crawfish Creek Bridge was a 42 feet long wooden bridge.[5]

The north and west entrances continued to be the most popular entries into the Park. The South Entrance Road, in 1909, was mostly used by the military personnel in their travels to and from the Snake River Soldier Station.[6]

In 1912, a road assessment was conducted to determine the suitability from an engineering standpoint of the system for the introduction of automobile traffic in the Park. The Army Corps officer, Captain Knight, concluded that it would be better if the existing system were reconstructed than creating a separate system for motorized vehicles as some had suggested. Captain Knight felt that the South Entrance Road, which was still considered to be of minor importance, needed only partial widening with "some relocations to reduce grades and the replacement of most of the wooden bridges and culverts which are generally in worn-out condition".[7]

By 1915, part of the road had been widened from 12 to 18 feet and some of the wooden bridges had been replaced. Thousands of feet of the South Entrance Road was realigned six to seven miles south of West Thumb and engineers began building 4-foot-high rock retaining walls.[8] By 1917, all but 2 miles of the road was considered improved in addition to widening, grading and realignments, 18 and 24-inch log and galvanized corrugated iron culverts were installed.[9]

In 1917, Secretary of the Interior Franklin Lane, visited the Park and after traveling on the South Entrance Road, he requested "a railing sufficient to hold cars from running over, painted or
whitewashed white so as to be easily seen from either direction." He outlined other dangerous road sections on the system.

In 1918, the newly created National Park Service assumed the responsibility for road improvement and construction in Yellowstone National Park. The South Entrance Road still was not heavily traveled by tourists and was considered in fair condition, except for the need for repair to many of the smaller bridges and pole culverts and to the sections of road that were washed out due to very high freshest and excessive rainfall during the spring of 1918.[10]

Secretary of the Interior Franklin Lane reaffirmed the Army Corps of Engineers philosophy toward road construction in the Park. In his statement of National Park Policy, he addressed road construction specifically by calling for the harmonizing of roads, trails, buildings, and other improvements with the landscape, and the employment of "trained engineers who either possess the knowledge of landscape architecture or have a proper appreciation of the aesthetic value of park lands."[11]

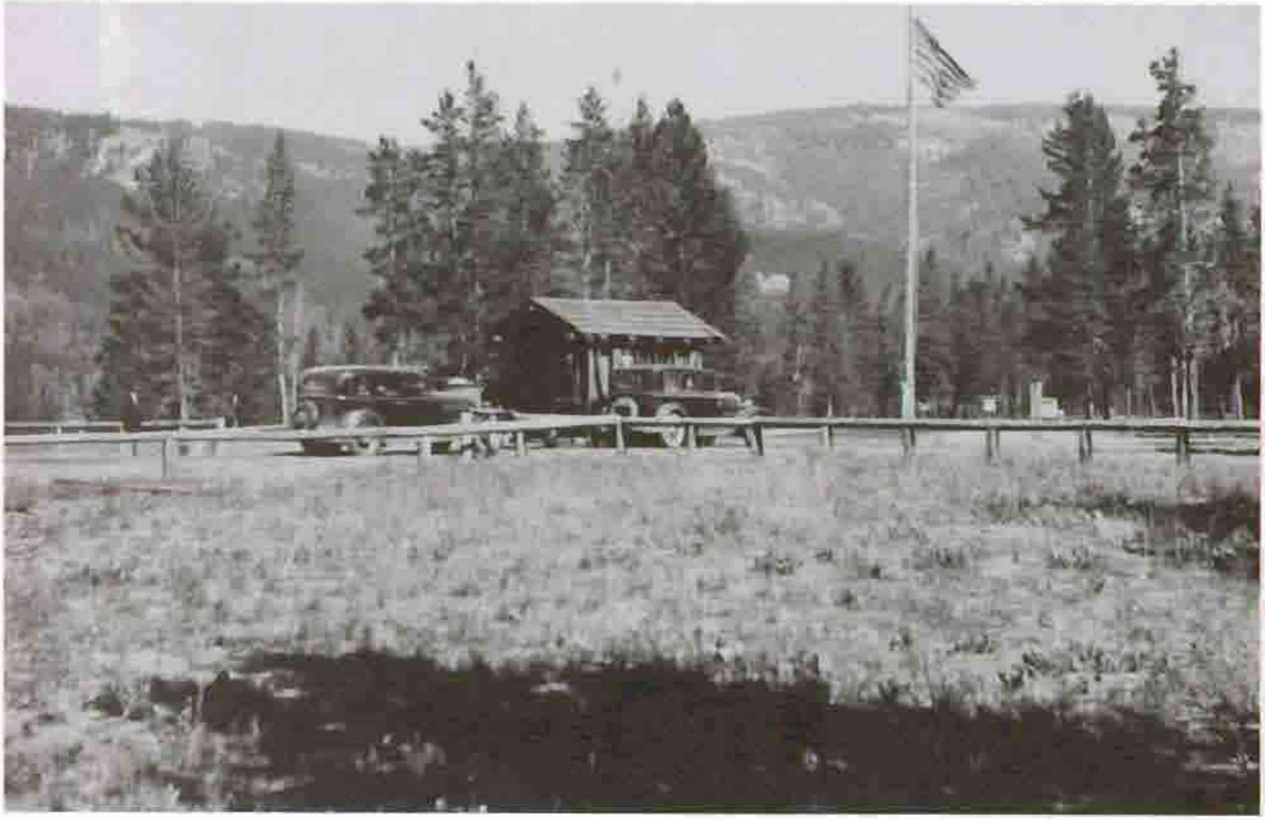
In 1925, the old log Crawfish Creek bridge was replaced by a 54 feet steel bridge on concrete abutments. The 15 degree skew bridge, which was placed over the creek at an angle to permit the road to be straightened at the crossing, had been relocated from it original sitting over the Gardner River in 1919.[12]

In 1926, the National Park Service and the Bureau of Public Roads reached an agreement that the Bureau would survey, construct, and improve the road system in the Park. As part of the terms of the agreement, the Bureau of Public Roads would provide all of the technical expertise and the National Park Service would provide the design and special treatments pertaining to landscape architecture. The National Park Service landscape architects worked very closely with the Bureau in order for the road system, including the bridges, to harmonize with the natural features and surroundings. At that time, most of the park roads were considered unimproved and some of the roads were so narrow that they were restricted to one-way traffic. The Bureau initiated the park survey in 1926, and construction began the following year. The 1926 survey for the South Entrance Road suggested reconstruction for many stretches of the road, widening all sharp curves between West Thumb and Lewis Lake, widening the road between Lewis Lake and the Snake River Station, the replacement of the Lewis River Bridge with a concrete structure, the replacement of 12 small log bridges with concrete culverts, and the replacement of wooden culverts with metal culverts.[13]

During 1930 and 1931, additional survey work was done on the South Entrance Roads, concentrating on the northern portion of the road from West Thumb to Lewis Lake. Surveys on the southern portion were done in 1932. The Lewis River Bridge site was very easily established as being very near the older bridge, but the Crawfish Creek Bridge site took extensive investigation and discussion. The design was finally approved and prepared during the winter of 1933-34. The designs for the bridges were completed by the National Park Service landscape architects--a log structure for the Lewis River Bridge and a stone-faced concrete structure for the Crawfish Creek crossing.

The newly proposed Crawfish Creek Bridge, which replaced the very narrow steel truss bridge built by the Army Engineers, and others being designed at the time, received much attention. The chief engineer of the National Park Service felt that it was ". . . worthwhile, if possible, to utilize a type of architecture that will blend harmoniously with the landscape. On the other hand, it must be realized that a bridge will always look like a bridge no matter what attempts are made to blend it into the surroundings or how much money is expended on it. This fact in many cases has been frankly conceded and steel or concrete types have been adopted. Masonry arches are of course the most desirable for most locations in National Parks, where ruggedness of landscape is the rule."[14]

By 1941, the most southerly portion of the South Entrance Road had been improved to 22-foot width bituminous surface with gravel shoulders on an originally graded 26 foot shoulder width. The northern half of the road was graded to a 28 foot shoulder width.[15] During the 1940s and 1950s, extensive surfacing projects were conducted on the South Entrance Road and the replacement of the guardrail, improved drainage and shoulders were carried out. In 1960, the log Lewis River Bridge was replaced leaving the third generation Crawfish Creek Bridge as the reminder of the collaboration of the Bureau of Public Roads engineers and the National Park Service landscape architects. In 1976, some road relocation and reconstruction was done on the South Entrance Road, including widening some sections to 30 feet shoulder to shoulder. Some work was done to drainage structures and replacement of guardrail.[16]



South Entrance Checking Station, 1935
Courtesy Yellowstone National Park Archives

South Entrance Checking Station, 1992
Courtesy Yellowstone National Park Archives

Crawfish Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe

South Entrance Road Over Crawfish Creek Bridge, 1989
Courtesy Historic American Engineering Record, Jet Lowe

ENDNOTES

1. William A. Jones, Captain, *Report Upon the Reconnaissance of Northwestern Wyoming Including Yellowstone National Park Made in the Summer of 1873* (Washington, D.C.: Government Printing Office, 1875), 58.

2. W. A. Jones, Major, *Construction and Improvement of Roads and Bridges in Yellowstone National Park.* Appendix EEE *(Annual Report of the Chief of Engineers for 1892)* (Washington, D.C.: Government Printing Office, 1893).

3. Hiram Chittenden, Captain, *Improvement of the Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges (Annual Report of the Chief of Engineers for 1900,* Appendix LLL) (Washington, D.C.: Government Printing Office, 1900).

4. Hiram Chittenden, Captain, Army Engineer Officer, to General Gillespie, Chief of the U.S. Army Corps of Engineers, 7 December 1901.

5. Hiram Chittenden, *Annual Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park,* Appendixes FFF and III *of the Annual Report of the Chief of Engineers for 1902* (Washington, D.C.: Government Printing Office, 1902), 3036.

6. The United States Army took over the administration of Yellowstone National Park in 1886, just three years after the Corps of Engineers assumed responsibility for road construction. A series of soldier stations were built throughout the Park for protection purposes.

7. Memorandum for all Engineers, Overseers and Foreman Under the Engineering Department, Yellowstone Park. May, 1915.

8. Lt. Col. Amos Fries and Col. George Zinn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park* (Washington, D.C.: Government Printing Office, 1917).

9. Memorandum from Acting Director Horace Albright to Lt. Col. Amos Fries, U.S. Army Corps of Engineers, 9 October 1917.

10. Maj. G.E. Verrill and Col. George Zinn, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park* (Washington, D.C.: Government Printing Office, 1918).

11. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1918* (Washington, D.C.: Government Printing Office, 1918), 274.

12. "Annual Report of the Superintendent of Yellowstone National Park for 1925," 9.

13. Horace Albright, Superintendent of Yellowstone National Park, to J. W. Johnson, District Engineer, Bureau of Public Roads, 11 March 1926. "Tentative Suggestions for Improvements to Park Roads."

14. Frank Kittredge, "Preserving a Valuable Heritage," *Civil Engineering,* September 1932, 536-37.

15. Mr. B.W. Matteson, District Engineer, Public Roads Administration to Dr. L. I. Hewes, Chief, Western Region, Public Roads Administration, 9 April 1941.

16. Fixed Property Record for South Entrance Road, Yellowstone National Park, 9 September 1976. Rocky Mountain Regional Office, Yellowstone National Park.

Chapter XVII

HISTORY OF WEST ENTRANCE ROAD

The first West Entrance Road, built by Gilman Sawtell, originated in Virginia City, Montana, and reached the Lower Geyser Basin by way of the Madison Canyon in 1873. Sawtell, the owner of a hotel near Henry's Lake in the Idaho Territory, named the toll-free road, The Virginia City and National Park Free Road, in order to differentiate it from the North Entrance toll road.[1] But, by 1877, the road was a barely passable road as noted by a visitor

> A mile further on we come to vast quantities of fallen timber and we find our progress impeded to such an extent that we are compelled to call our axes into regulation, and cut our way for more than a mile when we again find open timber.[2]

In 1878, Philetus Norris had the road along the Madison River to the western boundary in his improvement program which included widening of the grades. But two years later, Norris was approached by O. J. Salisbury, a partner in Gilmer & Salisbury Company, mail contractors, to find a new coach and mail route for the west side. The existing route along the Madison River, which required much bridging, was impassable most of the year and many considered the route dangerous. After two days of exploration, an acceptable route, which cut south from the Madison River at Riverside, was found. Salisbury left men to construct a mail station at the Riverside cutoff, while he proceeded east to secure his mail contract. Norris, who once considered the mountainous area south of the Madison River inaccessible, was surprised to find "a dry, undulating, but beautifully timbered plateau, allowing a judiciously located line of wagon-road with nowhere an elevation much in excess of 1,500 feet above the Forks of the Fire Hole."[3] This route, which was shorter by six miles than the Madison Canyon route, would be cheaper to construct and maintain and also would open up new observation points for scenic and geologic interests. Traveling through the beautiful pine forests on an August trip to the West Entrance via the new route, Norris commented that this dry route was preferable to the often snow-covered and flooded canyon route. He felt that this would be the preferred route, however, the other,if necessary, could be used for part of the summer.[4]

Patrick Conger, Norris' successor as superintendent, accomplished very little in new road construction, but he did improve the older Madison River route which Norris bypassed after the plateau route was built. Conger found it necessary to undertake heavy grading work along the river route to the Firehole Basin. He described the canyon as "difficult and rough, involving the fording of the streams five times in the short distance of about 10 miles. The Madison River at this point is a broad and rapid stream, and except in time of low water, these crossings are both difficult and dangerous." The superintendent estimated that at least $15,000 would be needed to construct a good road.[5]

By 1900, the route across the plateau joining the Grand Loop at Nez Perce Creek was abandoned.[6] In 1896, the Army engineers worked on the West Entrance Road and built a bridge over the only crossing of the Madison River.[7] Prior to Hiram Chittenden's transfer to Mount Rainier, the Army engineer noted that the most western section would need to be changed to meet the proposed location of the railroad terminus and the proposed hotel planned for a site at Riverside, about four miles within the western boundary. In 1908, considerable work was done to this section, including crowning the road and adding large amounts of clay to the sandy soil. Many large rocks were removed on the section of road west of the Madison River Bridge where the road was widened and crowned. The swampy areas on the north bank of the Madison River were raised, widened and surfaced.[8]

During 1912 and 1913, the road was widened from 12 to 18 feet and it was surfaced with gravel. The next year, 1914, the crew which was camped about 2 miles from the western boundary, finished the grading, rolling, and crushing to prepare for an oil finish the next spring. The use of a small, No. 3 oscillatory crusher on a very hard rhyolite rock made it a very slow process. Another crew, camped at the Firehole Junction, cleared and widened the road between the 9 and 13 mileposts. Other widening and about 300 yards of alignment to reduce grades and improve the appearance occurred during 1914.

The president of Yellowstone Western Stage Company, F. J. Haynes expressed concern that the road would not be in condition to accommodate both wagons and automobiles in time for the expected surge of visitors prompted by the Panama-Pacific Exposition to be held in San Francisco in 1915. In addition, Haynes was opposed to the construction of a hotel at the western entrance to the Park.[9] The Army engineer responded to the possibility of both types of traffic on the West Entrance road

> Whether the road will be safe for such combined use of vehicles is an entirely different question, and one that seems to me much more dependent upon whether or not animals become frightened than upon the condition of the road. On the whole this section of the road has less dangerous embankments than almost any other section of equal length in the park. However, there are a number of places where animal drawn vehicles may go over embankment should the teams become unmanageable and get away from the drivers. I doubt very much that such combined use would be safe with an practicable width of road that could be built in this section. This is taking into consideration the fear the team may have of automobiles, and not the width and surface of the road which I think ample, provided teams can be trained to allow such passing or separate roads assigned for each class of traffic.[10]

In 1916, the entire road section between West Yellowstone and Madison Junction was widened and graded. For the first 5 miles west of the boundary, oil macadam surfacing for the 18 feet width was completed. For the next 2 1/2 miles, a crushed-rock sub-base, 5 inches deep and 10 inches wide was prepared for an oil finish.[11]

In 1924, a combined checking and ranger station was constructed with park funds for the West Entrance. The log-trimmed building was the idea of the Chief Ranger, who also supervised its construction.[12]

During the 1930s, many improvements were made to this road section. In 1930, more road oil was mixed with the existing surface, mostly obsidian sand mixed with road oil, to make a fairly good temporary oiled road. A few years later the road was given a crushed rock and oil finish.[13] Also during 1939, a temporary wye was constructed at Madison Junction. The wye junction was given a palliative treatment, spraying a coating of oil on top of the loose road material after the surface had been smooth with a blade grader. Later this method was improved by providing a light processing of about 1 inch of the natural top material with sufficient oil to form a 3/4" consolidated mat. Most of the West Entrance Road received the improved treatment.[14]

The Bureau of Public Roads engineers found the route to be the most direct and best between the junction and the boundary, but many of the curves too sharp for safety and the alignment unnecessarily sinuous for the topography. The road width ranged from 18 to 24 feet. The one Madison River crossing was bridged with a narrow steel truss structure consisting of two 80-feet spans placed on concrete abutments and steel encased concrete piers. The lightweight constructed bridge had a width of 16 feet making it totally inadequate for the 1930s traffic. Nearby, the engineers found evidence of an earlier bridge, rock crib foundations.

After concessions by both the Bureau and the National Park Service's Branch of Plans and Design, an agreement was reached on the new line which followed the old road closely and a new configuration at the wye junction. The old narrow concrete bridge near the wye was to be replaced. The north leg of the wye was planned to be located "considerably higher than the present road in order to develop an overlook on the forks of the rivers and the historic campsite." The landscape architects insisted that "care was taken not to scar the rockslide by excavation and to extensively incorporate the present road within the construction limits of the proposed line." A section of the old road was incorporated into a parking area for fishermen and for viewing the river. On a section of the road, old established fill slopes to the river were not disturbed.[15]

On different sections of the road, the new road departed about 400 feet to the right from the old road, eliminating three curves, and the new road was 350 feet to the left reducing the angle of curves considerably. As the road approached the checking station, the width was enlarged from 26 feet to 80 feet to provide space for 4 four lanes of traffic.

The new road was designed during 1934 and 1935 "to the standards then being used by this district, which at that time had just adopted the spiral but had not yet adopted the rates of super elevation and widening now in effect nor the still flatter back slopes now required and which still used the profile grade as center line elevation on all sections." The road was designed with 26 feet width, which was standard for all entrance roads. Other design features were as follows:

> Revisions in alignment were made in a number of cases to reduce curvature rates to less than 5 degrees per hundred feet of distance, at which rate spiralling begins. At Madison Junction, where curvature was sharper, revisions were made to permit introduction of spirals, though it can probably be considered satisfactory practice to eliminate this complication in low-speed areas such as junctions.
>
> Cut and fill slopes were designed in all cases as flat or flatter than required to conform to the standards shown on the sheet of standard sections in force in 1934; these varied, for cut slopes, from 2:1 in low cuts in common material to 1/4:1, in solid rock cuts; and, for fill slopes, from 4:1 to 1 1/2:1, depending on the height of the fill.
>
> Cut slope treatment based on the same standard sheet was estimated for all cuts of whatever nature emerging in common material. Ditches along the road were designed on 4:1 slopes, from the road shoulder to the ditch bottom, to depths of 1 to 2 feet depending upon the drainage conditions at the particular place; where deeper ditches were required but deemed inappropriate, tile drain was provided for additional drainage. In one or two cases, as a further protection from surface seeps, a protection ditch was provided. In rock cuts, where feasible, ditch depths and widths were reduced, as indicated as permissible on the standard sheet, in order to save quantity.[16]

The only major structure constructed was the Madison River Bridge. All of the drainages were handled with corrugated pipe culverts, some with standard masonry headwalls. The materials for the concrete aggregate and the masonry work were mostly found in the project area.[17]

After the war, 1946, extensive work on done on this section. Most of the shoulders and slopes along the entire road had to be repaired and some resurfacing was done. Much of the damaged, broken or decayed log guardrail was replaced on this project.[18]

In 1955, just before the MISSION 66 program began some leveling and resealing was done to part of this road section to prolong the life of the road and reduce some maintenance. Large sections of the road had cracking and water had reached the base. At the same time, some of the 18" x 30' culverts were replaced.[19]

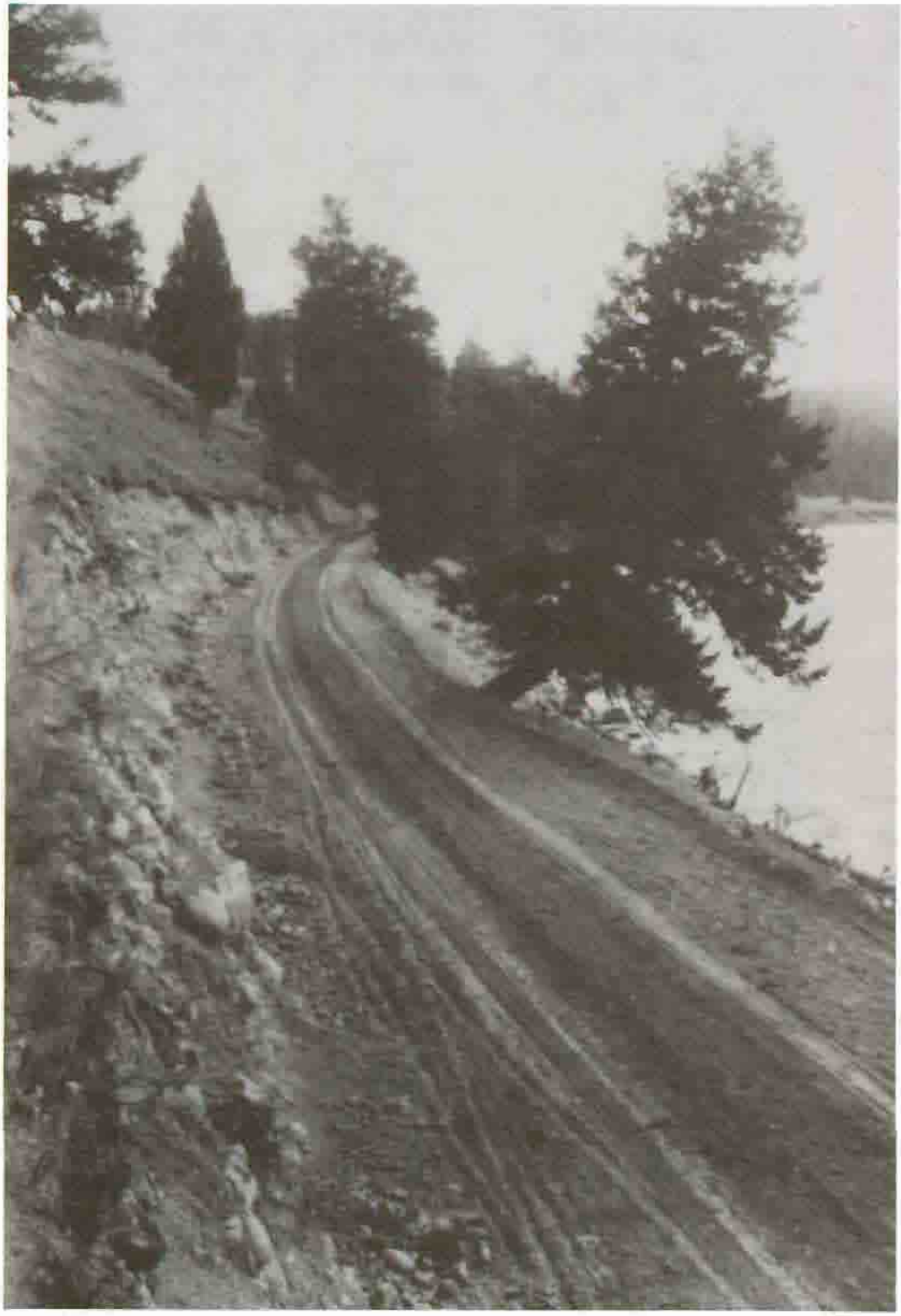
As part of the MISSION 66 program, grading and stabilized base construction was completed under three contracts covering 1958-1961. The 1958 contract included the construction of a new Madison River bridge. In order to insure a "more permanent dusk colored effect" of the concrete, the proposed formula of 1 pound of black mineral oxide was changed to use 1.5 pounds per sack of cement. "Previous experience proved marked bleaching by the sun when the proposed formula was used." A change in the concrete curb and gutter construction requested the colored pigment, Code No. 1562, by Conrad Sovig, San Francisco, California, be used in a ratio of two pounds per sack of concrete. In 1965, Kimberly Construction Company, Inc. of

Kimberly, Idaho received the contract for bituminous surfacing of the entire West Entrance Road. The same contract also provided surfacing for a section of the Grand Loop, from Madison Junction toward Old Faithful.[20]

The contractor,who began work on May 23, 1966, obtained the aggregate from the north face of a pit, located 1,000 feet left of station 414 on the West Entrance Road; the porous backfill came from a Forest Service pit about 4 miles north of West Yellowstone, Montana. Husky Oil Company of Cody, Wyoming, supplied the asphalt materials. The crews lived a government trailer house and a rented five room house owned by the Yellowstone Park Company.[21]

The project, which was completed in October, 1966, involved widening the existing asphalt treated base to afford a uniform 22 feet surface with 4 feet stabilized shoulders. In areas of severe distress, the existing stabilized base was removed. Some of these areas required the removal of the untreated base and subbase. The engineers found that these problem areas contained excessive amounts of plastic fines in the subgrade. Paving and a chip seal were placed on the parking areas along the road. The shoulders were given a Type 3 seal coat.[22]

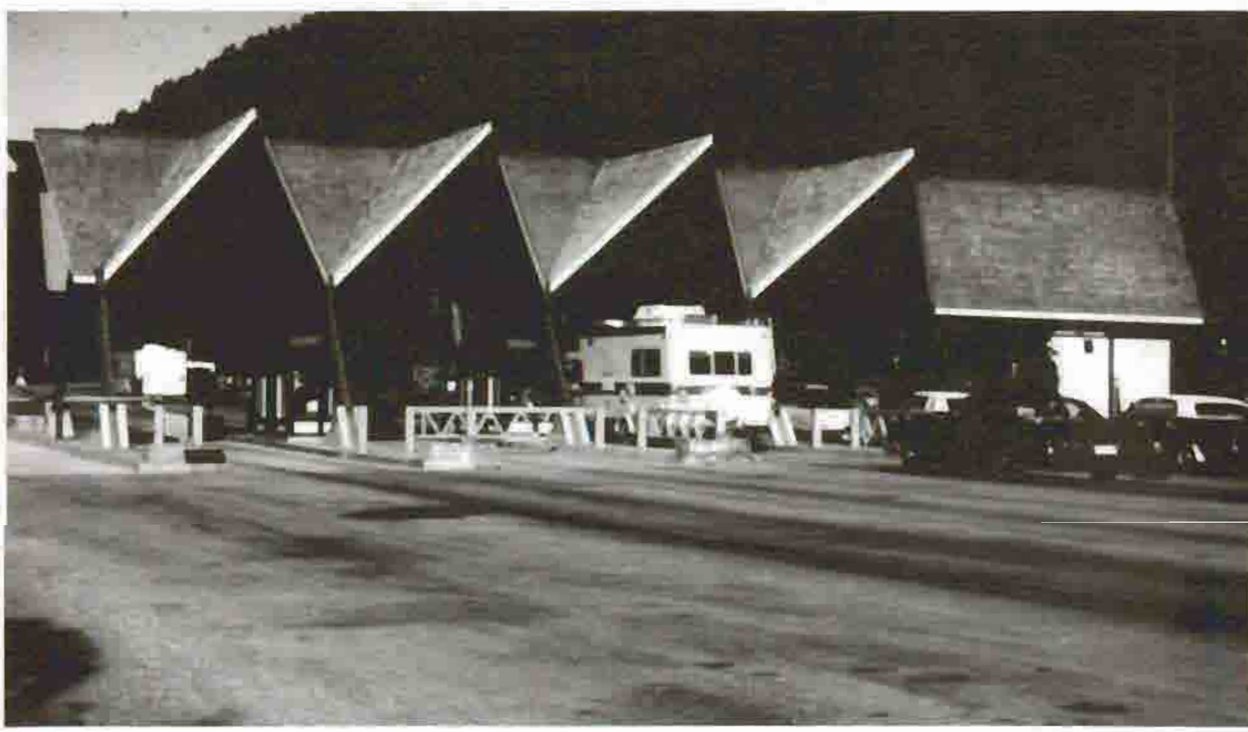
The only major structure on the road is the Madison River Bridge, built in 1958. The three span continuous steel girder with concrete deck is 203 feet long. The deck width from curb to curb is 28 feet 4 inches. The bridge roadway is flanked by a 2-feet wide concrete sidewalk on one side and a 3-feet concrete sidewalk on the other. The bridge has steel rails.[23]



Road Along Madison River, ca. 1900
Courtesy Yellowstone National Park Archives

Road at Madison Junction, 1905
Courtesy Yellowstone National Park Archives

West Entrance Station, 1924
Courtesy Yellowstone National Park Archives



West Entrance Station, 1992
Courtesy Yellowstone National Park Archives

ENDNOTES

1. Robert R. O'Brien, "The Yellowstone National Park Road System: Past, Present, and Future," (Ph.D. Diss., University of Washington, 1964).

2. O'Brien, "The Yellowstone National Road System: Past, Present, and Future." The quotation is from Frank Carpenter's *Adventures in Geyser Land,* reprinted Frank Carpenter, *The Wonders of Geyser Land,* ed. H.D. Guie and L. F. McWhorter (Caldwell, Idaho: Caxton Printers, 1935).

3. Philetus Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880* (Washington D. C.: Government Printing Office, 1881), 4, 9.

4. Norris, *Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880.*, 5, 9-10. The new west entrance route left the Madison River at Riverside, proceeded over the Madison Plateau, joining the Firehole River near Nez Perce Creek. The Old Fountain Trail follows the route quite closely.

5. P. H. Conger, *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior by P. H. Conger, Superintendent, for the Year 1882* (Washington, D.C.: Government Printing Office, 1882), 4.

6. O'Brien, "The Yellowstone National Park Road System: Past, Present, and Future," 116.

7. George S. Anderson, *Report of the Officer in Charge of the Construction and Maintenance of Roads in the Yellowstone National Park to the Secretary of War, 1896* (Washington D.C.: Government Printing Office, 1896), 5.

8. Hiram Chittenden, *Annual Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges in the Yellowstone National Park in the Charge of Hiram A. Chittenden, Captain, Corps of Engineers,* Appendixes GGG and KKK *of the Annual Report of the Chief of Engineers for 1905* (Washington D.C.: Government Printing Office, 1905), 2820. Ernest Peek, *Annual Report of the Chief of Engineers for 1909* (Washington D.C.: Government Printing Office, 1908), 2548.

9. James Parker, Acting Assistant Secretary of the Interior to Lt. Col. L. Brett, Acting Superintendent of Yellowstone National Park, 16 May 1914. Yellowstone National Park Archives, Yellowstone National Park.

10. "First Endorsement from the Major, Army Corps of Engineers, October 19, 1914." The park was opened to automobile traffic in August, 1915.

11. *Annual Report of the Superintendent of National Parks to the Secretary of the Interior For the Fiscal Year Ended June 30, 1916* (Washington D.C.: Government Printing Office, 1916), 33.

12. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1924, and the Travel Season, 1924* (Washington D.C.: Government Printing Office, 1924), 34. Several routes led to the West Entrance of the Park.

> There are several roads leading to the west entrance, most important of which is the so-called Warm River Yellowstone road, referred to in Director McDonald's letter of Sept. 7, 1923 to you. This is the road that Mather and Engineer Burney wanted to travel in late July but were prevented by so doing by graveling operations. I had this road inspected Oct. 16th and 17th

by the Engineer of the Park and Assistant Superintendent and I quote the following from the Engineer's report:

> Inspection of this road was made during a snow storm, and again on the following day when the snow was melting. From West Yellowstone to the foot of the grade leading over Targhee Pass, we found the road partly graded but not graveled. Water was standing everywhere from the melting snow and mudholes were numerous. The next five miles over the pass is newly graded and partly graveled and in good condition. The next five miles across the flat south of Henrys Lake is a good grade and well drained but not graveled and was so slick we had difficulty in staying on the grade. From the lower end of Henrys Lake flat to the top of the grade south of Warm River, a distance of about 35 miles, is an excellent road, with good grades, well drained and graveled. The remaining six miles to Ashton we found very slick. A little gravel on this section would make it an excellent road. Closely associated with this road is the road to the Bechler River, or southwest corner of the park, which I will refer to later in this report. Another road leads to West Yellowstone from the Ruby Valley through the old mining communities of Alder Gulch and Virginia City. This road is usually known as the Vigilante Trail. It is generally in good condition but considerable improvement can be made in the highway by widening it and surfacing it in places where the material of the road becomes slippery in wet weather. Another road leads up the Madison River to West Yellowstone from Three Forks, Montana. This road is usually in very good condition and I have heard no adverse comments on it during the past summer although like most of the other mountain roads in this state it can be improved by widening and surfacing.

Horace Albright, Superintendent of Yellowstone National Park to Stephen Mather, 22 October 1923. Yellowstone National Park Archives, Yellowstone National Park.

13. Guy Edwards, Assistant Superintendent, Yellowstone National Park, to Horace Albright, Director of the National Park Service, 10 November 1932. Yellowstone National Park Archives, Yellowstone National Park.

14. A. Stinson, "Location Survey Report (1934) on The Madison Junction - West Yellowstone Entrance Highway, The West Entrance Road, Route No. 3, Yellowstone National Park, Wyoming, May 11, 1936."

15. Stinson.

16. Stinson.

17. Stinson.

18. "Maintenance Plans and Estimates, Yellowstone National Park, January 1 to December 31,1946."

19. Warren Hamilton, Acting Superintendent, Yellowstone National Park, to Regional Director, Region Two, National Park Service, 18 February 1955. Yellowstone National Park Archives, Yellowstone National Park.

20. "Final Construction Report (1966) on Yellowstone National Park Project 1-C(1) and 3(1) Bituminous Surfacing Grand Loop and West Entrance, Yellowstone National Park, State of Wyoming." Luis Gastellum, Acting Superintendent, Yellowstone National Park, to Steve Lucas, Project Engineer, Bureau of Public Roads, 19 October 1960. Yellowstone National Park Archives, Yellowstone National Park.

21. Ibid.

22. Ibid.

23. "Parkwide Road Engineering Study of the Yellowstone National Park Road System, Draft Report, October 1986," U. S. Department of Transportation, Federal Highway Administration, Vancouver, Washington, 1986. Volume I.

Chapter XVIII

HISTORY OF GALLATIN ROAD

The first publicized drive for a road from Bozeman, Montana via the West Fork of the Gallatin River and over Bighorn Pass to Yellowstone National Park was in 1904 at the insistence of a group of Bozeman citizens.[1] Almost immediately Maj. Hiram Chittenden, the Army officer in charge of the road construction and improvements in Yellowstone National Park, warned the chief engineer in Washington D. C. that he objected to the proposal by the Bozeman citizens. He believed that the four existing approach roads, the North, the South, the West and the East met the needs of the public and that the road would be "of local importance mainly, and as such is not justified as a public measure". With the road having to cross high country, it would probably be available for travel for an average of two months a year. Major Chittenden, who estimated the road to cost approximately $50,000 plus maintenance, felt strongly that "It would be bad policy to increase that burden unless there is positive public necessity for it. It will be a great deal better to develop and perfect the present system of roads than to extend it unduly."[2]

However, a few years later a sum of $1,000 was specified in the appropriation for 1907 to be spent on a survey for a road to Bozeman through the northwest corner of the Park. The proposed route would begin at a point 7 miles south of Mammoth Hot Springs on the Norris road and would exit the Park at a point where the Gallatin River crossed the Park boundary. Lt. Ernest Peek calculated that a "crude road" could be constructed for $32,055 or a more substantial one built for about $100,000. Lieutenant Peek also felt that the maintenance cost on such a road would be so heavy "without any corresponding benefit to the general public."[3]

No action was taken on the fifth entrance road into the Park, but a survey and permission to build a road from Bozeman to Yellowstone (West Yellowstone), the new settlement at the west entrance to Park was secured by the Gallatin county commissioners in 1910.[4] During the summers of 1910 and 1911, the road contractors, Moore and Moore of Eldgridge, Montana constructed the road, 14 miles of which were within the boundary of the Yellowstone National Park. The road contractors were granted permission to construct a small log cabin within the Park boundary. The log cabin site, which was to be out of sight of the road, would be selected by the non-commissioned officer stationed at the Gallatin Soldier Station. Under certain restrictions the contractor was allowed to cut logs to be used in the cabin's construction and also for bridges on the Park section of the road. As part of the agreement, upon the completion of the road, the cabin which was used for storage of tools and equipment would be turned over to the Army.[5] The contractor was sent a copy of the rules and regulations of the Park, and was expected to abide by them.

In October, 1911, the road was completed for a total cost of $9,793.44 for the entire 31.1 miles. The county commissioners claimed that the 14 miles portion within the park boundary was $7,312.19. At the time of completion 60 bridges had been constructed on the road and one 120 feet long bridge across the Madison outside of the park boundary had not been finished.[6]

The completed road, which had no greater than an 8% grade, lessened the trip from Bozeman to Yellowstone (West Yellowstone) by approximately 55 miles. It was considered a much easier route than the one through Madison County. Within the same week of its completion, the Gallatin County commissioners now sought permission from Lieutenant Colonel Brett, the park superintendent to use automobiles on the road through the Park. The commissioners stated:

> We cannot see where there would be any objection for the reason that our road does not connect with any road entering the park until the town of Yellowstone is reached. In passing over our road through the edge of the Park we noticed an old Government survey had been made through there and have thought perhaps the Government at some time intended to construct a wagon road. We certainly believe that it would only be a great convenience to the Government but also to the Park Improvement Company as it brings both in close touch with the Gallatin Valley, the great grainary of our State. While over in the south end of our county we were informed by the builders of the great dam that they are now building a road around the north edge of the dam or lake above the water line which will connect with our road at the crossing of the Madison River at our bridge which will make a complete circuit of the lake and enable travelers to pass on west if they so desire. We hope you will consider this proposal with favor. From our point of view we cannot see where will it damage the Park in any manner whatever and it would certainly be a great public benefit and convenience for us in the transaction of necessary public business. The growth and development of the southern portion of our county makes it necessary for us to make frequent visits to that portion of our county.[7]

Lieutenant Colonel Brett replied that no permits for passage of automobiles had ever been permitted in Yellowstone, but he would forward their appeal to the secretary of the interior.[8]

The following year, the citizens again presented an application for use of automobiles on the road cutting through the northwest section of the Park. Lieutenant Colonel Brett explained that pressure and considerable agitation had been exerted from many quarters on parks, on different government departments, and to the Congress to allow the admittance of automobiles on park roads in general, however, he (Brett) was reluctant to forward the request and suggested that they submit it directly to the secretary of interior. Brett added:

> While, as stated above, autos on your road through the park would not be likely to do any immediate damage, the exception to the rule in one place would be apt to be used as an opening wedge resulting in the short time to their general use throughout the park, and our best authorities have agreed that this would not be safe with the roads in their present condition. Efforts are being made to get sufficient appropriations to build new roads for autos or widen the present ones to accommodate all sorts of traffic, but until this is done it is doubtful if the Department will favor the use of motor vehicles on any road within the park.[9]

In March of 1913, the superintendent of Yellowstone requested information from the county commissioners in regard to the exact number of miles within the Park boundary, the number of bridges on the park segment, and if Gallatin County spent any money on improvements or maintenance of the road during the summer of 1912.[10] The commissioners replied that there were 47 bridges on the 17.86 miles of park road and that a separate accounting of cost had not taken place for the park road segment.[11]

On May 31, 1913, the secretary of the interior granted permission for automobile use of the Gallatin Road but not permitted on any other Yellowstone road. The secretary's memorandum stated:

> Automobiles will be allowed to travel over the wagon road between Gallatin Station, Yellowstone National Park, and the town of Yellowstone, Montana, of which road about 17 miles lies wholly within the park. This authority granted upon condition that extraordinary care be exercised not to jeopardize life or limb of persons using road with animal drawn vehicles; that speed limit does not exceed 15 miles per hour; that rules and regulations of the park be strictly observed; and with further understanding that additional regulations and toll charges may be exacted later by the Department if found desirable.[12]

Due to unfit conditions the automobiles did not use the Gallatin Road until 1914.

Shortly after permission was granted for automobile usage, the county commissioners requested funding from the Government for the construction and maintenance of the park segment citing its importance and necessity:

> There is no means of communication between the Southern end of the County and the City of Bozeman, the County Seat, except via the Madison river, 136 miles, and via the Oregon Short Line Railroad, 396 miles, and therefore the construction of the West Gallatin Road will afford the shortest and easiest mode of communication to the inhabitants of the Southern end of the County with the City of Bozeman, the County seat; within this section is the Hebgen Dam, which ultimately is intended and expected to be one of the greatest irrigation reservoirs and power producing plants. Therefore, the construction of this road is of material importance to the inhabitants of the town of Yellowstone, of Hebgen Dam, and all that territory, and also to the inhabitants adjacent to tributary territory and upon the construction of this road depends the material and general development of that section of the country. Within the Gallatin National Forest there are approximately forty homesteaders tributary to the West Gallatin Road whose only communication and means of transportation to a shipping point is via this road. The improvement of this road will encourage and assist settlement along the West Gallatin River and will open up an almost impassable road to connect the Southern end of the County with the County Seat, the Southern end of the County now being practically isolated.

The construction of the West Gallatin Road will facilitate the supervision and care of both the Gallatin and Madison National Forests; the prevention of forest fires and the getting out of timber on Government and private lands.

The construction of the West Gallatin Road will also facilitate the administration and supervision of the Yellowstone National Park and the protection of the game in one of the greatest game preserves in the United States, to-wit: The Gallatin Preserve created by House Bill No. 304, Laws of Montana, Twelfth Session, 1911.

The construction of the West Gallatin Road will open up and afford an unrivaled scenic road for tourists to the Yellowstone National Park, and an automobile road to and from the Western entrance of the Yellowstone National Park, to-wit: the town of Yellowstone, and tourists from all parts will thereby be enabled to visit the Yellowstone National Park via this road, or return from the Park via this road.

The County of Gallatin has expended on the West Gallatin Road to the date hereof approximately the following amounts:

From the mouth of Spanish Creek to a point where the said road enters the Yellowstone National Park line ---- $35,000. Within the Yellowstone National Park ---- $10,000. From a point where said road comes out of the Yellowstone National Park to the town of Yellowstone $2,5000. Total $47,500.

And in addition thereto approximately the sum of $5,000 has been expended by the Forest Service on that part of the West Gallatin Road from the mouth of Spanish Creek to a point where the said road enters the Yellowstone National Park.

No final estimate has been made of the cost of the construction of the West Gallatin Road, although several preliminary estimates have been so made; as a result of the construction work done by the County of Gallatin on that part of the West Gallatin Road from the mouth of Spanish Creek to where the road enters the Yellowstone National Park, a distance of forty-two miles, there is a good mountain road, so to from where the road leaves the Park line to the Madison River there is a good road, but from the Madison River to the town of Yellowstone additional work must necessarily be done in order to put the road in passable condition.

That part of the West Gallatin Road which will be most difficult to construct and maintain and which will necessarily cost the most to us in proper shape for travel, within the Yellowstone National Park, and as before, stated the County of Gallatin, has already expended approximately $10,000 on this part of said road.

> The number of miles within the Yellowstone National Park is 17.8, the number of bridges to be built is 35, the maximum grade of the road is 8% and the work to be done is as follows:
>
> Grading: Widening of grades along side hills. Raising grades through wet places. Repairing and building bridges. Widening of right of way through timber. Riprapping in several places. Construction of corduroy road.
>
> The estimated cost of the construction of said 17.8 miles of road within the Yellowstone National Park is $45,000 in all, or about $2,500 per mile.
>
> The County of Gallatin has necessarily got to expend a large sum of money in order that the road from the mouth of Spanish Creek to where it enters the Yellowstone National Park, 42 miles, and from where it leaves the Yellowstone National Park line to the town of Yellowstone, 12 miles, shall be put in proper shape for general traffic. It is the opinion of the of Board of County Commissioners of the County of Gallatin that it is only proper and reasonable that the Federal Government should defray the costs of the construction of that part thereof within the Yellowstone National Park, 17.8 miles, more or less, for the reasons herein before given and for the additional reason that the Federal Government will derive its proportion of the benefit therefrom, which benefit is to be measured by the convenience in the administration of the affairs of the Yellowstone National Park, the affairs of the Madison and Gallatin National Forests, and the general development of that section of the country.
>
> WHEREFORE, the Board of County Commissioners asks that the Honorable T.J. Walsh and the Honorable Henry L. Myers, Senators, and the Honorable Thomas Stout and the Honorable John M. Evans, Representatives, use their best endeavors to the end that an appropriation be made by the Federal Government for the construction of that part of the West Gallatin Road within the Yellowstone National Park, as herein set forth.
>
> Dated this 3rd day of February, A. D. 1914.[13]

The district Army engineer reported to the chief of engineers, U. S. Army, that the West Gallatin Road had never been inspected by the Army engineers, but that Lieutenant Colonel Brett described the road as:

> Narrow, fairly easy grades, and a fairly good dirt road most of the way. A few slight cuts and fills. About 50 yards broken rocks near northwestern corner. Miry in wet weather, and was late in opening spring 1913, on account wet weather. Some of the expense of upkeep is for clearing out of trees carried down by snow slides.

The engineering officer stated that the road was not "an absolute necessity" for protecting and administrating the northwestern corner of the Park. While the road is used to "some extent by Park patrols" maintaining the Gallatin Soldier Station, most of the supplies are carried by pack train over the trails from Fort Yellowstone with the distance over one trail being 30 miles and the distance over another trail being 23 miles as opposed to the 75 miles by use of the road. He added that since the completion of the road, several new trails had been cut along the western boundary of the Park, with the patrols using the road to some extent. He said that some patrols use the road entirely.

The report to the chief of engineers explained that the road was not considered part of the road system constructed and maintained by the Army Corps of Engineers. Any use of funds for this section would have to be expressly authorized by Congress. The officer recommended that funds not be requested by the War Department as "The cost of maintenance of this road in its present condition would be entirely out of proportion to the benefits which would accrue to the Park." The Army's estimates for the annual maintenance sum should be approximately $3,000.00; they would not speculate on the cost of improvements as the engineers had not inspected the road, but from their experience with similar roads, it should be no more than $1,000.00 per mile.[14]

As a result of the increased automobile travel to the Park via the West Entrance, the Army engineers reversed their opinion of not supporting government funding for the improvements to the 17.8 miles of the West Gallatin Road. In the 1916 annual report, Major Fries, the superintendent, requested that the Government assume the responsibility for the maintenance and repair of the 17.8 miles section.[15]

In an August 1918 meeting held in Bozeman, Montana between Horace Albright, then assistant director of the National Park Service and Henry Graves, chief forester of the Forest Service a tentative agreement was reached whereby the Forest Service agreed to construct a road in the forest reserve up the West Gallatin River to the Gallatin Soldier Station in the park, that the National Park Service would connect with the road at the soldier station and construct the remaining portion within the park. The Gallatin County commissioners complied with the agreement with the Forest Service and by June, 1919, a locational survey had been completed within the forest section and bids for construction were due to be advertised by the end of June.

The National Park Service scheduled their locational survey for the summer of 1919. At the end of the summer, Stephen Mather inspected the park road system. Among his recommendations for action was a suggestion that the West Gallatin road be widened and that section from Grayling Creek to Yellowstone (West Yellowstone), Montana be rerouted within the park boundary.[16]

In 1920, William Buttelman, Chairman of the Board of County Commissioners, Gallatin County sought information on the West Gallatin Road plans of the National Park Service in a letter to Horace Albright, who was now the superintendent of Yellowstone National Park:

> As you perhaps know, work on our road was started as soon as the necessary surveys could be made, and to date, we have expended $50,000 as our share of construction. We have just completed arrangements with representatives of the Forest Service for the construction of four more sections of the road next spring and summer. Instead of costing this county $70,000 for its share of construction, as was originally intended, it is probable that it will cost us $125,000 or more. In addition, if present plans are carried out we will reconstruct the present road from Salesville to the point where construction of the West Gallatin Road was started; where necessary this reconstruction calls for gravel, and the estimated cost of this part of the road is high. This very material increase over the estimated cost is making it difficult for us to finance our share, particularly at this time, but we feel, in view of our agreement with the Department of Agriculture and with your Department, and the very great importance of the road, not only to this county but from the standpoint of tourists, to the entire state and nation that every effort should be expended in order that the road may be completed and opened up at the earliest possible date. At the time we feel that we are, to a large extent, wasting our money unless your Department actually constructs a road to connect with ours.
>
> This is a matter of great importance to us and may we not request that you notify us definitely of the plans of your Department relative to the road in question? If the money for the construction of this road is to come from a bill to be passed by Congress, will you notify us of the present status of the bill, and of its progress from time to time?[17]

Three days later, Horace Albright responded to William Buttelman:

> . . . We also discussed the possibility of continuing the road from Grayling Creek southward to the west entrance road, keeping it entirely within the Park boundaries. I promised at the time that we would have our part of the road carefully surveyed for the purpose of determining what it would cost to have that section of the highway improved along the lines of the reconstruction of the Gallatin road outside the Park.
>
> This was as far as the National Park Service was able to get at that time. Last year under my direction as Superintendent of the Park, the surveying that I promised was done, and we ascertained that it would cost approximately $60,000 to improve the road in the Park and rebuild the section south of Grayling. The estimate was transmitted to the Washington office of the National Park Service, but was not submitted to Congress for two reasons. First, because of advice received from the Committee on Appropriations that it would not consider any new road

construction projects in the national parks on account of the necessity for strict economy in the year 1920, and second, because it was not thought advisable to begin construction work in the Park until the County work outside was far enough along to enable us to say to Congress that our new road would connect with a reconstructed highway north of the park. It was the purpose of the National Park Service to submit the estimate this winter with a view of having the funds made available for use during the summer of 1921.

In the meantime, in July 1920, the Appropriations Committee of the House of Representatives visited Yellowstone park, and its members were so impressed with the fact that Yellowstone already had such a vastly larger road mileage than any other park, that they expressed the opinion that no more new road construction projects should be undertaken there until the other parks got farther ahead.

Recently I was called to Washington to appear before the Appropriations Committee on the fiscal affairs of the Park, and during my hearing I covered the roads of the Yellowstone Park very thoroughly, emphasizing before the said Committee and the many members individually that the Gallatin road had to be built on account of the vast amount of money spent by the County if for no other reason. However, the Committee undoubtedly continues to stand on its view that the Yellowstone Park has been treated well enough so far as road construction is concerned, and that it should be kept on a purely maintenance basis for the next few years. While I do not anticipate, therefore, that we will have any money to use in the new construction on the Gallatin road next summer, it is our purpose to do some very effective maintenance work and I expect to have an efficient crew on the road throughout the season.

I am sorry that I cannot give you a more encouraging reply at this time. However, after I have had a chance to get the opinion of some Washington officials on the road situation in the national parks, I may find the prospect for the Gallatin road brighter than it now seems.[18]

By 1923, approximately $500,00 had been spent by the Forest Service, Gallatin county and the state of Montana on the road from Bozeman to the park boundary. Albright noted that of the total amount, $300,000 of Forest funds had been used on that section. While conceding that the "road runs through an extremely scenic canyon and will be a most attractive approach to the park when finished", he felt that it will never be as important as the road from Livingston for which very little Federal money had been spent and "which is used by so many thousands of people and which is so very dangerous to life and limb".[19]

Albright reported to Mather that no funds were in sight for this project and that citizens of Gallatin County were now urging the revival of the old scheme of a road following the Gallatin over the Bighorn pass, down Panther Creek, and merging with the Grand Loop at the Seven Mile Bridge. The route was particularly attractive to the Chicago, Milwaukee, and St. Paul Railroad who were thought prepared to spend $300,000 to $400,000 for a road survey. This would have enabled the railroad company to bus people directly from their terminus near

Bozeman and compete with Northern Pacific Railroad which had their terminus at the park boundary at Gardiner.[20] Mather opposed the building of the new road across Bighorn Pass. He felt strongly that "We must keep a large area of Yellowstone in a state of untouched wildness if we are too be faithful to our trust as protectors of the wild life with which the park abounds."[21]

Albright agreed with Mather that nonessential roads should not be built in an area that is "full of wild life particularly elk" and that the "wild life of the park must have some secluded places in which to live unmolested by the noise and bustle of heavy traffic." The secretary of the interior denied the Chicago, Milwaukee, and St. Paul Railroad permission to conduct the survey.[22]

Just one year before the Bureau of Public Roads assumed the responsibility for road construction in Yellowstone National Park in 1926, park engineers completed preliminary surveys of the approximately 18 miles section north and west of Grayling Creek on the West Gallatin Road. Albright described this section of the road as "little better than a trail; it is narrow, and is a one-track road with many sharp blind curves and crosses Grayling twelve times on log bridges to avoid sidehill excavation. In the eighteen miles there are 35 log and pole bridges having combined length of 760 feet. These bridges require considerable repairs work to maintain them in a safe and stable condition. The proposed new road will be located entirely on the north and west side of Grayling Creek, except possibly two crossings at the most. The estimated cost for unit #1 is $60,000 in which is included an eighty foot concrete bridge over the Gallatin River.[23]

By 1927, the state highway departments had completed roads of high standards near the park providing a contrast with the poor condition of the park roads. Thus Albright called for the reconstruction of East Entrance Road and the West Gallatin Road.[24] In 1928, the West Gallatin Road was one of the three new road projects scheduled for the park. By the end of November, 1928, the Pioneer Construction Company of Bozeman, Montana completed the northern section of the project, under the supervision of the Bureau of Public Roads. All of the grading at been completed, C.M.P. culverts with concrete headwalls had been installed and two bridges, the Bacon Rind Bridge and the Speciman Creek Bridge had been completed. In 1927, Thomas Vint, associate landscape engineer for the National Park Service recommended that the bridges for this road be of the same design as those used by the Forest Service and the State of Montana in their portions of the road. Of all of the sketches submitted to Vint by the Bureau of Public Roads, he stated that he preferred the type used on the other park work, but that he would accept the concrete type used on the other sections through the forests.[25]

The southern section or Grayling Creek section was designated a minor road project and was constructed by day laborers under the supervision of the National Park Service. This 8.8 miles section had lower standards than those used on the northern section. The alignment and the grade line were the same as used on the northern section, however the width of the road was reduced and corrugated metal culvert pipes or wooden structures were installed instead of the concrete structures found on the other section. In some cases more temporary type structures were built in anticipation of more funds at a later date. Two temporary camps housing up to 70 men were established during the summer of 1928. By October 4, the camps had been dismantled due to lack of funds.[26]

During the early 1930s, the road received light surfacing and oiling and the condition was commended by Bozeman attorney, George Patten who expressed on behalf of the county his gratitude "for the consideration we have had from you gentlemen of the Park Service."[27]

In 1934, the Emergency Conservation Work program had several crews working in the Gallatin area. The crews had various projects including roadside cleanup, and the blending and sloping of the roadside banks.[28] The next year the crews began the construction of two entrance signs, one at Grayling Creek and one at Daly Creek. Sanford Hill, the associate landscape architect found the work of the C.C.C. crews at Grayling Creek to be inferior. It had been recommended that an experienced stone mason be hired to do the work, but the park was unable to find one. Hill stopped progress on the project until an experienced foreman could be found to supervise.[29] In 1939, Hill reported to Superintendent Edmund Rogers:

> These entrance pylons have not been completed although they were started about five years ago. The present appearance of this entrance to Yellowstone is very disappointing and it is recommended that this project be completed, which should include the construction of two new lettered signs. These new signs could be constructed in the sign shop using our new type letters, although they should be the same size as the original design.[30]

In 1940, the Bureau of Public Roads felt that with their new six-year proposed road plan, all essential work will be done to complete the Yellowstone road system. The only project proposed and surveyed in 1927 which had not been planned or completed was the Bighorn Pass road off the West Gallatin Road. Still in 1940, this proposed road was not considered necessary.[31]

No major work was done on the West Gallatin Road during the War years and the late 1940s. In 1950, the Teepee Creek Bridge was reconstructed.[32] In 1952, an inspection of the primary roads in Yellowstone showed that the system was in generally good condition, with the exception of the Gallatin Road. The unstable subgrade, the less than desirable base and the heavy volume of truck traffic continued to plagued the engineers on this section of the road. Approximately 75% of the road had been patched or showed distress. It was felt that at least 12.5 miles of the road would need complete reconstruction. The good condition assessment to the remaining system was attributed to the improved maintenance practices.

For the next few years, no new major construction projects were underway, and routine maintenance tried to address the ever increasing problems. However, the maintenance of the approach roads to the parks attracted the attention of the Congress. In "Report on Negotiations for States to Take Over the Maintenance of Roads Outside the Boundaries of the National Parks and Monuments as Required by the Conference Report on the Interior Department Appropriation Bill, 1955," three of Yellowstone's roads were an issue--the Northeast Approach Road, the South Approach Road, and the West Gallatin Road. In regard to the West Gallatin Road, the report suggested:

> This road is in an isolated section of the park and serves only minor park interests as compared to the usage it receives throughout the year by commercial traffic. . . . The Governor was requested by Assistant Secretary Lewis on March 5, 1954, to consider transfer of this road to the State, and at the Governor's suggestion, a meeting of Service and State Highway personal for a general discussion of the matter was held on June 2, 1954. Subsequently, the State took action to accomplish a portion of the reconstruction and is currently working on a two mile section within the Park conjunction with contiguous construction just outside of the park. The Service will follow up on the various aspects of this general operation relative to additional reconstruction and determination of the width of right-of-way acceptable in transferring responsibility to the State.[33]

Gallatin River Bridge, North of Gallatin Ranger Station, 1929
Courtesy Yellowstone National Park Archives

ENDNOTES

1. Aubrey Haines, *The Yellowstone Story* (Boulder, Colorado: Yellowstone Library and Museum Association in cooperation with Colorado Associated University Press, 1977), Vol. II, 246.

2. Maj. Hiram Chittenden, *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1905,* Appendix FFF.) (Washington D. C.: Government Printing Office, 1905), 2821.

3. Haines, *The Yellowstone Story,* Vol. II., 246.

4. Haines, 246.

5. Acting Superintendent of Yellowstone National Park to Messrs. James and Will Moore, 17 October, 1911. Yellowstone National Park Archives, Yellowstone National Park.

6. Fred Brown, County Surveyor of Gallatin County to Board of County Commissioners, 16 October, 1911. W. W. Davis, Chairman of the Gallatin County Commissioners to Col. L. M. Brett, 1st Cavalry, Superintendent, Yellowstone National Park, 14 October, 1911. Yellowstone National Park Archives, Yellowstone National Park.

7. W. W. Davis to Lieutenant Colonel Brett, 14 October, 1911. Yellowstone National Park Archives, Yellowstone National Park.

8. Lt. Col. L. M. Brett to W. W. Davis, 18 October, 1911. Yellowstone National Park Archives, Yellowstone National Park.

9. Lt. Col. L. M. Brett to W. W. Davis, 5 August, 1912. Yellowstone National Park Archives, Yellowstone National Park.

10. Maj. E. S. Wright, 1st Cavalry for Superintendent of Yellowstone National Park to Chairman of the Board of County Commissioners, Gallatin County, Montana, 1 March, 1913. Yellowstone National Park Archives, Yellowstone National Park.

11. E. H. Schumacher, County Clerk of Gallatin County, Montana to Maj. E. S. Wright, 1st Cavalry, March 12, 1913. Yellowstone National Park Archives, Yellowstone National Park.

12. Haines, 247.

13. E. H. Schumacher, County Clerk, Gallatin County to Lt. Col. L. M. Brett, Superintendent, Yellowstone National Park, 6 February, 1914. Yellowstone National Park Archives, Yellowstone National Park.

14. Memorandum from District Engineer Officer, Yellowstone National Park to the Chief of Engineers, U. S. Army, 16 February, 1914. Yellowstone National Park Archives, Yellowstone National Park.

15. Maj. Amos Fries and Maj. Arthur Williams, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon Crater Lake National Park* (Washington D. C.: Government Printing Office, 1916), 1844.

16. Stephen Mather, *Report of Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919* (Washington D. C.: Government Printing Office, 1919), 51.

17. William H. Buttelman, Chairman, Order Board County Commissioners, Gallatin County to Horace Albright, 13 December, 1920. Yellowstone National Park Archives, Yellowstone National Park.

18. Horace Albright, Superintendent, Yellowstone National Park to William Buttelman, Chairman, Board of County of Commissioners, Gallatin County, 23 December, 1920. Yellowstone National Park Archives, Yellowstone National Park.

19. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, Director of the National Park Service, 22 October, 1923. Yellowstone National Park Archives, Yellowstone National Park.

20. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, Director, National Park Service, 22 October, 1923. Yellowstone National Park Archives, Yellowstone National Park.

21. Stephen Mather, *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ending June 30, 1923 and the Travel Season, 1923* (Washington D. C.: Government Printing Office, 1923), 48-49.

22. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, Director of the National Park Service, 22 October, 1923. Yellowstone National Park Archives, Yellowstone National Park.

23. Horace Albright, Superintendent, National Park Service to J. W. Johnson, District Engineer for Bureau of Public Roads, 11 March, 1926. Yellowstone National Park Archives, Yellowstone National Park.

24. Horace Albright, Superintendent, Yellowstone National Park to Stephen Mather, Director of the National Park Service, 12 July, 1927. Yellowstone National Park Archives, Yellowstone National Park.

25. Thomas Vint, Associate Landscape Engineer, National Park Service to Dr. L. I. Hewes, Bureau of Public Roads, 21 January, 1927. Yellowstone National Park Archives, Yellowstone National Park.

26. C. A. Lord, "West Gallatin Road Project Grayling Creek Section-516 Report, February 5, 1929."

27. Horace Albright, Director of the National Park Service to George Patten, 11 February, 1931. George Patten to Guy Edwards, Acting Superintendent, Yellowstone National Park, 31 October, 1931. Yellowstone National Park Archives, Yellowstone National Park.

28. Walter D. Popham, "Emergency Conservation Work. Report to the Chief Architect through the Superintendent of Yellowstone National Park for the Month of September, 1934." J. W. Emmert, "Emergency Conservation Work, Yellowstone Park, Wyoming." "Final Narrative Report of E.C.W. for Third Enrollment Period, 15 October, 1934."

29. Sanford Hill, Associate Landscape Architect and Howard Gregg, Assistant Landscape Architect, "E.C.W. Report to the Chief Architect August 26 to September 26, 1935."

30. Memorandum from Sanford Hill, Resident Landscape Architect to Superintendent Edmund Rogers, 13 June, 1939. Yellowstone National Park Archives, Yellowstone National Park.

31. C. F. Capes, "Progress Report Season of 1940 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone National Park, Wyoming, February 28, 1941."

32. Edmund Rogers, "Annual Report for Yellowstone National Park for 1950," 18.

33. Memorandum from Regional Director to Superintendents, Yellowstone National Park and Glacier National Park, 3 March, 1955. Yellowstone National Park Archives, Yellowstone National Park.

APPENDIX A

Synopsis of Roads, Bridle-Paths, and Trails in the Yellowstone National Park "19th Century"

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK "19th CENTURY"

	Between points	Total
Road towards Bozeman	**Miles**	**Miles**
From headquarters at the Mammoth Hot Springs to northern boundary line of Wyoming		1.99
Northern boundary line of the National Park, below the mouth of the Gardner River	5.00	6.99
Direct road to the forks of the Fire-Hole River		
From headquarters at the Mammoth Hot Springs to Terrace Pass		1.93
Swan Lake	3.21	5.14
Crossing of Middle Fork of Gardner River	2.33	7.47
Willow Park, upper end	3.50	10.97
Obsidian Cliffs and Beaver Lake	1.37	12.34
Green Creek	1.40	13.74
Lake of the Woods	.76	14.50
Hot Springs	1.68	16.18
Norris Fork Crossing	4.17	20.35
Norris Geyser Basin	.71	21.06
Geyser Creek and Forks of the Paint Pot trail	3.13	24.19
Head of Canon of the Gibbon and foot-bridge on trail to Monument Geysers	.72	24.91
Falls of the Gibbon River	3.75	28.66
Canon Creek	.59	29.25
Earthquake Cliffs	3.00	32.25
Lookout Terrace	1.50	33.75
Marshall's Hotel, at the Forks of the Fire Hole River	2.43	36.18
Road from Forks of the Fire Hole River to foot of the Yellowstone Lake		
From Marshall's Hotel to forks of the road near Prospect Point		1.00
Hot Springs	1.08	2.08

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK- Continued

	Between points	Total
Rock Fork	3.86	5.96
Willow Creek	2.00	7.96
Foot of the grade up the Madison Divide	2.00	9.96
Upper end of Mary's Lake	1.91	11.85
Sulphur Lakes and Hot Springs	1.12	12.97
Alum Creek Camp	2.00	14.97
Sage Creek Crossing	2.00	16.97
Fork of the road to the falls near the Yellowstone River	5.00	21.97
Mud Geysers	2.00	23.97
Grizzly Creek	3.00	26.97
Foot of the Yellowstone Lake	3.26	30.23
Branch road to the Great Falls of the Yellowstone		
From Forks of the Fire Hole River to forks of the Lake Road to the Great Falls, as above		21.97
Sulphur Mountain	1.50	23.47
Alum Creek	1.61	25.08
Upper Falls of the Yellowstone, bridle-path	3.26	28.34
Crystal Falls and Grotto Pool, bridle-path	.40	28.74
Lower (Great) Falls of the Yellowstone	.24	28.98
Road to Tower Falls		
Headquarters at the Mammoth Hot Springs to bridge over the Gardner River		1.77
Bridge over the East Fork of the Gardner River	.38	2.15
Upper Falls to East Fork of the Gardner River	2.06	4.21
Black Tail Deer Creek	2.70	6.91
Lava Beds	2.00	8.91
Dry Canon, or Devil's Cut	4.69	13.60
Pleasant Valley	2.28	15.88
Forks of the Yellowstone	2.48	18.36
Tower Falls	3.19	21.55

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK - Continued

	Between points	Total
Geyser Basin road		
Marshall's Hotel to forks of road at Prospect Point		1.00
Old Camp Reunion	1.00	2.00
Fountain Geyser in the Lower Geyser Basin	1.00	3.00
Excelsior Geyser in the Midway Geyser Basin	2.00	5.00
Old Faithful, in the Upper Geyser Basin	6.00	11.00
Madison Plateau road		
Marshall's Hotel to Forest Spring		3.00
Marshall's Park	2.12	5.12
Lookout Cliffs	3.59	8.71
Riverside Station and Forks of Kirkwood or Lower Madison Canon road to Virginia	3.52	12.23
Bridge over North Madison River	11.53	23.76
Madison Canon road		
Marshall's Hotel to forks of road to the Mammoth Hot Springs		4.00
Mouth of the Gibbon River	5.00	9.00
Foot of the Madison Canon	6.00	15.00
Riverside Station	3.00	18.00
Queen's Laundry road		
Marshall's Hotel to crossing Laundry Creek		1.00
Twin Mounds	1.00	2.00
Queen's laundry and bath-house	.50	2.50

A bridle-path 3 miles long extends from there to the Madison Plateau road and another is partially completed via Twin Buttes and Fairy Falls to the Midway Geyser Basin.

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK - Continued

	Between points	Total
Middle Fork of the Gardner bridle-path		
Headquarters at the Mammoth Hot Springs to the West Gardner		2.00
Falls of the Middle Gardner	2.00	4.00
Sheepeater Cliffs	2.00	6.00
Road to thye Geysers	1.00	7.00
Painted Cliff bridle-path		
Meadow Camp to head of Grand Canon		1.00
Safety Valve Pulsating Geyser	1.00	2.00
Yellowstone River at Painted Cliffs	1.00	3.00
Paint Pots bridle-path		
Mouth of Geyser Creek to the Paint Pots		1.00
Geyser Gorge	1.00	2.00
Earthquake Gorge	2.00	4.00
Rocky Fork Crossing	2.00	6.00
Mary's Lake Road, near Yellowstone Creek	5.00	11.00
Grand Canon bridle-path		
Tower Falls to Forks of Trail		1.87
Antelope Creek	4.00	5.87
Bowland's Pass of Mount Washburn	2.00	7.87
Glade Creek	2.47	10.34
Mud Geyser	1.00	11.34
Hot Sulphur Springs	.83	12.17
Meadow Camp and fork of Painted Cliffs bridle-path Trail	1.59	13.76
Brink of the Grand Canon	1.00	14.76
Lookout, Paint, and forks of trail into the canon below the falls	2.19	16.95
Great Falls of the Yellowstone	.74	17.69

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK - Continued

	Between points	Total
Shoshone Lake bridle-path		
Old Faithful, in the Upper Geyser Basin, to Kepler's Cascades		1.94
Leech Lake	2.72	4.66
Norris Pass, Continental Divide	3.00	7.66
DeLacey Creek, Pacific waters	.97	8.63
Two-Ocean Pond, on Continental Divide	3.50	12.13
Hot Springs, at head of thumb of the Yellowstone Lake	2.99	15.12
Hot Spring, on Lake Shore	2.02	17.14
Hot Spring Creek	4.00	21.14
Natural Bridge	7.44	28.58
Outlet of Yellowstone Lake	4.68	33.26
Miner's bridle-path		
Baronette's Bridge, at forks of the Yellowstone River, to Duck Lake		1.76
Amethyst Creek	8.30	10.06
Crossing, East Fork of Yellowstone River	2.16	12.22
Gamekeeper's Cabin	.50	12.72
Soda Butte, medicinal springs	2.65	15.37
Trout Lake	2.00	17.37
Round Prairie	3.00	20.37
North line of Wyoming	3.84	24.21
Clarke's Forks Run Camp, near northeast corner of the park	3.18	27.39
Hoodoo or Goblin Mountain bridle-path		
Gamekeeper's cabin, on the Soda Butte, to Hot Sulphur Springs		2
Ford of Cache Creek	1	3
Alum Springs and return	4	7
Calfee Creek	4	11
Miller's Creek	2	13
Mountain Terrace	8	21
Old Camp	5	26

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK - Continued

	Between points	Total
Goblin Labyrinths	2	28
Monument of Hoodoo Mountain	1	29
Fossil Forest bridle-path		
Summit of Amethyst Mountain		3
Gamekeeper's cabin to foot of Mountain	3	6
Orange Creek	5	11
Sulphur Hills	4	15
Forks of Pelican Creek	8	23
Indian Pond at Concretion Cove of the Yellowstone Lake	5	28
Lower Ford of the Pelican Creek	3	31
Foot of the Yellowstone Lake	3	34
Passamaria or Stinkingwater bridle-path		
Concretion Cove to Turbid Lake		3
Jones' Pass of the Sierra Shoshone Range	7	10
Confluence of the Jones and Stinkingwater Fork of the Passamaria River	12	22
Nez Perce bridle-path		
Indian Pond to Pelican Valley		3
Ford of Pelican Creek	3	6
Nez Perce Ford of the Yellowstone	6	12
Alum Creek bridle-path		
From the Great Falls of the Yellowstone, via Crystal Falls and Grotto Pool and the Upper Falls, to the mouth of Alum Creek		4

SYNOPSIS OF ROADS, BRIDLE-PATHS, AND TRAILS IN THE YELLOWSTONE NATIONAL PARK - Continued

	Between points	Total
Terrace Mountain Trail		
Headquarters at the Mammoth Hot Springs, amongst the numerous active and extinct Mammoth Hot Springs, to foot of the Ancient Terraces		1
Up steep pine, fir, and cedar clad terraces, to summit of the mountain	1	2
Along the range of the vertical cliffs, for 400 to 800 feet high	2	4
Descent of South Terrace to Rustic Falls, 40 feet high, at the head of the impassable canon of the West Fort of the Gardner River	1	5
Upon the southern cliff, above these falls, is a Speepeater arrow-covert, and the remains of an ancient game-driveway thereto.		
Swan Lake, on the Fire Hole road	1	6
Trail to the Falls of the East Gardner River		
From the road near the middle of the canon along the eastern declivity, one mile		1
To the fall, not unlike the famous Minnehaha, and like which, allows a safe pathway between the sheet of water and the wall rock.		
Monument Geyser Trail		
Foot-bridge at head of the canon of the Gibbon, which ascends nearly 1,000 feet within a distance of one mile, some portions of which are exceedingly difficult for a horseman, and hence called a trail		1
The active and the extinct and crumbling geyser cones are alike uniquely interesting, and the outlook remarkably beautiful.		

Trail, or footpath, to head of the Great Falls of the Yellowstone

Leaves at the lower end of the camping ground above, and descends 500 or 600 feet within one-fourth of a mile to the pole-bordered outlook at the very head of the cataract.

Trail to the Yellowstone River below the Lower Falls of the Yellowstone

This trail descends Spring Sun from the rustic bridge nearly to its waterfall, thence along the steep declivity beneath Lookout Point, in a winding, dangerous way, to the foaming river, which cannot now be ascended, along it, as formerly, to the foot of the falls upon this side; but can be reached upon the other, via the timber-fringed gorge.

The main danger is from detached fragments of rock, which attain incredible velocity before reaching the river.

Besides these trails there are several others to fossil forests, cliffs, geyser or sulphur basins or falls, which will be fully noted in the forthcoming guide-book of the Park.

APPENDIX B

Memorandum of Agreement Between
The National Park Service
And
The Bureau of Public Roads
Relating to the Survey, Construction, and Improvement of Roads and Trails
In the National Parks and National Monuments

**MEMORANDUM OF AGREEMENT BETWEEN
THE NATIONAL PARK SERVICE
AND
THE BUREAU OF PUBLIC ROADS
RELATING TO THE SURVEY, CONSTRUCTION, AND IMPROVEMENT OF ROADS AND TRAILS
IN THE NATIONAL PARKS AND NATIONAL MONUMENTS**

*****

WHEREAS, Certain acts of Congress have authorized the making of appropriations and have made appropriations and authorized the incurring of obligations for the survey, construction, reconstruction, and improvement of roads and trails in the national parks and national monuments under the jurisdiction of the Department of the Interior; and

WHEREAS, The Bureau of Public Roads of the United States Department of Agriculture has an engineering organization perfected for the purpose of making surveys and improving highways; and

WHEREAS, The National Park Service of the Department of the Interior, in the interest of economy and efficiency, desires to utilize the services of the existing road-building organization of the Bureau of Public Roads in the survey, construction, reconstruction, and improvement of roads and trails within the national parks and national monuments, as authorized by Congress;

NOW, THEREFORE, The National Park Service, hereinafter referred to as the Park Service, and the Bureau of Public Roads, hereinafter referred to as the Bureau, do hereby mutually agree, as follows:

STANDARDIZATION OF CONSTRUCTION AND ARTICULATION OF HIGHWAYS:

ARTICLE I

(1) That the Park Service and the Bureau shall each use every effort to harmonize the standards of construction of roads and trails in the national parks and monuments with the standards adopted for the construction of the roads which form a part of the Federal Aid Highway System and of roads and trails within the national forests and to secure the best modern practice in the location, design, construction, and improvement thereof.

(2) That from time to time duly authorized representatives of the Park Service and of the Bureau will confer with authorized representatives of the United States Forest Service and the several State Highway Departments wherein the national parks and monuments are located, for the purpose of developing a general scheme of improvement by which the national park highways, highways forming a part of the Federal Aid System, State highways, and the highways within the national forests will so articulate with and supplement each other as to form an interconnected system of highways.

INITIATION OF PROJECTS AND PRELIMINARY SURVEYS

ARTICLE II

The services of the Bureau will be furnished only upon request in writing from the Director of the Park Service, and the following procedure shall be observed:

(1) Upon receipt of request from the Park Service the Chief of the Bureau will cause an investigation and a preliminary estimate of cost of the project to be made.

(2) Simultaneously with the above request the Park Service shall instruct its Landscape Engineer to cooperate with the engineers of the Bureau in making the preliminary investigation.

(3) The time for making the field examination of any such project shall be agreed upon by the Superintendent and Landscape Engineer of the Park Service and the District Engineer of the Bureau. When said field examination has been completed the following reports shall be prepared:

(a) Report to the Chief of Bureau by the Bureau representative on the location and construction of the proposed project, together with an estimate of the cost thereof. Copies of this report will be furnished to the Park Service in duplicate and to the Park Superintendent.

(b) Report to the Park Service by the Landscape Engineer on all landscape features of the proposed project. Copies of this report shall be furnished to the Bureau in duplicate and to the Park Superintendent.

(c) Report of the Superintendent of the Park to the Park Service commenting on the reports referred to in the next preceding paragraphs and making the recommendations with respect to the proposed project. Copies of the Superintendent's report and recommendation shall be submitted to the Chief of the Bureau in duplicate, through its District Engineer, and to the Park Service, in duplicate through the Field Assistant, one copy of such reports to be retained by the District Engineer and Field Assistant, respectively, for their files.

(4) Upon receipt of the preliminary reports referred to above, the Park Service Service shall inform the Bureau whether it desires the work to be undertaken by the Bureau as a major project or whether the Park Service shall proceed with the work as a minor project without the services of the Bureau.

EXECUTION OF MAJOR PROJECTS

ARTICLE III

(1) In case the project is a major one and the services of the Bureau are desired in the execution and completion thereof, the Director of the Park Service shall so notify the Chief of Bureau in writing and make request that the project be handled to completion by the Bureau in accordance with the procedure herein outlined.

(2) Upon receipt of such notice and request the Bureau will instruct its District Engineer to proceed, in cooperation with the Landscape Engineer of the Park Service and the Superintendent of the Park, with the location survey, and to prepare plans, specifications, and estimates for the project.

(3) When said plans, specifications and estimates have been prepared, and approval recommendations by the Landscape Engineer of the Park Service and the Superintendent of the Park are shown thereon, they shall be forwarded by the District Engineer to the Bureau for transmission to the Park Service for approval or disapproval.

(4) If the Park Service approves the plans, specifications and estimates, it shall so notify the Bureau in writing and instruct the Superintendent of the Park to advertise for proposals for the construction of the project.

(5) The advertisement for proposals shall specify the time and place of opening the bids, and the bids shall be opened and tabulated by the Superintendent of the Park and the District Engineer of the Bureau.

(6) The recommendation for award shall be made by the Park Superintendent, shall be concurred in by the District Engineer, and shall be forwarded to the Director of the Park Service, through the Chief of the Bureau, accompanied by the three low bids and a tabular statement of all bids received. The award shall then be made by the Secretary of the Interior.

(7) Immediately upon notice of award the Park Superintendent and the Bureau shall be notified and formal contract shall be executed by the successful bidder and the Department of the Interior.

(8) The prosecution of the work shall be undertaken by the District Engineer in accordance with the plans and specifications approved for the project, it being understood that the specifications shall govern all ordinary landscape features of the work, and any minor alterations which are authorized under the specifications without a modification of agreement, and which are deemed necessary during the progress of the work, may be ordered by the District Engineer in writing, with the written concurrence of the Landscape Engineer, to whom shall be delegated the necessary authority to do so.

PAYMENTS

ARTICLE IV

(1) As the construction of a project progresses prompt payments shall be made by the local fiscal or disbursing agent of the National Park Service to the contractor upon monthly estimates approved by the District Engineer.

(2) The Park Service will reimburse the Bureau for actual expenses incurred by reason of active work on investigating, surveying, preparing plans, specifications and estimates, and supervising projects. An estimate of the actual expenses to be incurred by the Bureau shall be made and forwarded to the Park Service upon receipt of each request for the Bureau's services, and the Park Service shall, upon receipt of such estimate, set up a liability on its books to defray such expenses against existing appropriations or appropriations authorized to be made against which obligations may legally be incurred.

(3) Reimbursements for the actual expenses incurred by the Bureau in rendering such services will be made by the Park Service from time to time upon the submission of vouchers therefor.

(4) Upon request of the Park Service preliminary investigations, surveys, and estimates will be made for major projects for which reimbursements will be made in the manner hereinbefore provided.

ACCEPTANCE OF PROJECTS

ARTICLE V

(1) Before approving final settlement with the contractor the District Engineer shall obtain from the Park Superintendent and the Landscape Engineer written recommendations for acceptance of the work in which he shall concur in writing.

(2) The District Ranger shall approve and forward the final voucher in favor of the contractor, through the Chief of Bureau, to the Park Service, accompanied by the above recommendations, for final acceptance of the Secretary of the Interior and transmission of voucher to the General Accounting Office for final settlement.

Signed this 18th day of January, 1926.

By: (Sgd.) STEPHEN T. MATHER,

Director, National Park Service

By: THOS. H. MacDONALD,

Chief, Bureau of Public Roads

Signed this 3rd day of February, 1926.

APPROVED: January 22, 1926.

By: (Sgd.) HUBERT WORK,

Secretary, Department of the Interior.

February 10, 1926.

By: (Sgd.) W.M. JARDINE,

Secretary, Department of Agriculture.

APPENDIX C

Report July 1951
Road Cross Section Design, Construction Standards and Maintenance in Yellowstone National Park and Grand Teton National Park

Frank E. Mattson
Landscape Architect
July 1951

SUMMARY

The objective of increasing or improving our road standards has been made to provide a wider and safer road and to provide such dimensions as will permit roadside parking so that the park visitors may slow down in safety and stop to view the wonders of the parks. The recent and current roads section designs, although directed toward such ends, do not result in these objectives. The practice of giving the road shoulder a bituminous treatment is actually increasing the width of the traffic surface beyond the desirable dimensions and not increasing the width of the shoulders and in many cases eliminating the shoulder entirely. Reprocessing the traffic surface during maintenance operations is resulting in wider and wider traffic surfaces and eliminating an effective shoulder. Many traffic surfaces now compare with the hazardous three lane widths.

The wider traffic surfaces are conducive to speed. Greater and faster speeds with more powerful cars in areas where we wish to keep the speed down to a minimum for no other reason than for the benefit of the park visitor. The road shoulders which we hoped to attain are not materializing and we provide for no roadside parking strip to permit the visitor to pull out of the traffic lanes to view the scenes of the park.

Our design standards, patterned upon State highway work is headed in the wrong direction. The standards of roads within the parks do not necessarily need to comply with highway standards outside of the parks and moreover the parks, of necessity, should have standards of their own.

Road shoulders are required in National Parks and they should be at least five or six feet wide to adequately serve slow moving and stopping by the park visitors. However, with the Services' background in conservative road widths, we do not feel free to recommend such wide road shoulders. It would be well if someone could have the vision to promote wider road shoulders.

Road shoulder design should fit the terrain. Generous widths are desirable and permissible in open and rolling terrain while lower standard overall dimensions should be used on mountainous terrain.

The traffic surface of park roads does not need to be more than 22 feet.

Maintenance operations need to be keyed to the standard to which the roads have been constructed. This rule should apply to modern sections. On unimproved sections some programmed improvements may be necessary with maintenance.

The term traffic surface is used here to describe those portions of the road surface which are designed to carry traffic and also those portions which will carry traffic because of their appearance and construction. Road shoulders, as we describe them, will be those portions of the road outside of the limits of the traffic surface. In other words, a traffic surface does not or is not described as having a shoulder.

During the discussions with the Bureau of Public Roads in 1946 while attempting to give our road program a long look ahead in preparation of the Road Report and without the benefit of the Services' consolidated thinking, it was the consensus in Yellowstone that we propose a road section with 22 feet of traffic surface and the equivalent of 4 feet of shoulder on a common plane with the traffic surface. Since the Bureau had already prepared their estimates on the basis of a 28 foot grade Mr. Learned requested that we retract this proposal to 3 foot shoulders, which we did. The Bureau also advised us at the time that the other areas of the Service were much more conservative. In our efforts to arrive at road shoulders on a common level with the traffic surface we agreed to shoulders which sloped away from the traffic surface on 12-1 as that would be quite an improvement over what we now have. We still believe that the shoulders should and can be on the same level as the pavement. The oiling of the road shoulders was not discussed at that time. All new road designs in the park propose the oiling of the road shoulders which we believe is undesirable for park roads.

RECOMMENDATIONS

GENERAL

Retain the standards we now use for flatness of slopes and fills and for rounding and warping of cuts and fills. Consider the steepening of shallow fill slopes to discourage rather than encourage driving off the roads. Provide extra road widening where it comes easily without moving deeper into hillsides, such as small daylighted outside cuts.

Provide 22 feet of traffic surface on all roads and stay within that dimension.

Provide shoulders which are on a common plane with the traffic surface.

Use shoulder material which will permit the growth of grasses and be stable enough to support traffic.

Eliminate the ditching on dry terrain where it actually serves no purpose.

Where moist conditions prevail consider extra subsurface drains in preference to heavy ditching.

Conventional standards for widening on curves and compensation for grade and alignment and for access roads should be followed.

FOR OPEN AND ROLLING TERRAIN

In Yellowstone:

Provide 3 foot shoulders for all Entrance and Grand Loop Roads.

On presently constructed roads which are considered complete this would mean reconstruction to provide for shoulders. On proposed improvements and on new construction it would mean redesign of the section to provide for shoulders which do not become absorbed into the traffic surface.

In Grand Teton:

The Eastside road for through traffic; provide four feet shoulders.

The Jenny Lake road: Retain as near as possible its present character.

Present Westside through road; 3 foot shoulders.

FOR MOUNTAINOUS TERRAIN

Some traffic width with no shoulder on the inside but with a small paved ditch. Generally no shoulder on the outside except to support traffic surface and guard rail where necessary. Provide wide shoulders, 4 feet if practical where location and terrain will permit, such as in through cuts on the outside of curves.

FOR MAINTENANCE

Maintenance should conform to the designed and constructed standards and not modify any standards unless they are programmed and authorized. Sections not conforming to design at present should be corrected to comply such as the South Approach road directly south of the park boundary.

PRESENT TREND IN CROSS SECTION DESIGN NOT DESIRABLE

The Rocky Mountain region has road cross section design which in a number of respects is peculiar to this section of the country. The section consists of successive layers of base or surfacing material for the traffic surface superimposed upon the rough grade leaving a traffic surface of about 22 feet above sloping road shoulders when the graded width was great enough, and no shoulder to mention where the original width did not permit it. This method lends itself to a simple type of road construction operation permitting various phases of the improvement to be accomplished over a period of years. In fact, in some respects, it permitted the stepping up of standards during the period in which the road was built. This is apparently what happened in Yellowstone, resulting in roads which have no more than a traffic surface and no supporting shoulder and no parking shoulder.

Through these stages the place has been reached where it is generally agreed that 22 feet is an adequate traffic surface width and we have followed this standard in the park, although, all of the road do not meet that dimension the State of Montana is going to 24 feet traffic surface dimensions, but 24 feet traffic surface alone with no shoulders is not adequate for safe driving.

On most of the park roads the traffic surface alone is the entire road width and for this reason there have been constant proposals to widen the roads. The standards have been raised in graded width and there are plans to improve already graded and partially surfaced sections. What are these plans like? Will they give us the wider roads we have been wanting?

All of the newer plans including those already graded and based show the paving of the shoulders and in some cases the ditches. This is a practice which the states have employed and evidently its objectives where admirable. It was hoped that the bituminous treatment would hold up the shoulders and it was also hoped that a differentiation could be provided in texture and color to show what was traffic surface and what was shoulder. We began following these principals in the parks but possibly not for the same purpose. The section appeared to have a facility for not requiring as wide a construction section.

However, the end result, and it can be observed on practically any of the bituminous surfaced highways in recent state work and in the park from Old Faithful to Isa Lake and on the South Approach Road, is that we have a wide traffic surface and no shoulders of consequence; no shoulders on which one would feel free to park and be free of the hazards of passing traffic. Without extremes in construction and maintenance costs we do not believe that it is possible to retain any difference in color or texture of the shoulders and traffic surface. Furthermore, there is proof that vegetation is more satisfactory for the prevention of erosion than a bituminous treatment.

The habits developed by maintenance work is reprocessing edge to edge currently resulting in 26 foot to 30 foot traffic surfaces were not, we believe, intentionally directed that way. But we do believe it is a serious mistake to continue the practice to provide that much traffic surface and wipe out the shoulders entirely. The object of the present cross section design and the object of the gradual increase in standards was to provide a road shoulder. The trouble with the paving methods is that we end up with no shoulders. The pride in squeezing 27 feet or 28 feet of surfacing onto a grade could very well be directed toward a constructive approach in retaining the original design of the section. The actual approaches to three lane highway dimensions is enough to terrify some of us.

Therefore, within the parks, all of us have urged the necessity of road shoulders so that traffic can flow smoothly while the visitors slow down or stop to view the wonders of the parks. We have built a number of sections with that particular improvement in mind. Now that they are built what do we have?

The trend of the design, the construction of the grade, and the actual maintenance of these sections has resulted in greater traffic surface widths and we still do not have any road shoulders. The trend is toward progressively wider traffic surfaces and narrower shoulders. The wider traffic surfaces are encouraging speed on roads which were not designed for speed.

PROGRESS IN ROAD DESIGN IN YELLOWSTONE

We believe that a review of the gradual improvement of the standard within Yellowstone will illustrate very well the pattern which we are now following.

THE STAGECOACH ROADS

There are several sections of road still existing which have not progressed far since they were built for stagecoach use. Although narrow, they are relatively safe because of the enforced slow speed, due to alignment standards and site distances. They do not have any shoulders but the fact that they also do not have any ditches permits a certain amount of freedom not found on many of the improved sections.

CIRCA 1927

The portions of the road on the north section of the loop and part of the East Entrance which were rebuilt during the first phase of reconstruction were on a relatively lower standard of grade compared to that which we are using today. Consequently, as the roads reached the stages of construction when the base and surfacing was being placed, the standards has been increased to a degree where the objective was to provide 22 feet of traffic surface. With the successive lifts of base and paving this width was attained in some cases but as on the Dunraven road it remained at 20 feet. The fact that this left the road without any shoulder was quite unavoidable and for this reason these sections of road, namely: Canyon-Tower Junction, Mammoth, Norris, Madison to Firehole Cascades and the east end of the East Entrance are now considered narrow for park use. They need to be improved. Even with maintenance it is not very practical to rebuild shoulders where none existed before. Reprocessing of surfacing on these sections has been an edge to edge operation and it cannot very well be much different.

1932-1936

The standards of this era were 26 feet graded sections for entrance roads and 28 feet graded sections for loop roads. They were designed for 22 feet of traffic surface which was superimposed upon the base course, which in turn had been superimposed upon the 26 foot or 28 foot grade; which did not leave much road shoulder.

The Northeast Entrance to Lamar section is a good example of what has resulted without disturbing the original construction. This was especially noted when Messrs Vint, Hall, Kreuger, and Cabot arrived in the park. Other sections with this standard within the park are: Firehole Cascades to Old Faithful, Isa Lake to West Thumb to Arnica Creek, Bridge Bay to Lake Junction, Lake to Canyon, South Entrance to Thumb. Reprocessing of unbased sections leaves traffic surfaces in the neighborhood to 27 feet wide. Reprocessing of finished sections leaves edge to edge traffic surfaces.

1938 TO PRESENT DATE

The sections built, such as Old Faithful to Isa Lake (see below) now show a definite trend toward completely roofed surfaces. This practice is in the plans for a number of portions included in the above construction period. Those portions include the Canyon Area, Northeast Entrance (Lamar to Tower Junction), Lewis Lake to Thumb, Lake to Canyon and the South Approach Road. With the exception of the South Approach road which is 30 feet wide these are all on 26 foot and 28 foot grades. The proposal is to give all of the shoulders a bituminous treatment although the traffic surface theoretically is designed to remain at 22 feet. Reprocessing of the first constructed portion of the South Approach road the past month has resulted in traffic surfaces in the neighborhood of 28 to 30 feet wide.

Incidentally, the South Approach Road dimension is measured on the grade after 4 inches of select material (which for all practical purposes is 4 inches of base) has been placed. This section, therefore, gives us the widest constructed sections we have in this area. The design calls for 22 feet of traffic surface and the balance, out of approximately 28 feet, in shoulder. This shoulder will be sloped if the plans are carried out. Please note again that the current reprocessing of the 1948 constructed section of the road has been spread to 28 to 30 feet wide.

THE OLD FAITHFUL TO ISA LAKE SECTION

Since this road section is held by many people to be an example of the type of road we should build we are making special mention of it. For those who are not familiar with it, it has a completely roofed section. The paving of the traffic surface was laid down separately from the shoulders with 3/8 inch chips and the shoulders and ditches with 3/4 inch chips. Actually this means nothing to the driver and is hardly discernable to those who are supposed to know the difference.

As with the section adjoining to the east of this it is all in relatively rough terrain which has not permitted grades or alignment of a high speed design. Site distances are very short and normally passing or overtaking traffic would not be easy. However, the fact that there is an apparent traffic lane of 28 or 30 feet makes the possibilities for speed obvious and the need for overtaking greater. The chance for passing, because of the wide surface, entreats many to pass who should not take the chance, but since there is width there for maneuvering, the speed is kept up.

Most of us compare this section with those roads in the park which have no more than 22 feet of traffic surface with no shoulders. It is quite natural that this section is considered by many to be a decided improvement over the narrow roads we have.

APPENDIX D

Roads and Trails Maintenance Report 1956

SPECIAL - DEFERRED

Roads and Trails Maintenance

Region Two | **Area Yellowstone National Park** | **State Wyoming**

Item	Estimate	Program 1956 Fiscal Year
Re-grading 5 mi., replace 2 culverts (horse) Route 5	750	
Re-grading 1 mi., and clearing 5 mi., (horse), Route 7-E	500	
Re-grading 2 m., (horse) Route 6-F	350	
Re-grading 2 mi. and marking (horse) Route 7-M	350	
Replacement 3 bridges, 150 ft. corduroy (horse) Route 7-R	325	
3/4" Leveling Course, 1.5 mi. @ $4,000, Route 1E1	6,000	6,000
3/4" Leveling Course, 1.0 mi. @ $4,000, Route 1F	4,000	4,000
3/4" Leveling Course, 2.0 mi. @ $4,000, Route 1H	8,000	8,000
3/4" Leveling Course, 1.0 mi. @ $4,000, Route 2B	4,000	4,000
3/4" Leveling Course, 2.0 mi. @ $4,000, Route 3	8,000	8,000
3/4" Leveling Course, 1.0 mi. @ $4,000, Route 4	4,000	4,000
3/4" Leveling Course, 2.0 mi. @ $4,000, Route 6	8,000	8,000
3/4" Leveling Course, 2.0 mi. @ $4,000, Route 10	8,000	8,000

These sections are raveling with lots of potholes. Patching is heavy and costly. The leveling course will restore a smooth riding surface, do away with the excessive patching and reduce maintenance cost. The original surface on many of these sections was placed in the late 1920s and early 1930s.

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Re-seal with chips, 17.5 mi. @ $2,700, E. end Route 10	47,250	22,935
Re-seal with chips, 1.0 mi. @ $2,700, Route 1B	2,700	2,700
seal with chips, 2.5 mi. @ $2,700, Route 1C	6,750	6,750
seal with chips, 5.0 mi. @ $2,700, Route 1D	13,500	13,500
Re-seal with sand, 3.0 mi. @ $1,300, Route 1E1	3,900	3,900
Re-seal with sand, 2.0 mi. @ $1,300, Route 1F	2,600	2,600
Re-seal with chips, 3.0 mi. @ $2,700, Route 1H	8,100	8,100
Re-seal with sand, 2.0 mi. @ $1,200, Route 3	2,600	2,600

Some of these sections were reprocessed last year and need a seal to keep out surface water and to give wearing surface. Other sections are old and cracking and letting water get into the base. Sealing will give several years' more service to those old roads and reduce maintenance.

Replace 1,400 lin. ft. Guard Rail with treated material @ $5.00, Route 4	7,000	7,000

The existing guard rail is rotting, falling down and does not serve as a safety factor any longer. Replacing this rail will provide safety at the most dangerous spots along this section and improve the roadside appearance.

Repair foot bridge and abutment, Norris Geyser Basin, Route 1B2	500	500
Repair and seal 1.0 mi. main Old Faithful Roads, Route 1C9	1,500	1,500
Repair entire bridge over Firehole River, Route 1C8	1,800	1,800
Repair and seal coat 1.0 mi. in Cooke City, Route 1H9	1,500	500
Regrade 5 mi. below Cache Creek Cabin (horse trail), Route 7E	700	700

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Replace 300 ft. corduroy and repair 4 small bridges (horse trail), Route 1J	1,375	1,375
Replace 300 ft. courduroy and build 600 ft. drain ditch (horse trail), Route 1C1	700	378
Build rock retaining walls (2) on switchbacks east end Route 10	850	
Repair Wyoming Creek Bridge, Route 10	20,000	
Repair Rock Creek Bridge, Route 10	3,500	
3/4" Leveling course, 1.0 mil @ $4,000 Route 5	4,000	
Replace rotted seat and bumper logs on Fishing Bridge, Route 5	11,000	
Remove trees in parkway front Hamilton Store at Fishing Bridge, Route 5	2,500	
Replace 3,750 ft. guard rail with guide posts, Route 5	2,500	
Replace 5,000 ft. guard rail with treated rail @ $5, Route 5	25,000	
Re-seal with sand 3.2 mi. @ $1,300, Routes 7 & 11	4,160	
3/4" Leveling course 3.1 mi. @ $4,000, Route 8	12,400	
seal with sand 2.3 mi. @ $1,300, Route 8	3,000	
place 1,500 ft. guard rail with treated rail, Route 8	7,500	
Re-seal with chips 5.8 mi. @ $2,700 west end, Route 10	15,660	
3/4" Leveling course on 0.3 mi. @ $4,000, Route 160	1,200	
3/4" Leveling course on 2.5 mi. @ $4,000, Route 100	10,000	
3/4" Leveling course on 2.5 mi. @ $4,000, Route 133	10,000	
Rebuild bridge (12 ft.) midway section, Route 102	1,800	
3/4" Leveling course on 1.3 mi. parking area @ $4,000, Route 131	5,200	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Sand seal 11.3 mi. parking area @ $1,300, Route 131	1,950	
Sand seal 1.6 mi. entire loop, Route 104	2,400	
3/4" Leveling course 1.0 mi. east end @ $4,00 Route 163	4,000	
Replace deck on 3 small bridges, Firehole Lake Loop, Route 124	1,500	
Stabilize, reprocess and sand seal parking areas, Route 162	2,820	
Replace guard rail logs with treated logs along Canyon rim, Route 162	1,000	
3/4" Leveling course 0.5 mi. east end, Route 162	2,000	
Sand seal 2.5 mi. Mammoth Campground road, Route 100	3,250	
3/4" Leveling course and sand seal 2.7 mi. cabin area roads, Route 152	12,160	
Sand seal 1.5 mi. @ $1,300, Route 163	1,950	
Replace guard rail with guide posts, 500 ft. Route 153	300	
Stabilize base and re-surface 1 mi., Route 160	10,500	
Place 4,000 ft. of underdrain, Route 160	16,000	
Flatten slopes for slide and erosion control, Route 160	5,000	
Repair 3 bridges, Route 224	1,500	
Repair 3 bridges, Route 249	1,500	
Repair 4 small bridges, Route 279	2,000	
Repair 6 small bridges, Route 247	3,000	
3/4" Leveling course, hospital to Route 24, 1 mi. Route 201	4,000	
3/4" Leveling course, Lake Service Roads 1 mi. Route 250	4,000	
3/4" Leveling course 6.2 mi. @ $4,000, Route 1A	28,800	
Stabilize base 0.4 mi. @ $2,000 at mile 14.2 Route 1A	2,000	
Stabilize base and replace mat @ $8,000 at mile 3.1, Route 1A	5,600	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Chip seal 14.2 mi. @ $2,700, Route 1A	38,340	
build eroded shoulders 2.0 mi. @ $2,000, Route 1A	4,000	
Chip seal 10.9 mi. @ $2,700, route 1B	29,430	
3/4" Leveling course 2.3 mi. @ $4,000, Route 1B	9,200	
Chip seal 5.1 mi. @ $2,700 east end, Route 1D	13,770	
Stabilize 2100 ft. gutter with bitumen Thumb end Route 1D	2,100	
Replace 900 ft. guard rail with treated rail, Route 1D	4,500	
Replace 9,800 ft. guard rail with guide posts, Route 1D	5,880	
Chip seal 2. mi. @ $2,700 near Lake Jct., Route 1E	5,400	
Bank protection along Yellowstone Lake, 250 ft., Route 1E	900	
Replace 700 ft. guard rail with treated rail, Route 1E	3,500	
Replace 2,075 ft. guard rail with guide posts, Route 1E	1,245	
Replace 4,500 ft. barrier logs @ $1.25, Route 1E	5,600	
Sand seal 3.0 mi. @ $1,300, Route 1E	3,900	
Replace 3,150 ft. guard rail with treated rail, Route 1F	15,750	
Replace 11,750 ft. guard rail with guide posts, Route 1F	7,050	
Replace base material to correct settlements, Route 1F	1,500	
3" Leveling course 3.5 mi. @ $4,000, Route 1F	14,000	
Chip seal 2.4 mi. @ $2,700, Route 1F	6,480	
Replace bituminous mat with 200 ft. concrete slab, Route 1F	5,500	
Replace 5,500 ft. of guard rail with treated rail, Route 1G	27,000	

Item	Estimate	Program 1956 Fiscal Year
Replace 2,350 ft. guard rail with guide posts, Route 1G	1,410	
Chip seal 1.1 mi. @ $2,700, Route 1G	2,970	
3/4" Leveling course 2.5 mi. @ $4,000, Route 1H	10,000	
Chip seal 3.0 mi. @ $2,700, Route 1H	8,100	
Paint Gardner River bridge, Route 1H	4,500	
Correct settlements at mile 3.5, 14.3, 16.9 and 17.3, Route 1H	6,000	
Replace 1,000 ft. guard rail with treated rail @ $5, Route 1H	5,000	
Raise rock wall 400 ft. near Undine Falls, Route 1H	3,200	
Repair disintegrated concrete curb, 3, 1000 ft. Route 2A	3,100	
Chip seal 3.0 miles @ $2,700, Route 2A	8,100	
3/4" Leveling course 1.4 mi. @ $4,000, Route 2 A	5,600	
3/4" Leveling course 5.7 mi. @ $4,000, Route 3	22,800	
Sand seal 6.0 mi. @ $1,300, Route 3	7,800	
Repair settlements 2 mi. east end, Route 3	8,000	
3/4" Leveling course 2.2 mi. @ $4,000, Route 4	8,800	
Sand seal 7.0 mi. @ $1,300, Route 4	9,100	
Replace 600 ft. guard rail @ $5, Route 4	3,000	
Replace 6,050 ft. guard rail with treated posts, Route 4	3,630	
Replace laminated wood deck, Lewis River Bridge, Route 4	10,000	
Stabilize base and replace surfacing 0.6 mi. Route 4	4,800	
Stabilize base and replace surfacing 4.3 mi. @ $8,000, Route 5	34,400	
Chip seal 10.1 mi. @ $2,700, Route 5	29,160	
Install 36" x 66' C.M.P. at east boundary, Route 5	660	
Install 4.18" x 30' C.M.P., Route 5	2,000	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Replace 1,000 ft. barrier logs @ $1.25, Route 5	1,250	
Re-shape, place rip rap 5 parking areas along Mary Bay, Route 5	15,000	
Cut slope treatment, tree removal and rock scale, Route 5	4,000	
Chip seal, parking area at Fishing Bridge, Route 5	1,250	
3/4" Leveling course 3.2 mi. @ $4,000, Route 6	12,800	
Stabilize base and replace surfacing 5.7 mi. @ $8,000, Route 6	45,600	
Build eroded shoulders 3.5 mi., Route 6	7,000	
Install 3, 18" x 30' C.M.P., south from Bacon Rind Creek, Route 6	450	
Sand seal 3.5 mi. @ $1,300, Route 6	4,550	
Remove trees from road shoulders, Routes 7 and 11	1,500	
Paint steel work on Lamar Bridge, Route 8	600	
Paint Yellowstone River Bridge, Route 8	1,000	
Replace 100 ft. guard rail with treated rail @$5, Route 8	500	
Rebuild eroded shoulders 10. 5 mi., Route 8	13,000	
Replace base material and new surfacing on 0.7 mi., Route 8	5,600	
Flatten out slopes for safety near Yellowstone River Bridge, Route 8	1,600	
Re-shape drain and stabilize 5 parking areas Route 8	2,500	
Replace 2 rock flumes near east end, Route 8	400	
Replace 1,000 ft. guard rail with guide posts, Route 8	600	
Place 100 ft. rock revetment near Soda Butte Creek, Route 8	800	
Repair hand rail at Soda Butte and Cloud Burst Creeks, Route 8	1,000	
Repair rock retaining wall at mile 8.0, Route 8	1,200	
3/4" Leveling course 0.8 mi. just east of Cooke City, Route 10M	3,200	

Item	Estimate	Program 1956 Fiscal Year
Chip seal 1.3 mi. at Park Boundary Route 10M	3,510	
Repair Sheep Creek Bridge deck, Route 10M	2,000	
Replace 45,000 ft. guard rail with treated rail, Route 10M	225,000	
Replace 8,000 ft. guard rail with guide posts, Route 10M	4,800	
3/4" Leveling course 6.6 miles @ $4,000, Route 10W	26,400	
Sand seal 18.8 mi. @ $1,300, Route 10W	24,440	
Replace 22,000 ft. guard rail with posts, Route 10W	13,200	
Replace 6,850 ft. guard rail with treated rail, Route 10W	34,250	
Correct intermittent settlements near mi. 32, Route 10W	4,000	
Repair Fox Creek Bridge deck, Route 10W	1,800	
Rebuild shoulders 2.3 mi., Route 10W	6,900	
Rebuild rock wall 125' x 75' or widen inside road near Twin Lakes, Route 10W	4,000	
3/4" Leveling course 7.3 mi., @ $4,000, Route 12	29,200	
Sand seal 3.1 mi. @ $1,300	4,030	
Install 10, 10" x 30' C.M.P., Route 12	1,300	
Replace timber cribbing near Virginia Cascades, Route 12	4,000	
Clear trees from road shoulders, 5 mi., Route 12	3,500	
Install 500 ft. perforated underdrain @ $3.50, Route 1A	1,750	
Re-shape, drain and stabilize, 12 parking areas, Route 1A	5,000	
Rebuild rock gutters, 600 ft. @ $8., Route 1A	4,800	
Replace 500 ft. guard rail with treated rail, Route 1A	2,500	
Stabilize base, 1 mi., Route 1B	4,000	
Re-shape and stabilize gutter with rock, Route 1B	5,000	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Install 600 ft. perforated pipe @ $3.50, Elk Meadows, Route 1B	2,100	
Repair 400 ft. rock retaining wall @ $7.50 at mi. 12.5, Route 1B	3,000	
Re-shape, drain and stabilize 15 parking areas, Route 1B	7,500	
Chip seal 2.4 mi. @ $2,700 near Madison Jct., Route 1C	6,480	
Stabilize 4,000 ft. gutter with bitumen, Route 1C	8,000	
3/4" Leveling course 0.5 mi. near Midway, Route 1C	2,000	
3/4" Leveling course 2.25 mi. between 5.3 and 12.1, Route 1C	8,000	
Replace rock barriers 400 ft., Firehole River Canyon, Route 1C	800	
Re-shape, drain and stabilize 15 parking areas, Route 1C	7,500	
Replace 1,200 ft. guard rail with guide posts, Route 1C	720	
Rebuild eroded shoulders, 4 mi. @ $2,500, Route 1D	10,000	
Re-shape, drain and stabilize 15 parking areas, Route 1D	7,500	
Vista clearing near spruce point, Route 1E-1	2,000	
Pave parking area, Hamilton's Store at Lake, Route 1E	2,500	
Dress black slopes at mi. 5.3 to 16.3, Route 1E-1	10,000	
Re-shape, drain and stabilize 8 parking areas, Route 1E	4,000	
Place 500 ft. rock rip rap 3 mi. west Lake Jct., Route 1E	1,500	
Rebuild 2.5 mi. shoulders @ $1,500 south end, Route 1E	3,760	
Stabilize and replace surfacing 0.5 mi. near Lake Jct., Route 1E	4,000	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
3/4" Leveling course 4.1 mi. @ $4,000, Route 1E-1	16,400	
Install 200 ft. perforated underdrain @ $3.50 Route 1E-1	700	
Install 2, 18" x 30' C.M.P. at mi. 103 and 10.5, Route 1E-1	300	
Re-shape, drain and stabilize 9 parking areas, Route 1E-1	4,500	
Replace 700 ft. log barriers @ $1.25 north from Lake Jct., Route 1F	875	
Repair rock flume 100 ft. near Canyon Jct., Route 1F	800	
Clear trees at south end to improve sight distance, Route 1F	2,400	
Repair eroded shoulders, 1 mi. near mi. 3.5, Route 1F	2,400	
Re-shape, drain and stabilize 20 parking areas, Route 1F	10,000	
3/4" Leveling course 1.7 mi. @ $4,000, Route 1G	6,800	
Stabilize base 1.3 mi. at mi. 16.5 to 17.9 Route 1G	5,200	
Rebuild eroded shoulders 2 mi. @ $2,000, Route 1G	4,000	
Re-shape and stabilize gutters with bitumen, 3,300 ft., Route 1G	3,300	
Re-shape drain and stabilize 12 parking areas, Route 1G	6,000	
Replace 3,100 ft. guard rail with guide post, Route 1H	1,860	
Round black slopes and scale loose rock, Route 1H	5,000	
Place 1,000 ft. treated guide posts at high fills, Route 2B	600	
Install 66" x 40' C.M.P. Arch at 1 mi. south of Gardiner, Route 2B	650	
Reprocess 0.2 mi. @ $2,700, 0.3 mi. north Mammoth, Route 2	540	

Item	Estimate	Program 1956 Fiscal Year
Re-shape drain and stabilize 10 parking areas, Route 3	5,000	
Install 6, 18" x 30' C.M.P., Route 3	900	
Re-shape, drain, and stabilize 10 parking areas, Route 4	5,000	
Repair 5,000 ft. bituminous curb @ $ .10 on south end, Route 4	500	
Rebuild 1 mi. shoulders south end to Lewis Lake, Route 4	2,000	
Place rock masonry walls 40' x 6' and 60' x 10', Route 10M	2,000	
Contract settlements at mi. 13, Route 10M	4,000	
Re-shape and stabilize 2.4 mi. gutter with bitumen, Route 10-M	12,670	
Place 600 ft. bituminous berm at mi. 14.0 and 18.6, Route 10M	500	
Rebuild shoulders 2 mi. @ $3,000 between mi. 0.0 and 5.0, Route 10M	6,000	
3/4" Leveling course 3 mi. Route 1D to dump ground, Route 233	9,000	
Dust coat 1.4 mi., Route 222	1,200	
3/4" Leveling course, 2 mi. Old Faithful area, Route 230	8,000	
3/4" Leveling course, 2 mi., route 236	8,000	
Replace 200 ft. corduroy section south end, Route 259	500	
Place bituminous mat on 0.2 mi. to mess house, Route 245	800	
Rebuild 16 ft. wood bridge at Sedge Creek, Route 254	1,200	
Rebuild 4 small bridges, Sylvan Pass to East Entrance, Route 258	2,000	
Seal cost 0.3 mi. bituminous walk and replace 1,000 wood walk, Route 105	2,250	
Reconstruct 0.5 mi. @ $5,000, Route 2-J	2,500	
Seal coat 0.5 mi. @ $800, Route 2K	400	
Repair concrete walks 1.0 mi., Route 2K	10,560	
Replace 5,000 ft. bituminous walk with sand, Route J-11	10,560	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Repair curb and seal coat 0.5 mi., Route 1-B-2	3,500	
Repair water ways, replace gravel surfacing, Route 1B2-1	1,000	
Repair guard rail on bridges, Route 1-C-6	2,400	
Repair wood bridge over Iron Creek and repair wood walk, Route 1-C-7	2,600	
Replace flagstone walk and steps with concrete, Route 1-B-6	1,200	
Repair 12 small log water openings, Route 1-E-2	1,200	
Repair and re-seal 0.2 mi., Route 1-E-2	600	
Repair numerous small bridges and rock walls, 3.0 mi., Route 1-G-50	5,500	
Repair numerous small bridges and rock walls, Route 1-G-51	4,800	
Repair trail and rebuild wood trestle 0.5 mi., Route 1-G-58	5,000	
Repair two wood trestles and several rock walls, Route 1-G-53	1,800	
Rebuild stairs, guard rail and platform, 1.0 mi., Route 1-G-54	5,600	
Replace wooden stairs with earth trail, Route 1-G-59	15,000	
Replace stone steps and build new rail at platform, Route 1-G-60	1,500	
Rebuild fence around tree, repair stairs, Route 1-H-8	1,200	
Repair walk and seal 0.1 mi., Route 1-H-6	750	
Repair trail with 1,500 new location, Route 1-B-4	1,000	
Repair walk and surface 1.0 mi., Artist Paint Pots trail, Route 1-B-5	1,200	
Repair and seal 1.0 mi., Upper Geyser Basin, Route 1-C-8	1,000	
Repair and seal 0.4 mi., Biscuit Basin walks, Route 1-C-6	400	
Relocation and regrading (horse), Route 1-C-2	350	
Surveying, mapping and measuring entire system, (horse)	5,880	

Roads and Trails Maintenance - Continued

Item	Estimate	Program 1956 Fiscal Year
Regrading 3 mi., and 260 ft. corduroy (horse), Route 1-A-2	850	
Regrading 5 mi., replace 2 bridges and 150 ft. corduroy (horse), Route 5D	450	
Regrading 10 mi. and replace 3 bridges (horse) Route 5M	1,325	
Widening 5 mi., regrading 1/2 mi. and marking (horse) Route 3D	165	

APPENDIX E

1930s Specifications

WOOD GUARD RAIL

This item of work will be performed, measured, and paid for as provided on the plans and in the Standard Specifications for Forest Road Construction, Form F.R.50, Revised 1932, except as follows:

MATERIALS

The guardrails may be obtained from suitable local material. The contractor shall secure written authority to cut the material from the Federal Service responsible for the area from which the timber is to be cut. The contractor may secure the necessary timber free of cost.

Conditions covering the cutting and removal of the timber and the disposal of the brush and refuse will be contained in such authorization.

PRESERVATIVE TREATMENT

The lower or butt ends of all posts to a point 4 inches above the ground line shall be treated with the preservative specified in Federal Specification TT-W-556 or TT-W-561 by immersing the timber for a period of four hours in a tank filled with the preservative to the required height, the preservative being kept at a temperature not less than 215° F nor more than 230° F. The posts shall then be immediately transferred to a tank filled with cold preservative and be kept immersed for not less than two hours, during the final ten minutes of which the temperature of the preservative shall not exceed 150° F but shall be above the temperature at which the solids separate from the oils. The level of the hot and cold preservatives shall be the same during both immersions. Posts shall be painted black to a point 4 inches above the ground line.

After the guard rail is complete in place, it shall be given two coats of Cabot's Creosote Stain No. 247 or equivalent. The cost of furnishing and applying the stain, as well as the above-specified treatment, is to be included in the unit bid per lineal foot for "Wood Guardrail, Complete in Place."

STONE PAVING

Stone paving shall be composed of hard, durable quarry or field stones, laid in close contact on a uniform bed, and shall be built in conformity with the plans, or to the line, grades and dimensions as directed by the Engineer.

MATERIALS

The paving stones shall present approximately rectangular faces, and the dimensions of the bottom of any stone shall not be less than three-fourths of the corresponding dimensions of the top. The top surface shall present no projections greater than one inch beyond the plane of the edges.

CONSTRUCTION

All stone paving shall be constructed by experienced workmen. The paving stones shall be set on edge, close together so as to break joints at least four inches. The paving when laid shall be thoroughly rammed so as to bring each stone to a firm bearing, and the finished surface shall present an even, tight and reasonably plain surface of the contour required. All stones shall be laid with their natural beds perpendicular to the finished surface, and on slopes the longest joint laid horizontally. The joints shall be filled with cement grout, composed of one part cement and three parts sand.

Stone paving laid on slopes of one vertical to two horizontal or steeper shall be provided with a footing and coping, each of which shall be at least 50 per cent deeper than the paving on the slope.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The quantity of stone paving to be paid for under this item shall be the number of square yards measured in place and constructed in accordance with the plans or as directed by the Engineer.

This item will be paid for at the contract unit price bid per square yard of "Stone Paving," which price will include all necessary excavation, backfilling, and the furnishing of all equipment, tools,l labor, and incidentals necessary to complete the work. Selections may be made with as low a ratio of length to height as 1¾ to 1, and as high as 3½ to 1.

The minimum face area of stones shall generally be 240 square inches, the average area 840 square inches, and the maximum area 1440 square inches. Smaller stones down to 200 square inches may be used sparingly. Spalls will not be permitted for chinking along the joints of the exposed face.

Extra large stones shall be used at all corners, graduating smaller away from corners and toward top of wall. Stones in top course shall average larger than those immediately below.

Stones with more than two right angle corners will not be permitted. In general five or more side will be required.

Mortar joints in the exposed surfaces shall generally be 1 to 1½ inches wide; none shall be more than 2½ inches and none less than ¾ inch wide.

CONSTRUCTION

All construction work shall be carried forward and all stock piling of materials shall be done upon the cleared right of way unless other permission is secured in writing from the Engineer.

All masonry shall be constructed by experienced workmen. Proper tools will be required of the contractor for quarrying and cutting stone.

Quarrying operations shall be so organized as to insure this portion of the work keeping well ahead of masonry operations and a surplus of both weathered and unweathered stone shall at all times be kept on hand to allow for adequate selection being made.

Stones larger than two man size shall be swung into place by approved rigging which will allow accurate placing.

Boulders may be plugged and feathered to obtain weathered surfaces.

All stones shall be laid with major axis horizontal, and in no case will four corners of adjacent stones be contiguous.

All stones shall be thoroughly wetted prior to laying. They shall be fully bedded in Portland cement mortar mixed in proportion of one part of cement to three parts of sand. Unless an approved mortar mixing machine is used, the sand and cement shall first be mixed dry in a tight box until the mixture assumes a uniform color, after which water shall be added as the mixing continues until the mortar attains a consistency such that it can be easily handled and spread with a trowel.

Mortar which is not used within thirty minutes after water has been added shall be wasted; retempering will not be permitted. If a stone is loosened after the mortar is set, it shall be removed, the mortar cleaned off and the stone relaid with fresh mortar.

MASONRY

DESCRIPTION

Masonry shall be approved stones laid in cement mortar beds and shall be constructed in accordance with the plans and these Special Provisions.

MATERIALS

The Portland cement, sand and water for the mortar shall conform with the respective requirements for these materials as contained in the specifications for concrete, except that a fine grading of sand may be allowed subject to the approval of the Engineer.

Stone shall be selected as directed by the Engineer from weathered boulders or slides, or shall be quarried from clear, durable stone from such quarries as may be approved by the Engineer.

APPEARANCE

The finished stone work shall present a good architectural appearance.

When required by the Engineer, the contractor shall build a sample section of face wall of the dimensions required to show the size of stones, breaking of joints, pointing of joints and general requirements of the finished wall. This sample shall be changed or remade until approved by the Engineer. Payment for this sample wall shall be on a force account basis.

There shall be a variety in the size of stones, and as a general rule not over ten per cent shall be of equal dimensions. Care shall be exercised to eliminate the nesting or bunching of either small rocks or rocks of the same size.

Stones shall be selected for variations of color and texture, in weathered and unweathered surfaces.

Wall faces shall be of stones with weathered surfaces. Stones with unweathered or quarried surfaces may be introduced to form up to 75% of the wall surface.

Unweathered stones must be distributed in relation to the entire wall area to avoid the appearance of patches of unweathered surfaces in an area of weathered surfaces.

The stones shall conform in general to the dimensions and face areas shown on the architectural plans.

Individual stones shall have wall heights between 10" and 24" wall length between 24" and 60", (except that in headwalls for pipe culverts, which shall be constructed in accordance with Plans and Architectural designs for headwalls for culverts, and the individual stones shall have minimum dimensions of 6 x 15 inches), the object being to average the wall with stones, whose wall lengths are 2½ times their wall heights.

Walls shall be provided with drainage openings wherever called on the plans or as directed by the Engineer.

All mortar joints in exposed surfaces shall be raked out to a depth of one inch or more before the mortar sets. If required by the Engineer, the joints shall be wetted and pointed with Portland cement mortar mixed in the proportion of one part of cement to two of sand.

Care shall be taken at all times to keep the surface of all stones free from mortar stains. Mortar stains shall be removed while fresh.

No masonry shall be laid in freezing weather without permission of the Engineer and the use of such precautions as he may require. No pointing shall be done in freezing weather. Any work damaged by frost shall be removed and replaced.

In hot or dry weather masonry or pointing shall be protected from the sun for at least three days after laying and in a manner satisfactory to the Engineer.

MASONRY GUARDRAIL

Masonry guardrail shall be constructed to conform to dimensions and design as shown in architectural plans.

General construction for guardrail masonry shall be identical with that for masonry walls except that individual stones shall have wall heights between 8 and 14 inches and wall lengths between 12 and 36 inches.

Guardrail on top of wall shall be constructed as an integral part of the wall, showing no conspicuous junction line of mortar joints.

Top of railing shall be finished to a smooth regular surface to a maximum variation of one inch.

Top course of stone shall be full width of railing and with transverse joints only. Small flat rocks shall not be used in the top course.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

This work shall be measured in accordance with the dimensions shown on the plans, except where changes are ordered by the Engineer, and will be paid for at the contract unit price bid per cu. yd. for "Masonry," complete in place, which price and payment will be full compensation for the concrete coping or stone top course, whichever is required, and for concrete bridge seats and backwalls, and for all materials, equipment, tools, labor, and incidentals necessary to complete this item of work.

SPECIAL CONSTRUCTION FEATURES

The work contemplated herein is located within or approaching a National park, and special attention must be given to landscape features of the work, and special care taken to protect natural surroundings and adjacent camp grounds.

Any timber or other landscape features scarred or damaged by the contractor's operations shall be removed, trimmed up, or restored as nearly as possible as their original condition, and all scars made on trees by construction operations shall be painted with an approved paint, at the contractor's expense. The Engineer shall decide which method is to be used.

No rock, rubbish, or other debris resulting from the work shall be left on the cleared right-of-way but must be deposited where indicated by the Engineer. The contractor will be required to gather all rock which falls outside of the finished roadway slopes, and place it in the fills at his expense. Care must be taken at all times to regulate operations so as to protect visitors and campers and to facilitate traffic.

Blasting operations shall be conducted under the most careful supervision, and only light shooting will be permitted. The contractor shall adopt precautions in using explosives, which will prevent damage to surrounding objects and the scattering of rock, stumps, or other debris outside of the finished roadway slopes. It may be necessary in order to protect trees and other objects from damage to take precaution of using suitable mats to smother the blasts and in other ways protect objects from damage.

In breaking up surface boulders or rock fragments the method of plastering or mud capping shall be used in preference to that of blockholing.

Rock blasting and side hill excavation, by means of coyote holes or gopher holes will not be permitted.

Failure to observe the necessary precautions to prevent damage, or failure to immediately repair any damage caused, will be sufficient grounds for closing down the work until the contractor has given evidence to the satisfaction of the Engineer that the terms of these provisions are to be strictly complied with.

BIBLIOGRAPHY

BIBLIOGRAPHY

PUBLISHED PUBLIC DOCUMENTS

Albright, Horace. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1929.* Washington D. C.: Government Printing Office, 1929.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended 1931.* Washington D.C.: Government Printing Office, 1931.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1932.* Washington D.C.: Government Printing Office, 1932.

Allen, Major Charles. "Annual Report of Major Charles J. Allen, Corps of Engineer, Officer in Charge, for the Fiscal Year Ending June 30, 1889." In *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Houses of Congress in 4 Volumes, Volume II - in four parts, Part IV.* Washington D.C.: Government Printing Office, 1889.

Anderson, Captain George S. *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1892.* Washington D.C.: Government Printing Office, 1891.

____. *Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1892.* Washington D.C.: Government Printing Office, 1892.

____. *Annual Report of the Superintendent of Yellowstone National Park to the Secretary of the Interior, 1893.* Washington D.C.: Government Printing Office, 1893.

____. *Report of the Acting Superintendent of Yellowstone National Park to the Secretary of the Interior, 1894.* Washington D.C.: Government Printing Office, 1894.

____. *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1895.* Washington D.C.: Government Printing Office, 1895.

____. *Report of the Officer in Charge of Construction and Maintenance of Roads, Etc., in the Yellowstone National Park to the Secretary of War, 1896.* Washington D.C.: Government Printing Office, 1896.

Baldwin, Kenneth. *Enchanted Enclosure: The Army Engineers and Yellowstone National Park, A Documentary History.* Washington D.C.: Historical Division, Office of the Chief of Engineer, United States Army, 1976.

Boutelle, Captain F. A. *Report of the Superintendent of Yellowstone National Park.* Washington D.C.: Government Printing Office, 1890.

Chittenden, Hiram M. "Roads in Yellowstone National Park," - S. Doc. 226, 50th Cong., 1st sess. Acting Secretary of War Transmitting in Response to Resolution of the Senate of March 12, 1900, Letter from Chief of Engineers, U.S.A., Together with the copies of Originals of All Reports Relating to the Present Condition and Appropriate Plans for the Development of the System of Roads in the Yellowstone National Park.

____. *Improvement of the Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1899. Appendix EEE).* Washington D.C.: Government Printing Office, 1899.

____. *Improvement of the Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report to the Chief of Engineers for 1901, Appendix FFF).* Washington D.C.: Government Printing Office, 1901.

____. *Improvement of Yellowstone National Park, Including the Construction, Repair and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1902,Appendix FFF).* Washington D.C.: Government Printing Office, 1902.

____. *Improvement of Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1903,Appendix GGG).* Washington D.C.: Government Printing Office, 1903.

____. *Improvement of Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1904, Appendix FFF).* Washington D.C.: Government Printing Office, 1904.

____. *Improvement of Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1905, Appendix FFF).* Washington D.C.: Government Printing Office, 1905.

____. *Improvement of Yellowstone National Park, Including the Construction, Repair, and Maintenance of Roads and Bridges. (Annual Report of the Chief of Engineers for 1906, Appendix GGG).* Washington D.C.: Government Printing Office, 1906.

____. "The Government Road System of the Yellowstone National Park." U.S. Department of Agriculture Public Road Inquiries -Bulletin No. 21. Proceedings of the International Good Roads Congress held at Buffalo, New York, September 16-21, 1901. Washington D.C.: Government Printing Office, 1901.

Conger, P. H. *Annual Report of the Superintendent of the Yellowstone National Park to the Secretary of the Interior by P.H. Conger, Superintendent, for the Year 1882.* Washington D.C.: Government Printing Office, 1882.

Crampton, Louis C. *Early History of Yellowstone National Park and Its Relation to National Park Policies.* Washington D.C.: Government Printing Office, 1932.

Drury, Newton. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1941.* Washington D.C.: Government Printing Office, 1941.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1942.* Washington D.C.: Government Printing Office, 1942

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1943.* Washington D.C.: Government Printing Office, 1943.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1946.* Washington D.C.: Government Printing Office, 1946.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1947.* Washington D.C.: Government Printing Office, 1947.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June, 1949.* Washington D.C.: Government Printing Office, 1949.

Erwin, Captain James B. *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1898.* Washington D.C.: Government Printing Office, 1898.

Fries, Major Amos, and Major Jay Morrow. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; and Report Upon Crater Lake National Park,* Appendixes EEE and FFF. Washington D.C.: Government Printing Office, 1914.

Fries, Major Amos. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park.* Washington D.C.: Government Printing Office, 1915.

____. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park.* Washington D.C.: Government Printing Office, 1916.

____. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park.* Washington D.C.: Government Printing Office, 1917.

Harris, Captain Moses. *Annual Report of the Superintendent of Yellowstone National Park, 1887.* Washington D.C.: Government Printing Office, 1887.

____. *Annual Report of the Superintendent of Yellowstone National Park for the Year 1888.* Washington D.C.: Government Printing Office, 1888.

Hayden, F.V. *Preliminary Report of the United States Geological Survey of Montana and Portions of Adjacent Territories, Being a Fifth Annual Report of Progress.* Washington D.C.: Government Printing Office, 1872.

Haynes, J.F. "Transportation in the Yellowstone National Park." *Proceedings of the National Park Conference held at the Yellowstone National Park, September 11 and 12,* 1911. Washington D.C.: Government Printing Office, 1912.

Ickes, Harold. *Report of the Secretary of the Interior for the Fiscal Year Ended June 30, 1940.* Washington D.C.: Government Printing Office, 1940.

Jones, Captain William A. *Report Upon the Reconnaissance of Northwestern Wyoming Including Yellowstone National Park Made in the Summer of 1873.* Washington D.C.: Government Printing Office, 1875.

Kingman, Dan C. "Construction of Roads and Bridges in Yellowstone National Park," quoted in *Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887.*

Knight, Captain C.H., Major J.D. Cavanaugh., and Major Jay Morrow. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Ranier National Park,* Appendixes HHH and III. Washington D.C.: Government Printing Office, 1912.

____. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park, Appendices EEE and FFF.* Washington D.C.: Government Printing Office, 1913.

Langford, Nathanial P. "Report of the Superintendent of the Yellowstone National Park for the Year 1872." In *Annual Report of the Secretary of the Interior for 1872.* Washington D.C.: Government Printing Office, 1873.

Ludlow, Captain William. *Report of a Reconnaissance from Caroll, Montana Territory, on the Upper Missouri to the Yellowstone National Park and Return, Made in the Summer of 1875. (Annual Report of the Chief of Engineers for 1876, Appendix NN.) Washington D.C.: Government Printing Office, 1876.*

Mather, Stephen. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1917.* Washington D.C.: Government Printing Office, 1917.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1918.* Washington D.C.: Government Printing Office, 1918.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1919.* Washington D.C.: Government Printing Office, 1919.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1920 and the Travel Season 1920.* Washington D.C.: Government Printing Office, 1920.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1921 and the Travel Season 1921.* Washington D.C.: Government Printing Office, 1921.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1922 and the Travel Season 1922.* Washington D.C.: Government Printing Office, 1922.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1923 and the Travel Season 1923.* Washington D.C.: Government Printing Office, 1923.

____. *Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1924 and the Travel Season 1924.* Washington D.C.: Government Printing Office, 1924.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for Year 1925.* Washington D.C.: Government Printing Office, 1925.

____. *Annual Report of the Director of the National Park Service to the Secretary of the Interior for 1926.* Washington D.C.: Government Printing Office, 1926.

Norris, Philetus. "Annual Report of the Superintendent of Yellowstone National Park for 1877." In *Annual Report of the Secretary of the Interior for 1877.* Washington D.C.: Government Printing Office, 1878.

____. "Report Upon the Yellowstone National Park for the Year 1878, to the Secretary of the Interior." In *Annual Report of the Secretary of the Interior for 1878.* Washington D.C.: Government Printing Office, 1878.

____. "Report Upon the Yellowstone National Park for the Year 1879." In *Annual Report of the Secretary of the Interior for 1879.* Washington D.C.: Government Printing Office, 1880.

____. "Annual Report of the Superintendent of the Yellowstone National Park for the Year 1880." In *Annual Report of the Secretary of the Interior for 1881.* Washington D.C.: Government Printing Office, 1881.

____. "Fifth Annual Report of the Superintendent of the Yellowstone National Park, September 1881." In *Annual Report of the Secretary of the Interior for 1881.* Washington D.C.: Government Printing Office, 1881.

Peek, First Lieutenant Ernest D., and Captain Hiram Chittenden. *Report Upon the Construction, Repairs, and Maintenance of Roads and Bridges, in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park. (Annual Report of the Chief of Engineers for 1906.)* Washington D.C.: Government Printing Office, 1906.

____. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park and Report Upon the Road Into Mount Rainier National Park.* Washington D.C.: Government Printing Office, 1908.

Peek, First Lieutenent Ernest D. *Annual Report of the Chief of Engineers for 1907.* Washington D.C.: Government Printing Office, 1907.

____. *Annual Report of the Chief of Engineers for 1908.* Washington D.C.: Government Printing Office, 1908.

Phipps, Senator Lawrence. "Roads in National Parks." Speech of the Honorable Lawrence Phipps in the Senate of the United States. Washington D.C.: Government Printing Office, 1923.

Raynolds, William F. *Report on the Exploration of the Yellowstone and Missouri Rivers in 1859-60.* U.S. Congress, Senate Executive Document 77, 40th Congress, 1868.

Sears, Captain Clinton B. "Annual Report of Captain Clinton B. Sears, Corps of Engineers, for the Fiscal Year Ending June 30, 1887." In *Report of the Secretary of War Being Part of the Messages and Documents Communicated to the Two Houses of Congress in Four Volumes.* Washington D.C.: Government Printing Office, 1887.

[United States Congress]. *Hearings Before the House of Representatives Committee on the Public Lands Regarding H.R. 3682.* (68th Cong., 1st sess.), February 7, 1924. Washington D.C.: Government Printing Office, 1924.

____. *New Roads in Yellowstone National Park.* S. Doc. 871, (62nd Cong., 24th sess.) Washington D.C.: Government Printing Office, 1912.

[U.S. Geological Survey] *Water Resources Data Montana Water Year 1986. Vol. 1.* Hudson Bay Basin, Missouri River Basin.

Verrill, Major G.D., and Colonel George Zuin. *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park; Report Upon the Road Into Mount Rainier National Park; and Report Upon Crater Lake National Park, Appendices EEE and FFF.* Washington D.C.: Government Printing Office, 1918.

Willing, 1st Lt. Wildurr and Major C.W. Kutz, *Report Upon the Construction, Repair, and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park. Appendices GGG and HHH.* Washington D.C.: Government Printing Office, 1909.

____. *Report Upon the Construction, Repair and Maintenance of Roads and Bridges in the Yellowstone National Park, and Report Upon the Road Into Mount Rainier National Park.* Washington D.C.: Government Printing Office, 1910.

Young, Colonel S.B.M. 3rd Cavalry. *Report of the Acting Superintendent of the Yellowstone National Park to the Secretary of the Interior, 1897.* Washington D.C.: Government Printing Office, 1897.

NEWSPAPER ARTICLES

Sheridan (Wyoming) Post Enterprise, 30 October 1927.

UNPUBLISHED PUBLIC DOCUMENTS

Albright, Horace. "Report on Roadside Cleanup, October 8, 1924."

____. "Report on Conditions of the Roadsides Between the Superintendent's Office at Mammoth Hot Springs and Norris Junction, September, 1924."

____. "Report on the Roadside Cleanup, Spring and Fall 1926, Yellowstone National Park."

____. "Report on Roadside Cleanup, Yellowstone National Park, 1927."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1926."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1928."

Ammann, F.C. "Final Construction Report (1934-1935) Project NR 1-C2. Bridges of the Grand Loop Highway, Yellowstone National Park, Wyoming. April 18, 1936."

____. "Final Construction Report (1934-1935) Project NR 1-C2. Grading of the Grand Loop Highway, Yellowstone National Park, April 18, 1936."

____. "Final Construction Report (1936-1937-1938) Grand Loop, Yellowstone National Park Project 1-D2 Grading Yellowstone National Park."

Anderson, E.O. "Final Construction Report (1932-1933) Project E 1-A4 Grading Mammoth Hot Springs - Norris Junction, Grand Loop National Park Highway, Yellowstone National Park, Wyoming."

____. "Final Construction Report (1933-1934) Project NR 1-A1, A3, A4, A5 Surfacing, Grand Loop National Park Highway. Yellowstone National Park, Wyoming. January 11, 1935."

____. "Final Construction Report, 1935, on Project NR 1-A1, A3, A4, At, Oiling, 1-A2, B, C-1, Seal Coat, Grand Loop Highway, Yellowstone National Park, Wyoming. January 11, 1936."

____. "Final Construction Report,(1936-1938) on Grand Loop National Park Highway. 1-B1 Bridges, March 1, 1939." Bureau of Public Roads. U.S. Department of Agriculture.

____. "Final Construction Report (1948-1949) on Grand Loop National Park Highway, Wyoming, Project 1-A, B, C-1 Reseal, Yellowstone National Park, State of Wyoming, February 8, 1950."

"Architectural Plans for Crawfish Creek Bridge, May 1, 1934." Branch of Plans and Design, National Park Service.

"Architectural Plans for Otter Creek Bridge, Yellowstone National Park, February 1934." Branch of Plans and Design, Office of National Parks, Buildings and Reservations.

"Architectural Plans for Pebble Creek Bridge, Yellowstone National Park, May 15, 1934." Branch of Plans and Design. National Park Service.

"Architectural Plans for Sedge Creek Bridge, Yellowstone National Park, January 8, 1934." Branch of Plans and Design, Office of National Parks, Building and Reservations.

Baker, Howard. "Report to Chief Architect on Inspection Trip to Yellowstone National Park, July 18 to August 4, 1938."

Bond, Robert. "Preliminary Location Survey Report on Relocation of Portions of sections 1-F, 1-G Grand Loop Highway, Yellowstone National Park, Wyoming 1937, February 26, 1938."

"Bridge at Station 243+51 Plans, August 1935." Bureau of Public Roads, U.S. Department of Agriculture.

"Bridge at Station 268+57 Plans." Bureau of Public Roads. U.S. Department of Agriculture.

"Bridge Over Sedge Creek Plans, December 1933." U.S. Department of Agriculture. Bureau of Public Roads.

"Bridge Inspection Report, Firehole River Bridge Over the Firehole River, July 11, 1985." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Fishing Bridge, July 17, 1984." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Lamar River Bridge, July 29, 1987." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Nez Perce Creek Bridge, August 13, 1986." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Otter Creek Bridge, Yellowstone National Park." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division. August 6, 1986.

"Bridge Safety Inspection Report, Obsidian Creek Bridge Over Obsidian Creek, Yellowstone National Park, Wyoming. July 6, 1985." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Safety Inspection Report, Pebble Creek Bridge, Yellowstone National Park." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division. August 10, 1986.

"Bridge Inspection Report, Pelican Creek Bridge, August 11, 1986." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Second Bridge on Firehole Lake Drive, July 24, 1985." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Fourth Bridge on Firehole Lake Drive, July 24, 1985." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Gardner River Bridge, July 28, 1987." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Safety Inspection Report, Soda Butte Creek Bridge, July 8, 1985." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Station 198+85 Bridge Over TLF Creek August 10, 1986." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Station 268+57 Bridge Over FHWA Creek, August 10, 1986." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

"Bridge Inspection Report, Station 243+51 Bridge Over RWC Creek, August 10, 1986." U.S. Department of Transportation. Federal Highway Administration. Western Direct Federal Division.

Burney, A.W. "Report of Work Done on Projects No. 6 and 9, Yellowstone National Park, July 2, 1925."

Capes, C.S. "Final Survey Report (1937) 1-H3 Bridge Investigation and Design, Grand Loop Highway, Yellowstone National Park, Wyoming."

____. "Progress Report for Season of 1939 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone Park, Wyoming."

____. "Progress Report for the Season of 1940 on Public Roads Administration Activities on the Yellowstone National Park Highway System, Yellowstone Park, Wyoming."

____. "Progress Report for the Season of 1941 on Public Road Administration Activities on the Yellowstone National Park Highway System, Yellowstone Park, Wyoming."

____. "Final Construction Report Project 1-A1, A3, Grading Mammoth Terraces - Obsidian Cliff Section, Grand Loop National Park Highway, Yellowstone National Park, Wyoming, June 19,1933."

____. "Final Construction Report (1939-1940) on Grand Loop National Park Highway, Project 1-D2, E2, pt. C2, Bituminous Surfacing, Yellowstone National Park, State of Wyoming."

____. "Final Survey Report (1937) 1-H3 Bridge Investigation and Design, Grand Loop Highway, Yellowstone National Park, Wyoming."

____. "Location Survey Report, 1932 on Firehole Cascades - Old Faithful Section of Grand Loop Highway, Yellowstone National Park, Wyoming, april 14, 1934."

____. "Monthly Narrative Report, Yellowstone National Park, Bureau of Public Roads District No. 3, June 30, 1935."

____. "Traffic Survey Report Intra-Part Travel Season 1937, Yellowstone National Park, Wyoming, September 20, 1937."

____. "Final Survey and Design Report (1941) on Northeast Entrance Road, 8-A4 National Park Project, Yellowstone National Park, State of Wyoming. November 28, 1941."

Cheatham, J.L. "Final Construction Report (1935-1936) on Project NR-4-A2, Bridges of the South Entrance Highway, Yellowstone National Park, Wyoming, April 14, 1937."

"Completion Report Narrative, Account 523.35 - Emergency Roads and Trails Reconstruction, Earthquake Damage."

Copeland, L.F. "Report on Proposed Alternate Bridge Locations and Recommended Structure Types for the Crossing of the Yellowstone River Route 8, Northeast Entrance, Yellowstone National Park."

Counter, J. Wayne. "Final Construction Report (1939) on Grand Loop Highway, Project 1-H3, Grading, Bridge, and Bituminous Surfacing Gardiner [sic] River Bridge, Yellowstone National Park, State of Wyoming, May 14, 1940."

Cowan, E.H. "Final Construction Report (1936-1937) on Grand Loop 1-E1, Parking Area, and East Entrance, (Fishing Bridge) 5-D1, Part D22, Bridge, Approaches, Surface and Secondary Roads. Yellowstone National Park, Wyoming." Bureau of Public Roads, U.S. Department of Agriculture.

____. "Final Construction Report (1939-1940) on Grand Loop National Park Project 1-E1, and East Entrance National Park Project 5-D1, Part C. Bituminous Surfacing, Yellowstone Park, State of Wyoming, March 11, 1941."

____. "Final Construction Report (1941-1944) on Grand Loop National Park Highway, Project 1-D1, D-3 Bridge and Bituminous Surfacing, Yellowstone National Park, State of Wyoming. November 25, 1941."

____. "Final Construction Report (1947) on Grand Loop National Park Highway, Project 1-D1, D3 Bituminous Surfacing, Yellowstone National Park, Wyoming."

Dalton, H.C. "Final Construction Report (1934) on Grand Loop Slide Removal Section NR 1-G2, Yellowstone National Park, Wyoming, March 4, 1935."

____. "Final Construction Report (1932-1933) on Project 1- G2, Bridge Accounts No. 1475, Yellowstone National Park, Wyoming, April 9, 1934."

Emmert, J.W. "Emergency Conservation Work, Yellowstone National Park, Wyoming. Final Narrative Report of E.C.W. for Third Enrollment Period, October 15, 1934."

"Final Construction Report (1930-1931) on Canyon Junction - Tower Junction Project, 1-G-1 Grading, Yellowstone National Park, State of Wyoming, January 30, 1932."

"Final Construction Report (1936-1937) on Grand Loop 1-E1 Parking Area, and East Entrance (Fishing Bridge) 5-D2, Yellowstone National Park, Wyoming - by E.H. Cowan, Chief Engineer. U.S. Bureau of Public Roads, D-3."

"Final Construction Report (1960-1961) Project 1-E, Bridges and Approaches, Grand Loop, Yellowstone National Park, Wyoming."

"Final Construction Report (1961-1963) on Yellowstone National Park Project 8 Bridges and Approaches, Northeast Entrance, Yellowstone National Park."

"Final Construction Report (1963-1964) on Yellowstone National Park Project 8 Grading, Base and Bituminous Surfacing, Northeast Entrance Road, Yellowstone National Park, Class 1 National Park Highway, Park County, State of Wyoming."

"Final Construction Project (1965-1966) on Yellowstone National Park Project 5 (1) East Entrance, Yellowstone Park, State of Wyoming."

"Final Construction Report (1965-1966) on Yellowstone National Park Project 1-A(1), B(1), and 12(1), Grading and Bituminous Stabilized Base, Grand Loop and Norris-Cutoff, Yellowstone National Park, State of Wyoming."

"Final Construction Report (1966) on Yellowstone National Park Project 1-C1 and 3(1) Bituminous Surfacing Grand Loop and West Entrance, Yellowstone National Park, State of Wyoming."

"Firehole River Bridge, Morning Glory Inventory Report." Engineering and Safety Services Division, Yellowstone National Park.

"Fishing Bridge Plans." sheets 31, 37, and 48. April 1935. U.S. Department of Agriculture, Bureau of Public Roads.

Foreman, L.C. "Final Construction Report (1935-1936) on Project NR 8-A1, Bridges, Tower Junction - Cooke City Highway, Yellowstone National Park, March 26, 1937."

____. "Final Construction Report (1936) on Tower Junction - Cooke City Highway Project RTEC 8-A1, Small Bridges and Culverts, Yellowstone National Park, State of Wyoming, March 29, 1937."

"Gardner River Bridge Inspection Report, October 1976." Sverdrup & Parcel and Associates, Inc.

"Gardner River Bridge Plans, August 1938." Bureau of Public Roads, U.S. Department of Agriculture.

"Gibbon River Bridge, Station 400+70, Plans, 2-5/6, January 1936." Bureau of Public Roads. U.S. Department of Agriculture.

"Gibbon River Bridge, Station 465+70 Plans, 1-3/4, January 1936." Bureau of Public Roads; U.S. Department of Agriculture.

Gregg, Howard. "Monthly Narrative Report to the Chief Architect, December 20, 1937 to January 20, 1938."

Hammons, Vernon L. "A Brief Organizational History of the Office of Design and Construction, National Park Service 1917-1962."

Hill, Sanford and James Sommerville. "Report on Yellowstone National Park, October 1938."

Hill, Sanford. "Monthly Report of the Associate Landscape Architect for February 25 to March 25, 1942."

____. Associate Landscape Architect and Howard Gregg, Assistant Landscape Architect, "E.C.W. Report to the Chief Architect August 26 to September 26, 1935."

____. "Monthly Report of the Associate Landscape Architect for March 26 to April 25, 1942."

____. "Monthly Report of the Associate Landscape Architect for July 1932."

____. "E.C.W. Report to the Chief Architect, August 26 to September 26, 1935."

____. Monthly Report of the Associate Landscape Architect for August 1942."

____. "Monthly Narrative Report to Chief Architect Through the Superintendent on Major and Minor Roads and Trails and Other Projects Other Than E.C.W. for Yellowstone National Park Period June 24 to July 25, 1936."

____. "Narrative Report on Yellowstone National Park for June 1939."

____. "Narrative Report on Yellowstone National Park for May 1940."

____. "Narrative Report to the Regional Landscape Architect Region Two on Yellowstone National Park for August 1940."

____. "Narrative Report to the Regional Landscape Architect Region Two on Yellowstone National Park for November 1940."

____. "Engineering Applied to National Parks." Proceedings of the American Society of Civil Engineers, v. 54, December 1928.

"Improvement of Yellowstone National Park Maintenance and Repairs, Report of Operations for October 1914."

"Lamar River Bridge Architectural Plans, November 30, 1939." Branch of Plans and Designs, National Park Service.

Lord, C.A. "Final Report Loop Betterment-Project #525.6, Otter Creek Road and Bear Feeding Ground."

____. "Madison Junction - Old Faithful Project 1C (503)(525.1), 1930."

____. "Final Report Project #525.9, Loop Betterment, (Old Faithful 5 Milepost)."

____. "Final Report Project #530, Madison - Norris Oiling, Cleanup, Bridge Removal, 1930."

____. "West Gallatin Road Grayling Creek Section 516 Report, February 5, 1929."

____. "Final Report Mammoth - Norris Project #502."

____. "Final Report Mammoth Terraces-Obsidian Cliffs, Post Construction Project #558, 1933."

Mattson, Frank, Robert Hall, and Robert Albers Jr. "Report to the Chief Architect Through the Superintendent Yellowstone National Park for the Period - September 28 to October 28, 1934."

"Monthly Narrative Report, July 31, 1928 of Yellowstone National Park, District No. 3."

"Monthly Narrative Report, September 30, 1928 of Yellowstone National Park, District No. 3."

"Monthly Narrative Report, June 30, 1929 of Yellowstone National Park, District No. 3."

"Monthly Narrative Report, July 31, 1929 of Yellowstone National Park, District No. 3."

"Monthly Narrative Report, October 31, 1929 of Yellowstone National Park, District No. 3."

"Monthly Narrative Report, Yellowstone National Park, Bureau of Public Roads, District No.3, August 31, 1932."

"Monthly Narrative Report to the Chief Architect for June 25 to July 25, 1934."

"Monthly Narrative Report for September 28 to October 28, 1934."

"Monthly Narrative Report for September 1942, Yellowstone National Park."

"Monthly Narrative Report to the Chief Architect of the National Park Service through the Superintendent of Yellowstone National Park, October 27, 1936."

McCarter, Kenneth, and Frank Mattson. "Landscape Architect Report of July 1932."

"MISSION 66 for Yellowstone National Park." National Park Service, United States Department of Interior.

"Narrative Statement for Completion Report for Route 12-E Arnica Creek-Bridge Bay Road, Contract No. 14-10-0100-1242 Order No. R-39-Yel-BPR."

"Nez Perce Bridge Plans, March 1934." Bureau of Public Roads, U.S. Department of Agriculture.

"Otter Creek Bridge Plans, January 1934." Bureau of Public Roads, U.S. Department of Agriculture.

"Parkwide Road Engineering Study, Yellowstone National Park." Vol. I. U.S. Department of Transportation Federal Highway Administration. Western Direct Federal Division. Vancouver, Washington, 1986.

"Pelican Creek Bridge Plans, February 1934."

"Plans for Proposed Bridge No. 4 over Gibbon River, 9 Miles South of Norris, Yellowstone National Park, 1911."

"Plans for Seven Mile Bridge over Gardner River, 1931." Bureau of Public Roads, Department of Agriculture.

Popham, Walter D. "Emergency Conservation Work, Report to the Chief Architect through the Superintendent of Yellowstone National Park for the Month of September 1934."

"Real Property Record for the East Entrance Road, Yellowstone National Park."

"Real Property Record for the Soda Butte Creek Bridge, Yellowstone National Park."

"Real Property for the South Entrance Road, Yellowstone National Park."

"Real Property for the Tower Creek Bridge, Yellowstone National Park."

"Roads - Construction (Terraces to Obsidian Cliff) Project 1-A-1 and 1-A-3."

Rogers, Edmund. "Annual Report of the Superintendent of Yellowstone National Park for 1936."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1937."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1938."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1940."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1942."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1943."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1944."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1945."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1946."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1947."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1948."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1949."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1950."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1951."

"Report of Proposed Projects for 1923."

"Seven Mile Bridge Inventory Report." National Park Service, Department of the Interior.

Smith, James. "Final Construction Report (1948-1949) on Grand Loop National Park Highway Project 1-F3, G4 Grading and Base Surfacing, Yellowstone National Park, State of Wyoming, March 2, 1950."

Smith, T.A. "Preliminary Location Survey Report on Grand Loop Highway, Firehole River Cascades to Madison Junction 1-C1 Relocation, Yellowstone National Park, Wyoming, January 16, 1939."

"Soda Butte Bridge Architectural Plans, November 18, 1934." Branch of Plans and Design, National Park Service.

Stinson, A.O. "Location Survey Report (1931-1932) on Bridge Bay-Inspiration Point Survey Including Section F and Parts of Section E and G of I., the Grand Loop System, and a Part of Section D of Route 5, the East Entrance Highway, Yellowstone National Park, January 20, 1934."

____. "Location Survey Report (1934) on the Old Faithful-West Thumb Road Section D, Route 1, Grand Loop Highway, Yellowstone National Park." Bureau of Public Roads District No. 3, Department of Agriculture. October 4, 1935.

____. "Location Survey Report (1934) on the Madison Junction West Yellowstone Entrance Highway, the West Entrance Road, Route No. 3, Yellowstone National Park, Wyoming. May 11, 1936."

"Technical Report Upon the Improvement of Yellowstone National Park. 1904."

Toll, Roger W. "Annual Report of the Superintendent of Yellowstone National Park for 1929."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1933."

____. "Annual Report of the Superintendent of Yellowstone National Park for 1934."

"Tower Creek Bridge Plans, October 1931." Bureau of Public Roads, Department of Agriculture.

Willing, Captain Wildurr. "Report of Inspection of Bridges in the Yellowstone National Park Made September 24, 25, and 26, 1909," with Recommendations by Request of Captain Wildurr Willing, Corps of Engineers, U.S.A.

Wohlbrandt, Phillip. "Final Report, Project No. 508, Flood Damage Reconstruction of Mammoth-Gardiner Road, April 21, 1943."

Young, Colonel S.M. "Report from Colonel S.M. Young, Acting Superintendent, Yellowstone National Park to Quartermaster General, U.S. Army, August 13, 1897."

SECONDARY SOURCES

BOOKS

Bartlett, Richard. *Yellowstone. A Wilderness Besieged.* Tucson: University of Arizona Press, 1985.

Bonney, Orrin H., and Bonney. Lorraine. *Battle Drums and Geysers: The Life and Journals of Lt. Gustavas Doane, Soldier and Explorer of the Yellowstone and Snake River Regions.* Chicago: The Swallow Press, 1970.

Chittenden, Hiram. *The Yellowstone National Park.* Cincinnati: Robert Clark Company, 1895.

Haines, Aubrey L. *The Yellowstone Story. Two Vols.* Boulder: Yellowstone Library and Museum Association with Colorado Associated University Press, 1977.

Ise, John. *Our National Park Policy, A Critical History.* Baltimore: Resources for the Future, Inc., by the John Hopkins Press, 1961.

Labatut, Jean, and Wheaton J. Lane. ed. *Highways In Our National Life: A Symposium.* New York: Arno Press, 1972.

Norton, Henry J. *Wonderland Illustrated: or Horseback Rides Through the Yellowstone National Park.* Virginia City, Montana: No publisher, 1873.

Stanley, Edwin. *Rambles in Wonderland, or, A Trip Through the Great Yellowstone National Park.* Nashville: Southern Methodist Publishing House, 1885.

Toole, K. Ross. *Montana An Uncommon Land.* Norman: University of Oklahoma Press. 1973 [6th printing].

Whittlesey, Lee H. *Yellowstone Place Names.* Helena: Montana Historical Society Press, 1988.

DISSERTATIONS

O'Brien, Robert R. *"The Yellowstone National Park Road System: Past, Present, and Future." Ph.D. diss.* University of Washington, 1964.

ARTICLES, SPEECHES, AND PAMPHLETS

"A Standing Menace. Cooke City vs The National Park." *Forest and Stream.* (December 8, 1892.)

Albright, Horace. "Unusual Difficulties Encountered in Developing a System of Scenic Highways in National Parks."

____. "Scenic Reserves." *The Saturday Evening Post.* (September 4, 1929).

Article in "Editor's Study" column. *Harper's Magazine.* Vol. XCIV, (January 1897.)

Capes, C.F. "Highway Improvements in Yellowstone National Park." Paper Presented at the Highway Conference Held in Boulder, Colorado, on January 16 and 17, 1936.

Carpenter, Thomas, Abbot, Stanley, and Zimmer, Edward. "Report of the Committee on Roads and Parkways." Branch of Plans and Design Conference, Washington, D.C., February 23-28, 1939.

Cotrell, C.C. "National Park Roads Vitally Needed." *Western Highway Builder.* Vol 4. No. 12, (December 1922).

Davis, Chester. "Motoring Through Wonderland 1915." *American Motorist,* (October 1, 1915).

DeVoto, Bernard. "Lets Close the National Parks." *Harper's Magazine.* (October 1953).

Haines, Aubrey. "The Bridge That Jack Built." *Yellowstone Nature Notes,* (January - February 1949). Vol. 21, 1-4.

Hewes, L.I. "America's Park Highways." *Civil Engineering.* Vol. 2, No. 9, (September 1932).

Huppe, K. "Literature Search Emigrant-Gardiner 69 KV." *Highland Technical Services,* The Montana Power Company, March 1988.

Kittridge, Frank. "Preserving a Valuable Heritage." *Civil Engineering.* Vol. 2, No. 9, (September 1932).

Nichols, Frank, A. "Picturesque Highways Built in National Parks to Give Access to a Natural Beauty of Woodlands."

Vipond, B.L. "Park Service Outlines Plans." *Western Highway Builder.* Vol. 4. No. 12, (December 1922).

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PART TWO

CULTURAL RESOURCE MANAGEMENT

I. GOALS

In 1986, the Federal Highway Administration began a multi-phase project to repair all of the principal visitor access and circulation roads in Yellowstone National Park. This project meets the purpose of the approved 1974 Master Plan "for public accommodation, for preservation of park resources, and for enhancing the quality of the park visitor experience." The first phase of the project was rehabilitation of the road segment between Biscuit Basin, west of Old Faithful, to the West Thumb Bypass. A National Register of Historic Places Determination of Eligibility for this road segment was prepared by the Rocky Mountain Regional Office, National Park Service and approved and signed by the Wyoming State Historic Preservation Office in September, 1986. Another road related resource, or property type, evaluated by the Determination of Eligibility process was the Bacon Rind Road Camp Bunkhouse. This building was found not to be eligible for listing on the National Register of Historic Places by a consensus Determination of Eligibility with the Montana State Historic Preservation Office in August, 1988. A nomination for another associated resource, the Baronett Bridge site has been prepared by the Wyoming State Historic Preservation Office. This site will be included in the Multiple Property nomination form for this project.

In anticipation of the requirements to meet the compliance needs of the Section 106 of the National Historic Preservation Act as Amended in 1980 and the Section 4 (f) of the Department of Transportation Act of 1966 for the rehabilitation of the entire road system, Yellowstone National Park requested a survey and evaluation of the entire road system as part of a larger project which would be Part I of a Historic Resource Study for Yellowstone National Park.

As the plans for the Historic Resource Study were developing, the Historic American Engineering Record office in Washington D.C. agreed to undertake a recording project of the roads and bridges in Yellowstone National Park as part of their multi-year National Park areas roads and bridges recording program. Thus the following Research Design was developed to meet the needs of these various projects.

The draft outline of the Survey Report for the Roads and Bridges in Yellowstone National Park, was sent to the State Historic Preservation Office of Montana and Idaho on May 3, 1989 for their comments. A meeting was held in Cheyenne, Wyoming with the State Historic Preservation Office staff on April 5, 1989 to discuss the project.

During the summer of 1989, an Historic American Engineering Record (HAER) team, recorded the bridges and some road sections in Yellowstone National Park. Measured drawings were completed for seven bridges in the Park -- Cub Creek, Crawfish, Fishing Bridge, one of the Gibbon River Bridges, the Army Bridge at the end of the Fountain Freight Road, the Army Bridge over Obsidian Creek, and the Gardner River Bridge east of Mammoth Hot Springs. These bridges and the remaining bridges built or designed 50 years ago were also photographed to HAER standards. The HAER documentation with original photographs will be sent to the Wyoming State Historic Preservation Office, Yellowstone National Park, and to the Library of Congress. A copy of the documentation will be sent to the Montana and Idaho State Historic Preservation Office.

II. RESEARCH DESIGN

OBJECTIVES

1. To inventory all historic resources associated with the historic context, "The History of the Construction of the Road System in Yellowstone National Park, 1872-1966." This project does not cover prehistoric resources; however, all historic archeological resources found will be identified and basic information will be recorded. This information will be turned over to the National Park Service archeologist for correct procedural requirements. The resources that were built after 1939 will not be inventoried, with exception of the Isa Lake Bridge.

2. To evaluate all historic resources inventoried and recommend for inclusion in the National Register of Historic Places those resources which meet the criteria as specified in 36 CFR 60. To evaluate any post-1939 resources which may meet the criteria for evaluation guidelines for "Considering Properties that have Achieved Significance Within the Last 50 Years."

3. The identified property types reflect the current knowledge of the survey area, Yellowstone National Park. Any resources found that can not be grouped with the identified property types will result in other types being added. The identified type, Roads, Bridges, and Buildings and Structures Associated with the Construction of the Road System, were selected as a result of the preparer's knowledge of Yellowstone National Park history and resources, and background research.

4. The area to be formally surveyed will be the Yellowstone National Park. An informal survey will be done of the adjoining national forests and areas north of the Park, between Gardiner, Montana, Livingston, Montana. This informal survey could be a personal tour or it could be conducted by correspondence with the cultural resource specialists in the national forests and interested groups or citizens in the gateway communities -- West Yellowstone, Montana, Cooke City, Montana, and Gardiner, Montana. The purpose of the extended survey is to assess similarities and differences in resources and also to analyze impacts or trends that the resources within the boundaries of Yellowstone National Park might have on these other areas.

5. Produce a Historic Base Map.

6. The narrative of the historic context will include information which may be useful to others in the management of Yellowstone National Park, i.e. the maintenance staff, the natural scientists, the interpreters, and etc.

7. To make the historic context compatible with the comprehensive historic preservation plans developed by the states of Idaho, Wyoming, and Montana. The development of this context should supplement their Transportation or related context.

III. ARCHIVAL RESEARCH

Research for the development of the Historic Resource Study has been conducted in the following depositories and/or with the following sources:

1. Yellowstone National Park Library and Archives, Yellowstone National Park.
2. Maintenance Files of Yellowstone National Park.
3. Denver Public Library, Western History Collection.
4. The Rocky Mountain Regional Office Library, National Park Service, Denver, Colorado.
5. National Archives, Washington D.C. -- National Park Service records, United States Geological Survey records, Office of the Secretary of the Interior records, Military records and the Forest Service records.
6. University of Wyoming, The American Heritage Center, Laramie, Wyoming.
7. Washington Historical Society, Hiram Chittenden Collection, Tacoma, Washington.
8. University of California, Los Angeles, Horace Albright collection.
9. The personal papers of Horace Albright in the possession of his daughter, Marian Schenck, Albuquerque, New Mexico.
10. National Archives and Records Center, Bureau of Public Roads records, Suitland, Maryland.
11. The cartographic records of the National Park Service, National Archives, Alexandra, Virginia.
12. National Archives and Records Center, National Park Service records, Denver, Colorado.
13. Numerous magazines and journal articles received via Inter-Library Loan.

The literature published about Yellowstone National Park is extensive, however the data concerning the development of the road system is in most cases minimal. Thus this research effort focused on primary material strictly concerned with the road construction. The very early (1872-83) material is general in nature, i.e. superintendent reports, traveler's accounts, but the early guidebooks and maps are more specific. After the U.S. Army Corps of Engineers took command of the road construction in 1883 and until it was turned over to the National Park

Service in 1918, the details of the planning and construction became more specific and a plethora of published material exists. The transition of the responsibility of the road construction to the National Park Service coincided with the creation of the Service's Engineering Division. Fortunately for researchers, the following types of reports are available:

1. Preliminary Inventory Report of Road Sections.
2. Monthly Progress Reports of Engineers.
3. Final Construction Reports of Engineers.
4. Monthly and Annual Reports of Superintendents.
5. Monthly and Annual Reports of Landscape Architects.
6. Bridge Reports.
7. Master Plans.

The different correspondence files of the National Park Service are very helpful. Individual collections are very useful, particularly Horace Albright. Albright took over the superintendency of Yellowstone National Park shortly after the U.S. Army Corps of Engineers left the Park. He was very interested in the road system and continued that interest after he became Director of the National Park Service in 1929 and into his retirement.

All of the above material not only gives technical information, but many documents impart the philosophy of what a park road should be. Information has been collected from the National Park Service and United States Forest Service records, magazine and newspaper articles, and other sources to be used for comparative data for similar resources. The records of the Wyoming State Historic Preservation Office were searched on April 5, 1989. Telephone communications with the Montana State Historic Preservation Office were conducted during the summer of 1989. The Bridge Surveys for Montana and Wyoming have been helpful.

The extensive documentation of the road system in Yellowstone National Park provides a good basis for making sound predictions of what to expect during the Intensive Field Survey to be completed during the summer of 1989. In addition to the primary and secondary material discussed, the historical photographic collections are rich with examples of conditions, "before and after" views, and etc.

Previous research known to exist relating to the road system is *Enchanted Enclosure: The Army Engineers and Yellowstone National Park - A Documentary History* by Kenneth H. Baldwin and "The Yellowstone National Park Road System: Past, Present, and Future" by Bob Randolph O'Brien. The Baldwin history is a compilation of government reports about the Yellowstone National Park. The O'Brien Ph.D. dissertation gives a good overview history, but focuses on the future of the transportation network within the Park.

IV. SURVEY REPORT

The field survey took place during the summer of 1989 and a portion during the summer of 1990. All vehicular bridges designed or built 50 years ago were surveyed. Bridges built after this period were not surveyed, however, they will be listed on an attached sheet. The precise location of each road segment and bridge was mapped, as well as sample surveying of culverts and headwalls. Due to the fact that there are probably a thousand or more culverts, predictive modeling will be used in the evaluation process. A detailed survey for the East Entrance Road and for the Old Faithful to West Thumb Bypass Road will be used. Every feature is on this survey map prepared by the Federal Highway Administration.

Survey forms, along with the survey report will be sent to the State Historic Preservation Offices.

The preparer surveyed the following roads:

1. of the Grand Loop Road (140.14)
2. the North Entrance Road (5.23 miles)
3. the Northeast Entrance Road (28.61 miles)
4. East Entrance Road (26.02 miles)
5. South Entrance Road (21.45 miles)
6. West Entrance Road (13.85)
7. the Norris - Canyon Road (11.57 miles)
8. the Gallatin Highway (20.50 miles)
9. Mammoth - Gardiner High Road (3.95 miles)
10. Bunsen Peak Road (5.88 miles)
11. Firehole Canyon Drive (2.20 miles)
12. Firehole Lake Drive (3.2 miles)
13. Virginia Cascade Drive (1.94 miles)
14. Mount Washburn Road as far as parking area (1.45 miles)
15. North Entrance Concessioner Service Road (0.31 miles)
16. Blacktail Deer Plateau Drive (6.88)
17. Madison River Loop Drive (1.10 miles)

Total miles surveyed - 294.28 miles

As part of the Historic American Engineering Record (HAER) project, each historic bridge was photographed, providing current views. In appropriate cases, important features or details were photographed. Historic plans, drawings, and photographs were assembled.

The bridges built after this period were not inventoried, but will be listed and mapped in the National Register Documentation.

The following are the roads and the types of roads not surveyed:

1. Mesa Road
2. Old Mary Mountain Road
3. Maryville Road
4. Slough Creek Ranch Road
5. Road into Reese Creek area
6. all service roads
7. all roads in developed areas
8. campground roads
9. side roads into interpretive areas
10. utility roads

The assessment of these roads will be included in the evaluation of resources associated with either the concessions or administrative historic contexts. These were not part of the planned road system or in some cases they may have been a portion of an older road, but that issue will be addressed as each context is developed.

The preparer concluded, as a result of the survey and based on the historic context, and in consultation with the National Register staff in June, 1990, that the Grand Loop Road will be designated as a Historic District and each entrance road will be a separate district. While all are primary park roads, the historical purpose and evolution of each entrance road stands alone.

The only objective not met was a personal survey of the surrounding forest roads, with the exception of the Beartooth Highway leading out of the Park at the Northeast Entrance. The road between Gardiner, Montana and Livingston, Montana did receive a windshield survey. No new property types were found, but based on the developed historic context, the Engineers Building and the Chittenden House will be added to the Property Type--Buildings and Structures Associated with the Construction of the Road System.

A list of the evaluated properties will be included in this report. This included resources that have been found eligible for listing on the National Register and those found to be not eligible for listing on the National Register. This evaluation will allow planners to have available the information on which resources have historic significance. It will provide necessary information toward the development of a preservation plan.

In regard to the selection of this particular context, "The History of the Construction of the Road System in Yellowstone National Park, 1872-1966," the choice was based upon the need for the evaluation of the road system in order to meet the compliance needs of the Section 106 of the National Historic Preservation Act of 1966 as Amended in 1980 and the Section 4 (f) of the Department of Transportation Act of 1966. Additional Historic Contexts will be written for Yellowstone National Park, including "The History of Concessions in Yellowstone National Park, 1872-1978," currently underway, and "The History of Administration of Yellowstone

National Park, 1872-1966." The completion of the last two contexts should provide the necessary documentation for the evaluation and registration of the remaining historic resources with the Park.

Since the extensive road project only involves Yellowstone National Park, the very detailed portion of the historic context applies only to the road construction within the Park borders. However, in order to evaluate the construction of this system, a general overview of the major road events and development across the United States was developed. Note that a mention of other park roads projects will be found in both the detailed portion of the context and in the general overview.

The decision for the period of time, "1872-1966" was chosen as it encompassed the creation of Yellowstone National Park through the Mission 66 era. Since the first idea for a loop road to include the "wonders" of the Park originated with the first superintendent at a very early stage, the Park's creation was the appropriate beginning date. This also allowed for the study of what roads may have been in use prior to the Park creation. The closing date of "1966" was chosen as it marked the end of the last extensive construction program, MISSION 66, across the National Park system.

The question of integrity not only followed the guidelines found in the National Register Bulletin No. 15, "Guidelines for Applying the National Register Criteria for Evaluation," but also the following issues were examined:

what the road system was and is
why it's design has stood the test of time
how the early design philosophy has been executed
how it's evolution has adhered to the design philosophy

The typology of significant property types has been based on the function, style and association with the planned road system in Yellowstone National Park. The three identified property types are associated with the context, "The History of The Construction of the Road System in Yellowstone National Park." These property types can be identified with the following statewide contexts:

WYOMING

This survey and the resulting National Register nomination forms should supplement the Wyoming's Comprehensive Preservation Plan in the following areas:

1. add significant information to the Transportation Context.
2. add some information to the Military Context.
3. add some information to the Recreation and Tourism Context.
4. add some information to the Cultural Landscape Context.

The study fits into the four of the chronological stages for the following periods:

1.	Territorial	1868-1890
2.	Expansion	1890-1920
3.	Depression	1920-1930
4.	Modern	1930-Present

Under the Wyoming Transportation Context, several resources types can be found in the Yellowstone Roads and Bridges Survey:

1. Stage Coach and Freight Roads
   The Northeast Entrance Road, portions of the North Entrance Road, and the Gardiner to Mammoth Hot Springs Freight or Wagon Road.
   The Baronett Bridge Site.
2. Automobile
   The Grand Loop can be considered a cultural type.
   The Entrance Roads.

MONTANA

The survey and resulting National Register nomination forms will supplement the Montana Comprehensive Preservation Plan in the following ways:

1.	Second Historic Period	1850-1890
2.	Third Historic Period	1890-1930
3.	Fourth Historic Period	1930-1950

The survey supports the study associated with the Thematic classification "Developing a Transportation Network with the Landscape." The road from Mammoth Hot Springs via Norris to West Yellowstone could be associated with a Military Context.

The survey falls within the Southcentral Montana and Southwestern Montana regions.

V. NATIONAL REGISTER DOCUMENTATION

A. PROPERTY TYPES AND REGISTRATION REQUIREMENTS

NAME OF PROPERTY TYPE--ROADS

The roads, which were built for the planned system in Yellowstone National Park, were constructed over many decades with many different standards, many different techniques, many different materials, and under many administrators. While the Grand Loop Road has basically the same configuration as it was first built, many of the present day roads may be on the original alignment or in many cases, the alignment could be off several hundred yards or more. This is also true of the entrance roads. The roads began as not much more than muddy tracks, then they were widened somewhat to accommodate the wagons and carriages. By 1883, the standard for the roads were as follows

> 18 feet width road, well rounded up in the center, and provided with suitable side ditches and cross culverts; that all trees be removed for a width of 30 feet; that on side hill cuttings the fill be retained by a dry stone wall, and that an ample ditch be placed on the up hill side at least a rod from the road to catch the snow water and convey it to the natural water courses, and that where there are meadows or marshes that cannot be drained and must be crossed, the corduroy be replaced by a good plankroad. That all culverts be of stone or 3 inch plank, and that all bridges be well constructed of good sawed lumber.

It was during this period, 1883, that the Army Corps of Engineers officer, Dan Kingman, expressed his concern for the appearance and quality of the park as a result of man's impact.

By 1905, most of the roads had a width of from 18 to 20 feet and a recommendation was made to increase the width of the Grand Loop to "at least 25 feet," building the stone guard walls in mortar and reconstructing the existing ones in mortar, clearing the dead and down timber for 100 feet as a fire precaution and for scenic appearances.

By the 1930s most surfaced roads extended from 18 to 20 feet with a ruling grade of 5 percent, with some 6 percent, and a few 7 percent. By this time, the steep and narrow ditches flanking the roads had been substituted with broad shallow type ditches and there was an increased use of riprapped embankments. Landscape details in curbing at pullouts, stone culverts, and stone masonry head walls with pipe culverts, cement rubble masonry guard wall, were prevalent.

The curves were designed to be "long, carefully compounded curves with gradual changes in length of radii." The culverts were designed to be subordinate to the natural surroundings. The design guidelines were outlined in the 1938 National Park Service publication, *Park and Recreation Structures.*

> The culvert proper is sometimes of local stone when this is abundant and workable, but if it must be of concrete or of galvanized iron, reasonable concealment of the fact is to be striven for. The head wall, by extending well into the culvert opening, should avoid disclosing that it is a mere veneer. Natural rock is certainly the preferred material for the head wall, laid either dry or in mortar.

By 1935, the width of the roads had been raised to 28 feet, shoulder-to-shoulder, for the Grand Loop and 26 feet, shoulder-to-shoulder, for the entrance roads and the Park was using the Standard Specification for Forest Road Construction, Form F.R.50 Revised 1932, for the wooden guardrail. In 1940, the State of Wyoming recommended that the Park abandon the standard log guardrail in favor of the post and reflector type adopted by the state. Instead, the Park began using a native stained post, 8 inches in diameter, with a reflector placed on each post, spaced 40 to 50 feet apart. Over the years, newer generations of log guard rail design have been used and many linear feet of rail existing in the Park in 1991 are a weathering steel beam, supported by wood posts. While the steel beam is not a natural material like the stone or log railing, it does weather to a rustic shade and does blend in the wooded sections of the Park.

After World War II, many of the shoulders were surfaced creating three lane road sections, which invited higher speeds and hazardous passing conditions. The Park's landscape architect reiterated the National Park Service philosophy, "The standards of roads within the parks do not necessarily need to comply with highway standards outside of the parks and moreover the parks, of necessity, should set standards of their own."

In 1956, the National Park Service and the Bureau of Public Roads agreed to a number of specific design and construction details

> a minimum width of 26 feet will be used which included 22 feet of pavement and 2 feet shoulders on either side
>
> native grass shoulders plant mix surfacing to be included on all parking areas in lieu of bituminous surface treatment
>
> all standard AASHO regulatory signs to be installed
>
> road striping

> parking areas painted delineator strips to be used instead of minimal aggregate guide markers
>
> bituminous gutters to be used, minimum 8-inch diameter guide posts to be substituted wherever possible for guardrail with certain hazardous locations maintaining some guardrail replacement.
>
> 12-inch diameter logs would replace the 18-inch logs or stone found in parking areas.

The standards set for the MISSION 66 program called for "the landscape architect and the highway engineer [to] exercise imagination, ingenuity, and restraint to conserve park values," however, the tremendous flexibility of application of these weaker standards produced some sections, such as the Old Faithful Interchange. The park road widths currently extend from 22 feet to 32 feet, and even up to 66 feet on bypasses.

In 1963, the Bureau of Public Roads were described in a national magazine as

> rapidly converting Yellowstone's road system into a network of broad shouldered, high-speed highways, with startling cuts and fills slashing wide, leveled ways through rolling forest and meadows. A result is that the park, though dedicated as a nature sanctuary, is a meeting ground for through routes, with heavy summer traffic converging from all directions.

By 1983, when the latest standards for Park Roads were developed, the purpose of the Park Roads was defined as

> A park road should be fundamentally designed to maintain an overall continuing sense of intimacy with the countryside or area through which it passes. The purpose of park roads remains in sharp contrast to that of the Federal and State highway systems. Park roads are not intended to provide fast and convenient transportation; they are intended to enhance visitor experience while providing safe and efficient accommodation of park visitors . . . . They are not, therefore, intended nor designed as continuations of the State and Federal-aid network.

The newest standards provide for a varying minimum road width, dependent on the average daily traffic. At the extreme end, with an average of 8,000 vehicles, the width could be as much as 12 feet, 4 lanes, with 4 foot shoulders, except in urban areas where the should could be 8 feet. The shoulders could be dirt, gravel, paved, turf, stabilized turf or a combination of surfaces, depending upon bicycle use, climate, land surface type, maintainability and aesthetic goals.

In addition to the Grand Loop and the Entrance Roads, there are several secondary roads in the Park which for the most part have not been improved to the latest standards. In many cases they are narrow, dirt roads which probably are more similar to the appearance of the roads during the historic period. Examples of this category are the Bunsen Peak Road and the Blacktail Deer Plateau Road. These secondary roads are used for side trips for scenic or wildlife viewing.

This general overview illustrates the evolutionary aspects of this type of resource as it responded to changing needs, materials, funds, and techniques. Included as part of this property type and considered as features of the road are the guardwalls, guardrails, culverts, embankments and pullouts.

SIGNIFICANCE

The Grand Loop Road, the five Entrance Roads, and the secondary roads are significant according to the Criteria established by the National Register of Historic Places in the following ways:

CRITERION A. -- Resources that are associated with events that have made a significant contribution to the broad patterns of our history.

NATIONAL LEVEL

At the national level of significance the planned road system in Yellowstone National Park is the first, large-scale designed planned system giving people access into the "scenic splendors" in the country. While the plans and designs for Central Park precede Yellowstone National Park by approximately 16 years, the scope of project and the size differ significantly. The first superintendent, Nathanial P. Langford envisioned this scheme long before anything of this magnitude had been executed anywhere else in the country. One of the significant considerations is the fact that the early configuration providing accessibility to the major geologic and scenic wonders is almost a mirror image of the extant system.

In addition to the significance of the concept, importance should also be given to the fact that this undertaking was in an isolated region at a time when road building across the country was in its infancy. Even after the railhead reached the park boundary, in 1883, the difficulty of transport and the logistics of building a road system covering this very large, geologically challenging region with challenging climatic conditions makes the construction effort momentous.

The system also represents the important position of the Army Corps of Engineers role in the development of the Park. Before the turn of the century, there was no national road system only road districts, within states, and a few state-built public roads. The Federal government had been responsible for the roads in Washington D.C., the roads to government posts (which in most cases were no more than trails), roads on military reservations, and for building the road system in Yellowstone National Park. Since the Park covers over 3,400 square miles, it is reasonable to suggest that the park road system was one of their most ambitious road projects. Capt. Dan Kingman of the Army Corps of Engineers established the first road standards for a park in 1883; he also is credited with setting the philosophy for roads in a wilderness setting. The techniques devised for building a road through a sensitive area such as a park were in many cases the collaboration between the Bureau of Public Roads engineers and the landscape architects of the National Park Service. Their techniques and philosophy were adopted not only in other parks, but in some state highway departments.

STATE LEVEL

The configuration of the road system in Yellowstone National Park was important toward the development of the surrounding towns and approach roads to the Park.

CRITERION B -- resources that are associated with the lives of persons significant in our past.

STATE LEVEL

U.S. Army Corps Engineering Officer Hiram Martin Chittenden is considered significant under Criterion B at a State Level for his vital and innovative role in the development of the road system in Yellowstone National Park, for his role in the very early recognition of Yellowstone's place in history in the United States, for his other important historical contributions to the literature of the American West, and for his role toward the development of the design philosophy which the National Park Service later adopted for its roads and building programs.

Hiram Chittenden, who graduated third in his West Point Class of 1884, arrived in the Park for a short period, 1891-1893, to supervise the Army Corps' construction of the road system. His most important accomplishment for that period was the completion of the Old Faithful to West Thumb route and on to the Grand Canyon via the Lake Hotel area. Poor funding scheduling and lack of funds hampered any real achievements for his first stay in the Park, but he was immediately recognized as "zealous, untiring, and remarkably efficient." When he was transferred in the spring of 1893, the Acting Superintendent Anderson expressed his unhappiness with Chittenden's transfer, "The unfortunate relief of Lieutenant Chittenden last spring has been a most serious blow to road building here. He was greatly interested in his work, tireless in his attention to it, and ably equipped for it."

For the short period that Chittenden spent in the Park during the early 1890s, he developed a sense of the importance of Yellowstone in American history. He researched the area history and while later stationed in Louisville, Kentucky and Columbus, Ohio, he wrote *The History of Yellowstone Park*, which was published in 1895.

Chittenden was called back to the Park in 1899, at the urgency of Sen. Thomas Carter of Montana and Mr. Huntley, one of the Park's concessioners. General Wilson of the Army Corp of Engineers asked him to return to the Park "to take full charge of the Park, including the

Superintendency" to which he replied, "No Superintendency," but "I would like to be placed in charge of the road work." It was during his second period in the Park, 1899-1906 th Chittenden heavily influenced the road program, the Park appearance, and philosophy.

Immediately upon returning to the Park, Chittenden took on the construction of the very important Mammoth Hot Springs to Golden Gate section. Chittenden selected a location and invited the Park officials, and the Cavalry officers in charge of Park administration, to take a look. "They had to go on foot because the ground was so rough and as we clambered through the mass of rocks which is now known as Silver Gate they unanimously declared that it was a fine location for scenery, but impossible to build." Chittenden inquired if that was all they had to say and then he proceeded to build it to his specifications. The following year, Chittenden built the Golden Gate viaduct which replaced the rickety wooden trestle built in the 1880s. Chittenden felt that the construction of the viaduct was the "most difficult piece of work I executed while I was in the Park."

The 200 feet Golden Gate Viaduct was a series of eleven concrete arches, built into the cliff wall on the inner side. The work was carried out under extraordinary working conditions. The site was described in a Livingston, Montana newspaper

> The execution of this work was one of extraordinary difficulty. This arose first from the conformation of the canyon and its influence upon the winds, which prevailed during the entire season. The canyon is practically the small end of a funnel, which gathers up the wind on the plateau above and conveys it to the lower country. The wind was high nearly every day during the work. At times, it attained the force of a gale with sufficient power to pick up stones half an inch in diameter. When it came to mixing the concrete it was found almost impossible to conduct the work during the middle of the day. The dust and cement filled the eyes and lungs of the workmen in spite of goggles and handkerchiefs. On this account men kept constantly quitting, not withstanding increased pay for concrete work, and their places had to be filled with new and inexperienced men.

Prior to this time, and with his experience with the appropriations for construction of the roads and the inefficient distribution, Chittenden formulated a plan for the completion of the 300 mile road system. He pressed for a one time appropriation of $300,000, which he felt would be sufficient to complete the system. Chittenden envisioned the need for two types of appropriations, one for construction and one for maintenance. He pointed out in his reports to Congress that the only time real progress was made on the system was in 1891 when two appropriations for a combined total of $120,000 were used to construct 60 miles of road. While maintenance had been carried out to some extent, Chittenden should be attributed with giving maintenance a major place in the Park budget and in the daily operations of the park.

During this time, Chittenden built the first East Entrance Road, including the construction of the first Fishing Bridge, he shifted a dangerous section of the Gardiner to Mammoth Hot Springs road to the left side of the Gardner River, and he worked on the South Entrance Road into the Teton Forest Reserve. Chittenden felt that it was time to perfect and embellish the road system. He proposed to clear all dead and down timber for the distance of 100 feet and to thin the living trees to allow grass to grow among them to encourage the game that frequented the area. He planned to rebuild the retaining walls with fine masonry and position strong guard rails at the most precarious points; the slopes and cuts would be thoughtfully aligned and where possible small watercourses would be carried along the routes. Chittenden felt that "In these and other ways the roads will themselves be made one of the interesting features of this interesting region."

Other important engineering feats of Chittenden's were the construction of the North Entrance Arch, the Yellowstone River Bridge, and the Mount Washburn Road. Captain Chittenden felt that the heavily traveled, highly visible northern park entrance at Gardiner, Montana, deserved an impressive entrance gate. The Northern Pacific Railway's train station, designed by Robert Reamer, had been completed adjacent to the park boundary on the western edge of Gardiner and a new route into the park was scheduled for construction. Chittenden, who called Reamer "an architect of great originality and particularly skillful in adapting his work to natural surroundings," believed that with the completion of the train station, the time was right to further improve the North Entrance with a compatible entrance arch. Reamer had submitted a draft design which Chittenden disliked. At a conference in the United States Commissioner Judge John Meldrum's office, Chittenden proposed new suggestions for design which were accepted. The arch was dedicated in the attendance of President Theodore Roosevelt, in 1903. The monumental arch, with the definite Army Corps of Engineers detailing, stands as a fitting memorial toward their significant work in the Park.

Of the nine important bridges built in the Park during 1903, the most impressive and certainly most significant was the Melan Arch bridge over the Yellowstone River, above the Upper Falls. The steel and concrete bridge was completed with great difficulty, however, Chittenden felt that its location merited an artistic design because of its prominent location. For many years the idea of a bridge in this location had been contemplated, but lack of funds prevented its construction. Chittenden spent considerable time on site selection. Not wanting to introduce an artificial structure at the most desirable and obvious site, the brink of the Upper Falls where the gap narrows to 50 feet, Chittenden chose a 120-feet span between two jutting rocks, about 1/2 mile above the Upper Falls at the rapids, with the roadway at the center being 43 feet above the low water in the river. Despite the volcanic rhyolite rock being of inferior quality for construction, Chittenden stated, ". . .still from the fact that it has resisted for an indefinite geological period the action of the river, it must have considerable stability." Including dangerous rapids just below, Chittenden had many obstacles to overcome. One of the most serious was the construction of the framework and related framing. All of the rough material was cut locally, but the finer lumber came from the Pacific Northwest. Using a small dynamo connected to the rock-crusher engine and a temporary plant to provide artificial light, the crews were able to complete the concrete work by working around the clock. A detailed description of both the bridge and the construction of the bridge and a sketch plan of the working site, illustrating the gravel piles, the sluices for washing sand, the cement and crushed rock storage, the dynamo, the boilers and the working camp can be found in *Engineering News*, for January 4, 1904. The article is entitled "Reinforced Concrete Arch Bridge over the Yellowstone River, Yellowstone National Park," by Hiram Chittenden.

The bridge held a special place in Yellowstone history and it was not without a fight that the bridge was removed in 1961. In 1947, A.W. Burney, the Assistant Chief of Development for the National Park Service called it one of "significant interest because it is one of the first reinforced concrete arch bridges of this type (Melan Arch) constructed in this country. It was designed by and erected under the supervision of Capt. Hiram M. Chittenden, Engineer Corps, U.S. Army." Burney recalled that an *The Railway and Engineering Review* article, dated September 5, 1903, also described it's design and construction.

By 1959, the now-called Chittenden Bridge had been condemned, but a movement arose to have the bridge retained. Gen. J. A. Code, who was a first assistant to the head of the Signal Corps during World War II stated "That bridge should be retained as a memorial to early bridge building in America. It should be closed to vehicular and foot traffic. There isn't a bridge in the world that can compete with it in beauty and unique setting."

For the next two years efforts were made to preserve the bridge and build its replacement in a different location. However, the final decision was made to replace the 1903 bridge with a new bridge on the same site. In a letter to General Chittenden's family, Lemuel Garrison, superintendent of Yellowstone National Park, wrote:

> . . .there have been further developments concerning construction of the Chittenden Memorial Bridge. These developments demand additional respect of General Chittenden's engineering prowess. The site he selected for his bridge is not only the best, but is also the most logical site for a bridge across the Yellowstone River. As Mr. Scoyen wrote you, a site upstream was selected for the Chittenden Memorial Bridge, but as engineering data accumulated it became increasingly clear that costs for a bridge there would be staggering. The more the problem was studied, the more Bureau of Public Roads engineers and our own experts realized that the site selected by General Chittenden is the only logical site to construct the new bridge. Accordingly, we will remove the old bridge this summer and immediately start construction on the new. A plan has not yet been approved for the new bridge, but I can tell you what we will try to do. We will erect a reinforced concrete arch which we hope will be as fine a contribution to contemporary bridge design as the original was to earlier concepts of bridge design. This is a high standard of achievement, but we will do our best. We will not attempt a slavish copy of

> Chittenden Bridge. It is unique and any copy would detract from the value of the original by not measuring up to its beauty and grace. I know General Chittenden would use the results of modern engineering research in designing the bridge if he were to tackle the job today, and, somehow I don't think he would approve of copying a previous design. . . . I think, however, that a new bridge of clean design similar to that General Chittenden built, on the site he selected, and named Chittenden Memorial Bridge will be a most fitting tribute to that fine engineer. We will place there a memorial tablet whereon all may read of General Chittenden and why we honor him.

Another major engineering feat was the construction of the road over Mount Washburn, where Chittenden found that the presence of solid rock on most sections of the road made construction very difficult and slow. Ten years after its completion, Franklin Lane, the secretary of the interior, wired the retired General Chittenden to announce that in an August 2, 1913 ceremony, the road over Mount Washburn had been dedicated and christened the Chittenden Road. An immediate response came from the Chief Geographer, R. M. Marshall, who was responsible for changing the name on the newly published maps. In a letter to General Chittenden, he stated "There can not be too much Chittenden for me in this world, geographically."

Finally in 1959, General Chittenden's contributions were honored by the Park changing the road signs from "Mt. Washburn Road" to read "Chittenden Road to Mt. Washburn."

Chittenden's accomplishments toward the history of the American West did not only include the publication of the first comprehensive book on the history of the Park and still one of the classic of Yellowstone literature, but he wrote several other major works.

In regard to *The History of Yellowstone National Park*, which was Chittenden's first book, the author had the privilege to be able to explore the region, examine its history, and perceive its place in the country's history. After its 1895 publication, Chittenden continued to revise it, with other editions being published.

The other classics of Western American history that he authored were the *American Fur Trade of the Far West*, the *History of Early Steamboat Navigation on the Missouri River*, and the collaborative work with Alfred T. Richardson, *The Life, Letters, and Travels of Father Pierre Jean de Smet*. In addition to these works, he also authored *War or Peace, Flood Control, and Letters to an Ultra-Pacifist*. Chittenden's writings have been praised by his contemporaries and later historians:

Frederick Jackson Turner

> characterized the *American Fur Trade of the Far West* as "excellent" and admitted that the book's map showing the western fur trade posts "furnished the basis for the map of western posts and trails in (Turner's) *Rise of the New West.*

Grace Lee Nute

> characterized the fur trade history as "remains the best general account available."

Ray Billington

> found the fur trade history "the most useful work on the fur trade."

Chittenden's accomplishments did not only relate to Yellowstone National Park and his literary efforts, but after leaving Yellowstone for the Pacific Northwest, he continued with engineering projects. Besides serving as the President of the Port Commission of Seattle, he supervised the construction of the docking and terminal facilities, he was active in many other water or flood projects on the West Coast, and most importantly he was responsible for the design and construction of the locks which raised the seagoing vessels 19 feet from Puget Sound to Lake Washington. At the time of their construction, they were the fourth largest locks in the world. In 1956, President Dwight Eisenhower signed a bill in which the locks were named the "Hiram Chittenden Locks." The locks were listed on the National Register of Historic Places on December 14, 1978.

Hiram Chittenden is listed in both the *Dictionary of American Biography and A Biographical Dictionary of American Civil Engineers, Vol. II.* At the dedication of the Chittenden Memorial Bridge in Yellowstone National Park on August 9, 1963, Chittenden was described as

> at least a triple threat to man. He had three distinguished careers with national and lasting recognition in each -- engineering, history, and conservation. As if these weren't enough to keep him busy, he became a student of international affairs, writing one book and a number of articles in this field. There was a book of poetry along the way, and the design of two monuments to attest to his artistic nature. As an engineer, he left his major marks here in Yellowstone, and in Seattle where the Chittenden Locks identify his contribution to the Port of Seattle. But it was here in Yellowstone that his greatest engineering accomplishments were made in a national sense. Thus he sensed when summing up his career he said: 'My work in the Yellowstone Park will stand out as perhaps most important in the construction line of anything which I have accomplished . . . . It was in the

> fullest sense a labor of love. . . . In every important respect the Yellowstone Park has so far fulfilled the expectation of its founders and has justified the wisdom of its creation.'

CRITERION C -- resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

STATE LEVEL

Under Criterion C the road system in Yellowstone National Park represents the continuing design philosophy first recognized by the Army Corps of Engineers and then later expounded upon by the landscape architects of the National Park Service. The use of the road has remained the same, however some changes have been made to meet the needs of visitors, to improve with advancing technology, and to meet weather, natural and geologic concerns. What one sees today does not exist exactly as it was first constructed. The road alignments, width of roads, surfacing materials, guardwalls and guardrail, culverts and traffic patterns have changed and been altered many times. Despite the fact that the road has had many changes and certainly does not look like it did during the historic period, it is the continuation of the philosophy of design that is most important. It is not the road alignment, width of the road, surfacing material or traffic patterns that are significant. The designed features such as the guardrails or guardwalls, the culverts, embankments, and designed pullouts are considered as part of the system and impart to the visitor a feeling of "blending with nature." The continuation of the earlier design philosophy in most cases has produced a modern road system with a high degree of feeling. Many historic components of the earlier system are extant, i.e. bridges, culverts, guardwalls and guardrails.

As the first designed road system for a national park or other reservation, it served as a model for other park areas. The consistent concern from Capt. Dan Kingman in 1883, through the work of the landscape architects of the National Park Service demonstrates the National Park Service's role as a leader in the landscape architecture field. The use of native materials compatible with the landscape and the concern for scarring or excavation has been a model for state park systems, moreover techniques used by the National Park Service were adopted by some state highway departments. In an article entitled, "America's Park Highways," the Deputy Chief Engineer of the Bureau of Public Roads L.I. Hewes, cites the importance of the philosophy of the National Park Service and its influence across the country:

> In all the work in the National Parks, the Bureau of Public Roads has been guided in its design by the Landscape Division of the National Park Service. . . . The influence of the park land-scaping methods has been felt by the bureau's entire organization and has resulted in better looking roads outside the parks. The highway departments of the Western states have been influenced by

> the results achieved on the park roads, and there has been a noticeable improvement during the last few years in the appearance of the roads constructed by the strates themselves.

In addition to Dan Kingman's setting the first park road standards in 1883, he also instilled a philosophy of wilderness road construction. Chittenden followed Kingman's thoughts showing his concern for man's imprint on the park. In addition to his concern for the siting and the artistic development of the Yellowstone Bridge, Chittenden wrote:

> As a general policy, the extension of the system should be restricted to actual necessities. The Park should be preserved in its natural state to the fullest degree possible. While it is true that highways are the least objectionable of all forms of artificial change in natural conditions, still they should not be unnecessarily extended, and the great body of the Park should be kept inaccessible except on foot or horseback. But a road once found necessary should be made as perfect as possible. So far as it may detract from scenery, it is far less objectionable as a well-built work than if left in a rough and incomplete state. The true policy of the government in dealing with this problem should therefore be to make the roads limited in extent as will meet actual necessities, but to make such as are found necessary perfect examples of their class.

Soon after the National Park Service resumed the responsibility for the construction of the roads in Yellowstone, a national landscape engineering office was created and the earlier philosophy was continued. As part of the cooperative agreements with the Bureau of Public Roads, the National Park Service landscape architects controlled the appearance of the road system and all landscaping details. By the 1930s, standardized plans for guardrails, guardwalls, and culverts were on the shelf. Another standard that marked a park road was the flattening and rounding of the slopes and cuts. In 1935 and 1938, the design philosophy was expressed in the publication of two books by Albert Good, *Park Structures and Facilities* and *Park and Recreation Structures.*

One other area of significance for the Yellowstone roads was the association with the nationwide Roadside Improvement Program under the leadership of Mrs. John D. Rockefeller. It would be difficult to pinpoint any particular resource in the park to that association, but the work done in the park as a result of that program was very important to the park's appearance and to the moral of the park employees, who gained more pride from their work.

CRITERION D -- This criteria does not apply to this property type. See the registration requirements for explanation.

REGISTRATION REQUIREMENTS

The registration requirements for the Property Type - Roads, will be for roads that are Historic Districts and those that will be submitted as an individual resource. The Grand Loop is considered one Historic District. Each Entrance Road is a Historic District and each secondary road will be submitted as a Historic District.

Under Criterion A, the following Registration Requirements are listed:

1. the road must have been built as part of the designed, planned system.

2. Locational integrity is not absolutely required, as the road's configuration (connecting the most important scenic and wonders of the Park) changed many times over the last 119 years. The important point is that any variation adheres to the original purpose or function of the road. Often the road alignment was moved to another route because of geology, natural features, settlement, habitat, etc.

3. Design integrity is more important under Criterion C and will be discussed in that section.

4. Workmanship integrity will be discussed under Criterion C.

5. Feeling is important for Criterion A and it is closely related to the integrity of design because a visitor must be able to recognize that the road is "different" from those outside of the Park boundary. The road must possess enough physical attributes of the National Park Service design philosophy to convey that feeling to the visitor. Since the road is an evolutionary resource, the question of well-executed reconstruction of a guardwall or a compatibly designed culvert, or other feature, should not detract from its eligibility.

6. Portions of an old road should not be considered eligible, as any visible evidence actually represents a failure of the landscape architect's program of total road obliteration. As a new or better route was constructed, in most cases, the landscape architects called for the road to be revegetated in order to eliminate a scar on the natural environment. The exception to this requirement would be the older roads that became some of the Park's secondary roads, such as the Mammoth Hot Springs to Gardiner or the Blacktail Deer Plateau Road. Another exception would be the roads that were built for other purposes, such as the Old Marysville Road in the Southwest part of the Park.

7. Only designed pullouts will be considered for eligibility. Throughout the Park, there are many pullouts or expanded shoulders for cars to use for viewing or for overtaking by the traffic. These should not be considered eligible or as a contributing feature.

Under Criterion B, the Registration Requirement for Criterion A and C are sufficient.

Under Criterion C, the Registration Requirements are the following:

1. The road and its features should retain sufficient evidence of the design philosophy harmonizing with the environment as expressed and executed during the historic period. The elements of the philosophy are:

   a. the introduction of certain elements of grace in alignment
   -- the road lies gently on the landscape
   b. the use of architecturally pleasing structures--manmade features such as culverts, walls, curbing etc. were constructed of natural materials and their scale was compatible with the natural environment
   c. the protection of trees, shrubs, and other natural growths from destruction and damage--this provided undisturbed vegetation along the road, which offered a feeling of a natural setting
   d. diminution of scars--large cuts and fills were avoided.

2. The road must evoke a feeling that it is a park road and an image that it is distinctive from those found outside the boundary of the park.

NAME OF PROPERTY TYPE--BRIDGES

DESCRIPTION

The bridges in Yellowstone National Park have ranged from the first bridge to cross the Yellowstone River, crudely built log spans, Army truss and steel girder bridges, log causeways, log trestle viaducts, important Melan Arch Bridge, a concrete viaduct, single to multiple reinforced concrete slab bridges, concrete arch bridges with stone veneer facings, timber trestle, concrete girder bridges with masonry piers, a 8-span timber and log bridge to a 962 foot steel deck truss bridge.

The first bridge to cross the Yellowstone River, the Baronett Bridge, was a log structure built one year before the Park was established. After it's destruction by fire set by the Nez Perce on their exit from the Park in 1877, the bridge was replaced. By that time the second Park superintendent, Philetus Norris, found bridging the Yellowstone River at that point was not as much of a problem as bridging the Gibbon, Firehole and Madison rivers where unusual geologic conditions existed. He found it easier to cut slopes through the grassy turf for fording or placing long, limber poles or foot logs. These covered the placid, water-flow from the geyser or hot spring formations. However, bridge building did progress with 12 bridges being built in 1881.

When the Army Corps of Engineers arrived in the Park in 1883 to assume the responsibility for road construction, Lt. Dan Kingman described the bridges as "covered with small poles, and then even long stretches of corduroy to weary and vex the people who were obliged to travel over them." When he developed the first park road standards, he called for the bridges to be "constructed of good sawed lumber." By 1885, Kingman had constructed the first wooden trestle through the Golden Gate Canyon. By 1889, 21 more bridges had been built in the park of which 4 were considered substantial, but the new engineering officer in charge felt that as appropriations warranted, they should all be replaced with iron or stone structures.

By 1896, there was an awareness that the crossing near the Grand Canyon of the Yellowstone should be a structure of an attractive design, preferably an iron bridge. Seven years later, Chittenden would design and construct the Melan Arch bridge. In 1901, Chittenden began replacing many of the wooden bridges with rock-filled wooden abutments and piers with steel constructed bridges either solid concrete abutments or tubular piers. One year later, the old wooden trestle through the Golden Gate was rebuilt with a concrete viaduct.

In addition to the construction of the Melan Arch bridge in 1903, 8 other important bridges were built continuing the replacement of the older wooden bridges with steel or concrete bridges. An inspection of the Park bridges conducted in 1909 by Capt. Wildurr Willing called for the replacement of more of the 19th century bridges with steel structures.

After the admission of the automobile and the creation of the National Park Service, an important policy statement regarding the national parks was made by the Secretary of the Interior. The portion of which pertained to roads and bridges in the parks called for:

> In the construction of roads, trails, and buildings, and other improvements, particular attention must be devoted always to the harmonizing of these improvements with the landscape. This is a most important item in our program of development and requires the employment of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the aesthetic value of park lands.

From that time until the National Park Service and the Bureau of Public Roads began their collaborative working relationship, most of the bridges in the Park were merely repaired. The next extensive bridge program would be in the 1930s, however, the Cub Creek Bridge on the East Entrance Road would be the first bridge project for the two agencies. (1926)

With the new working agreement of the National Park Service landscape architects responsible for the architectural details of construction, the appearance and types of bridges changed from steel constructed to concrete arched bridges faced with stone veneer, timber and log, or concrete girder bridges with stone abutments. The National Park Service admitted that "a bridge will always look like a bridge no matter what attempts are made to blend it into the surroundings or how much money is expended on it." However, the landscape architects did promote the use of masonry arch bridges that blended with the landscape, as the most desirable type, particularly where "ruggedness of the landscape is the rule."

During the first two decades many of the remaining steel bridges were moved to other locations in the Park to satisfy a need. Some of the steel Army bridges were relocated in the adjoining national forests.

Between 1926 and 1939, 30 major bridges were built in the park. With the exception of two of the remaining Army bridges and one bridge designed but not built during this time, the bridges being nominated as part of this documentation come from this period.

Minimal work was done during the World War II years and as a part of the MISSION 66 program initiated in 1956, 14 of the older bridges were scheduled for replacement. By 1966, fourteen new bridges had been built and for the most part, these new bridges blended with the environment, despite the fact that their design moved away from the obvious rustic design of the pre-World War II era. During the 1970s, four more bridges were constructed.

Tracing the different types of bridges used in Yellowstone and the approximate periods of their use supports the fact that this road system is an evolutionary resource. Over the years, most if not all of the log railings and posts have been replaced most of the decks have been replaced. These changes are mostly due to the climatic conditions or the type of materials used. In some cases, concrete spalling etc. has called for the reconstruction of some portions.

SIGNIFICANCE

The bridges in Yellowstone National Park are significant according to the Criteria established by the National Register of Historic Places in the following ways:

CRITERION A -- Resources that are associated with events that have made a significant contribution to the broad patterns of our history.

NATIONAL LEVEL

Although segregated as a separate Property Type for documentation purposes the bridges in the park are a part of the road system, thus the significance found under Property Type--Roads, also applies to the bridges.

CRITERION B -- Resources associated with the lives of persons significant in our past.

While two of Chittenden's major achievements were bridges, neither exists today. The reconstructed Golden Gate Viaduct does not have enough integrity from the Chittenden era to have the association.

CRITERION C -- Resources that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

STATE LEVEL

Under Criterion C, the bridges can represent the National Park Service's design philosophy of harmonizing the manmade features with the surroundings. The bridges are the resources on the road system which maintain the best integrity and clearly represent the works of the landscape architects of the National Park Service.

CRITERION D -- Resources that have yielded, or may likely to yield, information important in prehistory or history.

STATE LEVEL

Under Criterion D, the Baronett Bridge Site is significant at the State Level for its position as the first bridge to cross the Yellowstone River. The bridge, which predated the creation of the Park by one year, gave access to the Cooke City mines from the Yellowstone Valley. As one of the first of two private parties doing business in the Park at the time of its establishment, the site is also important for Concessions History which will be developed later. The site's cultural deposits can contribute to our understanding of the late nineteenth century transportation frontier and the settlement and development.

REGISTRATION REQUIREMENTS

The Registration Requirements for the Property Type--Bridges are the following:

CRITERION A -- Resources that are associated with events that have made a significant contribution to the broad patterns of our history.

NATIONAL LEVEL

Under Criterion A, the following Registration Requirements is listed:

1. the bridge must have been constructed as part of the planned road system in the Park.
2. the bridge must meet the National Register of Historic Places criteria for the 50-year consideration, however, Criteria Consideration G should be used on any bridge which was designed during the historic period (1872-1941), but not constructed until later as a result of the U.S. entry into World War II.
3. the bridge should meet the integrity of Location, however, Criteria Consideration B is applicable to the two remaining Army-built bridges. As the movement turned from the construction of steel bridges to more modern types, many the Army built were relocated within the Park and into the surrounding national forests. The two extant army bridges, the North Entrance Arch are the most visible reminders of the Army Corps presence in the Park. While there are two buildings associated with the Army Corps, they are not an obvious association.

Criterion B is not applicable for the bridges in Yellowstone.

Under Criterion C, the Registration Requirements are the following:

1. the bridge must have sufficient integrity to express the design philosophy of the National Park Service--harmonizing any manmade features with the environment.
2. the bridge is eligible for listing if any replacements or reconstructed portions have adhered to the original design.

Under Criterion D, the Registration Requirements are the following:

1. the bridge site must have significant importance in the history of the Park or of the region.
2. bridge sites of nonextant bridges should not be considered eligible unless the bridge were known to have been a significant engineering example and the cultural remains could potentially yield important information about its construction or design.

NAME OF PROPERTY TYPE--BUILDINGS AND STRUCTURES ASSOCIATED WITH THE CONSTRUCTION OF THE ROAD SYSTEM IN YELLOWSTONE NATIONAL PARK

DESCRIPTION

The types of buildings and structures associated with the construction of the road system in Yellowstone National Park are entrance stations or entrance arches, buildings constructed in the Mammoth Hot Springs area for offices, equipment, and residences, road camp buildings and sites, and the site of the Baronett Bridge Complex.

The interpretive kiosks in pullouts were not built as part of the road program and thus will be addressed in a future Historic Context for History of the Administration of the Park-Subcontext--Interpretation/Education.

The first buildings associated with the road were those found at the Baronett Bridge Site. The toll cabin is addressed under Criterion D in the Property Type--Bridge portion.

There are two extant historic entrance structures, the Northeast Entrance Station and the North Entrance Arch (Gardiner Arch). The North Entrance Arch was built in 1903 to the design of Hiram Chittenden to be compatible with the recently completed Gardiner train station designed by Robert Reamer. The columnar basalt stone arch has two battered towers, fifty feet in height, with an arch curtain five feet thick and is built to the same height as the towers. The structure is capped with a concrete roof and shingled with chippings from the cut stone used in the arches construction. The style reflects the Army Corps of Engineers and the use of the stone was compatible with the train station that was long ago removed. In 1921, a compatibly designed stone building which housed a ranger and was used as a checking station, was built near the arch. This new building replaced "an unsightly tent arrangement." Over the years the building was altered by the enclosure of the porch. In 1937, the building was destroyed by fire and until 1991 temporary buildings have been used on the North Entrance, several hundred yards from the arch, inside the park. During the summer of 1991, a compatibly designed stone and log building was built.

The historic context discusses the entrance stations on the other entrance roads and photographs illustrate their design. For the most part, the historic entrances were rustic log structures.

The one extant rustic log example is the Northeast Entrance Station, which was designated a National Historic Landmark under the Architecture in the Parks theme in 1987. The nomination called the entrance station "a classic in terms of its rustic design. Its pristine, nearly original condition makes it outstanding in the National Park system, and perhaps unique, for its architectural integrity.

The buildings that were constructed by the U.S. Army Corps of Engineers for housing, offices, and equipment storage were primarily constructed during the 1902-1903 period at the Mammoth Hot Springs/Fort Yellowstone area. Prior to that time, the Army Corps personnel were authorized to use some of the buildings the Cavalry had built at Camp Sheridan, the forerunner of the nearby Fort Yellowstone. The Camp Sheridan buildings that the engineering group used were the warehouse, guard house, quartermaster stable, and office. None of these buildings exist.

During the 1902-1903 period, most of the buildings for the engineering group were built adjacent to the very finely constructed and attractive Fort Yellowstone. Chittenden first built a reservoir at the base of the Mammoth Terraces in 1901 and the following year the reservoir provided the source of power for the hydroelectric plant. These resources will not be addressed during Part I, but will be addressed when the overall evaluation of the Mammoth Hot Springs area is completed.

The first year of construction, 1902, Chittenden completed the following buildings:

> 1 commissary and storehouse, 100'x 24', one story
> 1 shop, 80'x 24', 2 stories, the upper used as quarters
> 1 shed, 100'x 20'
> 1 shed, 200'x 20'
> 1 stable, 30' x 40'
> 1 bunkhouse, 30' x 40'

The following year, Chittenden completed the U.S. Engineers Office, which was the second building constructed of stone since the U.S. Commissioner's house was completed in 1891, and an attractive cottage-style residence for himself to the rear of the Engineer's Office. Upon completion of the various buildings at Mammoth Hot Springs, Chittenden felt that:

> This is the only point in the Park where an extensive transformation of natural conditions by the work of man has been permitted. Yet it was unavoidable here, and in yielding to this necessity, the effort has been made to provide a substitute that would be in harmony with the natural surroundings, and would itself be a feature of interest.

The Engineer's Office was a contrast in style to the other Army engineer buildings, which were simple, wooden frame buildings with wood shingle roofs. The photographs found in the Historic Context, Chapter III, illustrate the style of the buildings.

In 1908 the engineers built a storage barn, adding a chimney in 1913 and another cottage on Avenue E. During June, 1915, the engineers built a wagon shed. Upon the departure of the cavalry troops in 1916, the engineers took over several of the buildings of Fort Yellowstone. They used the double set of stone officers quarters, 2 sets of wooden officers quarters, 2 sets of NCO quarters 1/2 of the double stone barracks, the stone blacksmith shop, and a stone stable.

The only extant buildings constructed by and for the U.S. Army Corps of Engineers are the Engineer's Office and the Chittenden House.

The other type of resource associated with this property type is the road camp (or site of road camp).

The first reference of a road camp established by the military was Kingman's 1885 road camp near the Norris Geyser Basin, but Kingman's reports give very good detailed information on the number of laborers, the type of work and their pay. An 1883 report lists the daily ration for the construction crews.

Upon Chittenden's return to the park in 1899, he began to consider the supplying and positioning of the necessary number of men in the appropriate locations for work. By 1901, the government provided housing and subsistence for which the workers paid forty cents a day. All of the working parties lived in a camp. Then in 1902-1903, additional quarters were built at Mammoth Hot Springs.

Prior to leaving Yellowstone, Chittenden made a long list of recommendations for the road projects in the Park. Among those was his proposal for road camps for crews of 13 to 15 men including a cook. Besides bunkhouses and messhalls, the camps should have buildings in which to store forage to avoid damaging the roads by hauling forage during the spring when the roads were soft. His idea was for two crews to work from one camp, with each crew responsible for about five miles of road. The road camps would be situated approximately 8 to 10 miles apart. This scheme would provide a systematic method for general maintenance, sprinkling, and development of the road system.

Following Chittenden's suggestion, Lt. Ernest Peek established a number of camps during 1907, including a permanent camp with floor and framed tents near Obsidian Cliff and Canyon Junction. A permanent camp was started on the Lake to Canyon Road and one at Beryl Springs. Three very rough houses were finished on the Continental Divide between West Thumb and the Upper Geyser Basin. Barns were built at two of the houses and the timber cut for the third house.

In 1908, Peek expanded the number of road camps to include ones at Excelsior Geyser, Upper Geyser Basin, West Thumb, Lake and Trout Creek. The third barn, which was started in 1907, was completed at Spring Creek on the Continental Divide Road. Peek found that having these accommodations greatly increased the productivity, as before the road camps were built, the crews had to sleep on the ground. Before the summer of 1908, Peek planned to build a barn at Beaver Lake and at Trout Creek. Peek saved money by having mangers built at Beaver Lake, Beryl Springs, Excelsior Geyser, Upper Geyser Basin, West Thumb, Lake, Trout Creek, Canyon, and two other places on the Lake to Canyon Road. These mangers prevented the needless waste caused by feeding on the ground. In 1909 another barn and a warehouse were built at Beaver Lake.

In 1910, permission was given to the contractors, Moore and Moore of Eldgridge, Montana, to build a small log cabin within the park boundary. The contractor had to build the cabin on a site selected by the noncommissioned officer stationed at the Gallatin Station, out of view of the road. The contractor did have permission, under certain restrictions to cut logs in the Park for its construction. About 1913, a 26' x 34' barn was built at Trout Creek road camp, a log storehouse was built at the East Entrance, a log cabin/storehouse was built at the Lake sprinkler camp, and a 25' x 130' wagon shed with storage loft was built at Mammoth Hot Springs. The following year, barns were built at the Gibbon Meadow and Grand Canyon camps and cabins were built at Beaver Lake and Grand Canyon camps. In 1915, telephones were installed at most of the camps.

In 1915, the year automobiles were permitted to enter the Park, Maj. Amos Fries, who was known for running a "tight ship," decided that the practice of building bunkhouses and barns was not practical. He felt that for them to be effective required placing them in locations that would offset the long commutes the crews had to make which was too costly. He preferred the use of 15' x 24' tents.

In 1919, most of the road work was routine maintenance and many of the road crews were pulled off road work to fight fires, however, some of the camps, corrals, and equipment were moved around to other locations in the Park. In 1921, wooden messhalls were built for the road camps at Tower Junction, Madison Junction, Excelsior Geyser, and at Gibbon Meadows. Most of the building material came from the razed Yellowstone Western Stage Company buildings at West Yellowstone. Each of the 16' x 22' buildings contained a kitchen, dining room, and cook's bedroom. The roof extended six feet beyond the front wall to form a porch, which was enclosed by screening. The doors and windows were also screened. A 16' x 26' log mess house and a 16' x 30' log stable were built at the Lewis River road camp.

After the Bureau of Public Roads began supervising the road work in Yellowstone, the prospects of a greatly expanded roadwork program lasting many years was evident. The road camp facilities for the road crews were examined and tentative proposals offered an improved housing situation.

By 1926, twenty road camps within the boundaries of the Park had log and/or frame constructed buildings. The status of the road camps in 1926 is listed:

Mammoth Hot Springs - 1 building with 7 private rooms and a dormitory provided with iron bunks sufficient for 30 men. The building was described as "nothing more than a shell and not suited for winter use." There are 14 small rooms above the old carpenter shop which housed the truck drivers, barn men, commissary employees and other semi-permanent employees. Three men lived on the north side of McFarland's shop, which had no toilet, or bathing facilities.

Recommended: That the old carpenter shop be partitioned off to construct 4 or 5 private rooms and a bathroom for the permanent mechanics. Additional quarters for single permanent employees such as blacksmiths, carpenters, mechanics, and head barnmen should be provided.

Beaver Lake	has a log mess-house and frame stable.

Recommended: A frame bunkhouse for 10 men, repairs to present stable, repairs to messhouse new fir floor, and a large range with hot water tank.

Norris	has a log and frame stable, frame messhouse, frame bunkhouse with log trim, frame house for foremen, and another frame building.

Recommended: The present frame messhouse, which was described as "too large and unsightly," should be razed and a new one built. The stable and bunkhouse need painting or staining and the two small frame buildings should be moved to a "less conspicuous" location.

Gibbon Meadow	has log stable and frame messhouse; nothing was recommended for additions, but it was recommended that when the road through the Gibbon Canyon was completed, the road crew should be located at Norris.
Madison Junction	has a frame messhouse, log storehouse with the horses being stabled in one end of the storehouse.

Recommended: A log bunkhouse for 12 men. It was felt that a stable was not needed in this location because motor equipment will probably be used on this section after its completion.

Excelsior Geyser	has frame messhouse and log stable.

Recommended: Frame bunkhouse.

Old Faithful	has frame messhouse and frame officer's house.

Recommended: Frame bunkhouse for camp cleaners, sprinkler man and truck driver, frame stable for camp cleaner's teams, sprinkler team, and ranger's horses.

Spring Creek	has frame bunkhouse, small frame house for cook and frame stable. Nothing required.

Delacy Creek — has frame messhouse and bunkhouse and frame stable. Nothing required.

Dry Creek — has frame messhouse and bunkhouse and frame stable. Nothing required.

West Thumb — has frame messhouse, frame bunkhouse, frame grainary and log and slab shed for stable.

Recommended: The present messhouse and bunkhouse located in the new auto campground should be razed and an entire unit, messhouse, bunkhouse and stable built on the hill south of the auto campground.

Lake — has a log messhouse, several old sheds, and log building used for bunkhouse.

Recommended: New log or frame stable, raze all old sheds, build additional room on messhouse for cook's quarters. Either remodel the old bunkhouse or build new one.

Trout Creek — has log mess building and frame stable.

Recommended: Frame bunkhouse, small stable should be built back of messhouse -- the old stable should be razed.

Canyon — has log messhouse and log stable.

Recommended: New bunkhouse for 15 men and build additional room on messhouse for cook's quarters.

Dunraven Pass — has frame messhouse, frame stable with log trim, and frame bunkhouse with log trim. Nothing required.

Tower Junction — has frame messhouse and old log stable.

Recommended: Log or frame bunkhouse and a new stable built behind the messhouse; the old stable should be razed.

Blacktail Deer Creek — has log messhouse and log stable.

Recommended: Messhouse, bunkhouse, and stable. An entire new layout should be built in a new location nearer the road.

Virginia Meadows has log messhouse.

Recommended: Small log or frame bunkhouse and small log or frame stable.

West Gallatin has nothing.

Recommended: Log messhouse, log bunkhouse.

Cook City Road has nothing.

Recommended: There should be two units on this section, one about Lamar Canyon and the other at Devil's Well, and a messhouse bunkhouse, and stable built at each place.

Turbid Lake has nothing.

Recommended: An entire unit--bunkhouse, messhouse, and stable. Cub Creek has log messhouse, log bunkhouse, log stable, and log bathhouse. Nothing is required.

East Entrance has nothing.

Recommended: An entire unit--either log or frame messhouse, bunkhouse, and stable.

Lewis River has log messhouse and log stable.

Recommended: Log bunkhouse.

In 1927, the Park sent bunkhouse and mess house blueprints to Thomas Vint, chief of the landscape architecture division, in the National Park Service Field Headquarters in San Francisco for approval. Generally, these utilitarian type buildings were constructed from standard designs found in the files in the park. The older bunkhouse design had a "bull-pen" arrangement for sleeping and the revised drawings offered separate sleeping rooms and a separate room and office for the foreman. The rationale for the changes in design was that the foreman needed privacy to prepare the cost reports and time sheets and that in many cases the foremen were required to do paper work at night. The move for separate sleeping areas would provide more comfort and privacy and thus less friction for crews whose ages varied from eighteen year olds to men in their fifties. Tidiness and cleanliness of the building was also an issue. Each sleeping room was designed for two men using double-tier bunks. The new designs for the mess house included a separate sleeping room for the cook on the first floor and framing the building 2 1/2 or 3 feet above the ceiling to provide two addtional rooms for extra men or transients if necessary.

The plans called for three team stables with the possibility of lengthening it an additional nine feet if space were needed for more stock. The resident engineer in Yellowstone preferred a rough lumber exterior on the frame building using the standard stain, however, cost estimates for the addition of log trim fell within the allotment from the appropriation. One year later in 1927, the road camp building program changed "because of conditions that could not have been foreseen."

In 1929, the National Park Service's Washington Office requested the closing and dismantling of the camps due to lack of construction funds, however, a new road camp was built at Lake consisting of a messhouse, a 20-man bunkhouse, a 3-stall stable, and a stable each at Canyon and West Thumb.

The following year, restored funding enabled some camps to be reestablished on a more permanent basis using the revised plans for bunkhouses and messhouses. A typical completed road camp included the messhouse costing $1,424.00, the bunkhouse costing $1,140.00, and the stable costing $855.00.

In 1930, two groups of road camps were built according to the standard plans, the Bacon Rind Creek camp and the camp 3 1/2 miles west of the East Entrance which served the crew stationed for work between the East Entrance and Sylvan Pass. The two camps were identical in construction. The messhouse was a 1 1/2 story frame building, 18' x 32', with vertical siding and battens, consisting of a kitchen, pantry, and a mess hall on the first floor and three partitioned sleeping rooms and bath in the alcove upstairs. The bunkhouses, 18' x 30', were of the same construction, but partitioned into 5 sleeping rooms and a common room with a built-on shower. Each sleeping room accommodated two men. The bunkhouse was framed two feet lower than the messhouse and the upper portion floored and had a ceiling which provided space for tools and equipment for winter storage. The stables were of frame construction, 16' x 28'. The building was divided into double stalls to house three teams. The upper floor contained the hay loft and grainery which had a tin lined rodent proof oat bin.

During 1931, the landscape architecture division of the National Park Service took a strong stand on appearance not only of the recently built structures, but also the conditions of the abandoned road camps, with the results that they were left in better condition than before. A few years later the C.C.C. assisted in the cleanup of old sites, removal of old buildings and the cleanup of old dump grounds.

Many of the road camps later housed road maintenance crews and over the years, many of the buildings have been relocated throughout the park or removed.

During the extensive road projects work of 1930s and into the 1940s, many of the contracts obligated the contractors to return the road camps to their natural conditions upon completion of the work. Sometimes buildings were left under certain conditions, such as:

> With regards to the matter of removal of buildings and cleanup at the camp occupied by Strong and Company, contractors at Canyon, we are agreeable to leaving the N.P.S. mess hall, bunk house and

> barn. The remainder of the buildings are of such flimsy construction that to retain them pending their further use in subsequent contracts would not be practical. These shacks would require maintenance and protection which is not warranted by their value.

Toward the end of the 1940s, the Park tended to encourage the contractors to use space within the Park's utility areas. In reference to the use of an old camp at Riverside Geyser, Superintendent Rogers believed that "The scenic value of the Riverside Geyser outweighs any economic value the campsite might have. In fact there is not much consequence in making a comparison. Furthermore the use of the road and campsite detracts materially from the enjoyment of the views of the geyser."

There are a few isolated road camp buildings throughout the Park, however, the last most intact road camp at West Thumb, burned during the fires of 1988.

SIGNIFICANCE

NATIONAL LEVEL

One building and one structure associated with the construction of the road system in Yellowstone National Park are significant at the National Level under Criterion A and Criterion C. The Northeast Entrance Station was designated a National Historic Landmark in 1988. The nomination called it "a classic in terms of its rustic design. Its pristine, nearly original condition makes it outstanding in the National Park system, and perhaps unique, for its architectural integrity."

The other nationally significant structure is the North Entrance Arch. It is significant for both Criterion A, and Criterion C. Under Criterion A, the arch is significant for the following reasons:

1. it is an integral part of the road system
2. it is associated with the role of the U.S. Army Corps of Engineers' significant contribution toward the development of the road system and its standards
3. it is the earliest attempt in recognizing the importance of an entrance at a park it serves as the transition from the rest of the country into "a special place."
4. for nearly 90 years it has served as a symbol of Yellowstone National Park.

Under Criterion C, the arch is important for its design. Long before there was a National Park Service directive for compatible design, Chittenden designed this arch to be compatible with the well-known architect, Robert Reamer's design of the train station at Gardiner, Montana and its surroundings. In addition, the actual design of the arch is significant. The use of the columnar basalt to achieve a certain effect is significant. Despite maintenance and some restoration, the arch maintains a high degree of integrity.

STATE SIGNIFICANCE

The Engineer's Office and the Chittenden House are significant at the State Level under Criterion A, Criterion B and Criterion C.

Under Criterion A, the two buildings are and were significant buildings associated with the U.S. Army Corps of Engineers association with the development of the road system in Yellowstone National Park. These were the most permanent buildings and the only ones that required design. The others, which have all been demolished, were typical, functional buildings, similar in style to those found in the park and other parks, such as Glacier National Park.

The interior of the Chittenden House has lost its integrity, but the first floor of the Chittenden House retains much of its integrity. Specific details will be found on the individual nomination form.

The buildings at Fort Yellowstone that the Army Corps of Engineers used after the Cavalry's withdrawal in 1916, are not significant under this context. While the engineers used them for two years, their importance is drawn from their association with the Cavalry's administration of Yellowstone National Park.

LOCAL SIGNIFICANCE

The road camp buildings and the road camp sites were evaluated for local significance under Criterion A, Criterion C, and Criterion D.

Under Criterion A, the existing remanents are isolated, or they have been relocated without their component structures thus losing the feeling of setting and association. They fail to represent a road camp. Their integration into another functional complex such as housing diminishes their significance as examples of "road camp."

Under Criterion C, the individual buildings have lost their design integrity by the modification of the building to meet new functional requirements. The buildings do not qualify for the Criteria Consideration B.

In 1988, the Bacon Rind Dorm from the old Bacon Rind Road Camp on the Gallatin Highway was determined not eligible by the Montana Historic Preservation Office. The dorm has been altered and moved to the West Entrance of Yellowstone National Park.

The only resources that might have applied under Criterion D are the road camp sites, sites of old entrance stations, or miscellaneous buildings constructed at Mammoth Hot Springs. It is doubtful that significant information could be yielded from the entrances, stations, sites, road camp sites, or the miscellaneous buildings that could not be discerned from historic photographs, documentation, or historic site plans. In the case of the miscellaneous buildings at Mammoth

Hot Springs, the site of the engineers old buildings have been reused for building sites for other functions. Photographs of the buildings can be found in the Historic Context.

As part of the Historic Context, an effort was made to include information about the crews who built the roads, their camps, the equipment, their employment, and other details. This information can be found in different places in the Historic Context. Sometimes it is included within the text and/or endnotes, or it could be visual in a photograph. The road camps within Yellowstone National Park are probably no different than the hundreds of road camps used for the construction of state roads. If road camps sites are thought to be significant, ones outside Yellowstone National Park would probably retain more integrity than those within the boundary as one of the usual contract stipulations was that the camp be returned to as near natural condition as possible. An effort would have been made to obliterate the site and revegetate. The dumps that may have had an association with the road camps should not be considered as eligible also. One such dump was examined by archeologists during the summer of 1990. Their conclusion was "It is unlikely that any additional mitigation of this site would contribute to the history of the Park. Therefore, no further work is recommended."

Several of the contractors who built the roads have records, photographs, movie film, and other details which could be of interest to any one interested in road camps. Among the contractors who have maintained their records are Lowerdmilk and Sons of Denver, Colorado and Morrison-Knudsen of Boise, Idaho. The sites of the crews from the earlier period were housed in tents and the camps would have been of a very temporary nature. It would be difficult to differentiate those camp sites from any other camp sites of visitors, etc.

REGISTRATION REQUIREMENTS

The Registration Requirements for the Property Type--Buildings and structures associated with the construction of the road system in Yellowstone National Park will address the resources as included in an Historic District, such as the Entrance Station and the North Entrance Arch or as individual buildings such as the Engineer's Office, the Chittenden House, and the road camp buildings or sites.

Under Criterion A, the following Registration Requirements are listed:

1. the entrance structure and entrance stations must have integrity of Setting and Location
2. the Engineer's Office and the Chittenden House must have integrity of Location. These two buildings will be nominated individually at this time, however, they will be placed within the Fort Yellowstone Historic District at a later date. The other buildings within the proposed Fort Yellowstone Historic District are associated with the Calvary and the management of the Park. The Calvary buildings that the Army Corps Engineers used after 1916, will be part of the Fort Yellowstone Historic District for their association with the management of the Park, but mention will be made of the engineers

use. The Setting is not as important for the individual listing of the buildings as buildings are to be listed for their association with the road construction and their setting within Fort Yellowstone has changed considerably prior to and after their construction.

3. the road camp must have integrity of Setting and Location. The planned road camps of the 1920s and 1930s had standardized designs and prescribed functional buildings or structures, such as a messhouse, bunkhouse, and stable. All three buildings should be present to be eligible.

4. the road camps must have integrity of Feeling and evoke a sense of "road camp"

Under Criterion C, the following Registration Requirements are listed:

1. The interiors of the Engineer's Office and the Chittenden House must possess significant design integrity to reflect the historic function; the floor plans, materials and workmanship must have sufficient integrity to reflect the feeling of the historic period. The exterior of the buildings must possess significant integrity of design, workmanship and materials to evoke their period of construction.

2. The entrance building and arch must possess significant integrity of design, workmanship and materials to evoke their period of construction.

3. If an individual road camp building is found to be within another use area and it retains the highest level of integrity of location, design, workmanship, and materials to evoke it as a good example of a road camp building, it could be eligible. It is important that the building not have extensive modifications. In order for the building's interior to be eligible, it must possess significant design integrity to reflect the historic function; the floor plans, materials and workmanship must have sufficient integrity to reflect the feeling of historic period.

Criterion D does not apply to these resources. See the Significance Statement.

B. LIST OF PROPERTIES ELIGIBLE FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES

1. Grand Loop Historic District
   - a. Seven Mile Bridge
   - b Obsidian Creek Bridge
   - c. Gibbon River Bridge (4.9 miles from Norris Junction)
   - d. Gibbon River Bridge (6.1 miles from Norris Junction)
   - e. Nez Perce Creek Bridge
   - f. Firehole River Bridge near Morning Glory Pool
   - g. Army Bridge at end of Fountain Freight Road
   - h. Isa Lake Bridge
   - i. Otter Creek Bridge
   - j. Tower Creek Bridge
   - k. Lava Creek Bridge
   - l. Gardner River Bridge
   - m. road

2. North Entrance Road Historic District
   - a. North Entrance Arch
   - b. road

3. Northeast Entrance Road Historic District
   - a. Lamar River Bridge
   - b. FHWA Creek Bridge
   - c. RWC Creek Bridge
   - d. Pebble Creek Bridge
   - e. Soda Butte Creek Bridge (6.4 miles from entrance)
   - f. Soda Butte Creek Bridge (3.3 miles from entrance)
   - g. TLF Creek Bridge
   - h. Northeast Entrance Station National Historic Landmark
   - i. road

4. East Entrance Road Historic District
   - a. Fishing Bridge
   - b. Sedge Creek Bridge
   - c. Pelican Creek Bridge
   - d. Cub Creek Bridge
   - e. road

5. South Entrance Road Historic District
   - a. Crawfish Creek Bridge
   - b. road

6. West Entrance Road Historic District
    a. road
7. Chittenden House (Mammoth Hot Springs)
8. Engineers Office (Mammoth Hot Springs)
9. Baronett Bridge Site
10. Bunsen Peak Road
11. Mammoth to Gardiner Road (old road)
12. Mount Washburn Road
13. Blacktail Deer Plateau Road
14. Fountain Freight Road

C. LIST OF PROPERTIES NOT RECOMMENDED FOR LISTING ON THE NATIONAL REGISTER OF HISTORIC PLACES

1. all bridges built after the historic period
2. the Gallatin Highway
3. Road Camp sites
4. the Golden Gate Viaduct as a structure

PART THREE

MANAGEMENT ISSUES

MANAGEMENT ISSUES

I. Research Needs/Ideas

A. The survey and evaluation of the following roads need to be completed following the completion of the remaining volumes of the Historic Resource Study for the Park:

1. Mesa Road
2. Old Mary Mountain Road
3. Maryville Road
4. Slough Creek Ranch Road
5. Road into Reese Creek area
6. all service roads and roads in developed areas
7. campground roads
8. utility roads
9. side roads into interpretive areas

B. The Corkscrew Bridge Site needs to be surveyed and evaluated.

C. A study of the relationship between the construction of the road system and the development of the wayside interpretive exhibits.

D. A study of the impact the creation of the park on the development of the national road system.

II. Treatment of Contributing Resources

Memorandum of Agreement - Yellowstone National Park, and the State Historic Preservation Offices of Wyoming and Montana.

PROGRAMMATIC AGREEMENT
AMONG
NATIONAL PARK SERVICE,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
WYOMING STATE HISTORIC PRESERVATION OFFICER,
MONTANA STATE HISTORIC PRESERVATION OFFICER,
FOR PRINCIPAL PARK ROAD SYSTEM IMPROVEMENT,
YELLOWSTONE NATIONAL PARK

WHEREAS, the National Park Service (NPS) has determined that proposed improvements to the principal park road system at Yellowstone National Park (Yellowstone NP) may affect properties included in or eligible for inclusion in the National Register of Historic Places; and has requested the comments of the Advisory Council on Historic Preservation (Council) pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470 [f]), and its implementing regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800); and,

WHEREAS, this AGREEMENT seeks to provide the mechanism to complete any and all requirements of Section 106 of the National Historic Preservation Act of 1966 and its implementing regulations, 36 CFR Part 800, with regard to work related to any specific route on the principal park road system at Yellowstone NP; and,

WHEREAS, the NPS, through the Rocky Mountain Regional Office, has delegated responsibility for complying with Section 106 of the National Historic Preservation Act and the Council's implementing regulations, 36 CFR Part 800, to Yellowstone NP; and

WHEREAS, this AGREEMENT seeks to strengthen and foster the partnership among the NPS, Wyoming State Historic Preservation Office (WYSHPO), Montana State Historic Preservation Office (MTSHPO), and the Council in execution of all organizations' responsibilities under Section 110 and Section 106 of the National Historic Preservation Act of 1966, amended; and,

NOW, THEREFORE, the NPS, WYSHPO, MTSHPO, and the Council agree that the work undertaken on Yellowstone principal road system, including material obtained from sources outside of Yellowstone NP, shall be administered in accordance with the following stipulations in order to satisfy the NPS's Section 106 responsibilities for work related to each specific route on Yellowstone NP principal road system.

STIPULATIONS:

I. Applicability

This AGREEMENT outlines procedures that will substitute for the Section 106 review process outlined in the 1990 Nationwide Programmatic Agreement and Council's regulations in 36 CFR Part 800 for all work completed for road improvement, reconstruction, and road material acquisition on the principal park road system. The work will be identified in the Parkwide Road Improvement Plan, Environmental Assessment (Finding of No Significant Impact signed June 10, 1992) and any subsequent route specific Environmental Assessments (EAs) that are developed out of the Parkwide Road Improvement Plan, EA.

As identified in the Parkwide Road Improvement Plan, Yellowstone NP will ensure that consultation with appropriate SHPOs, Council, Native American tribes, and other interested persons is completed on all identification, evaluation, and mitigation efforts for each specific route prior to any work being initiated on that route.

II. Consultation with Native American Tribes

Yellowstone NP will consult with appropriate tribe(s) and Native American individuals regarding identification, effects, and treatment of cultural resources that may be affected by this undertaking. The consultations will be in accordance with 36 CFR Part 800.1(c)(2)(iii), National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties, and the Council's Public Participation in Section 106 Review: A Guide for Agency Officials. Consultation will include, but not be limited to, the following tribes:

Crow
Arapahoe and Shoshone at Fort Washakie
Confederated Salish and Kootenai Tribes
Blackfeet
Nez Perce
Shoshone and Bannock Tribes at Fort Hall Indian Reservation

III. Identification and Evaluation Standards

Yellowstone NP will ensure that historic properties, which may be affected, are identified and evaluated in a manner consistent with National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation, National Register Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties, Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines, applicable SHPO guidance, and the following procedures:

A. Locating Historic Properties

Yellowstone NP will determine the level and type of investigation needed to identify historic properties in accordance with the Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines and appropriate State Historic Preservation Office guidelines.

B. Historic Properties--Evaluation Strategy

1. Historic Structures and Features. The National Register of Historic Places Multiple Property Documentation Form which is currently being prepared for historic features and structures associated with the Yellowstone road system will serve as an historic context for historic-era road-related properties that may be affected.

2. Traditional Cultural Properties. Native American individuals and tribes, as identified in Stipulation II above, will be consulted regarding potential traditional cultural properties (TCP). Any potential TCPs identified in the Area of Potential Effects (APE) will be evaluated for National Register eligibility. Yellowstone NP will seek to evaluate TCPs through the development of ethnographic or ethnohistoric contexts, when funding becomes available to complete this evaluation.

C. Evaluating Historic Significance

Yellowstone NP shall ensure that potential historic properties which may be affected by any phase of the work are evaluated in accordance with 36 CFR Part 800.4 (c), to determine their eligibility for inclusion on the National Register of Historic Places. The evaluation will be consistent with the Secretary of the Interior's Standards and Guidelines for Evaluation (48 Federal Register 190: 44738), 36 CFR 63, and the following stipulations:

When requesting the SHPOs comments on a route specific EA, Yellowstone NP shall provide the SHPO with sufficient information in order to review Yellowstone NP's recommendations on the eligibility of the properties, including the Wyoming or Montana state site form, as appropriate and the Rocky Mountain Region Site Status Evaluation Form, used for prehistoric or historic archeological sites.

Isolated finds, defined as a single artifact, will not be considered eligible for inclusion on the National Register of Historic Places. Descriptive information regarding isolated finds will be included in a report format acceptable to the appropriate SHPO.

IV. Mitigation and Documentation Standards

Yellowstone NP will apply the Criteria of Effect and Adverse Effect in 36 CFR

Part 800.9 to properties identified in the APE. Whenever possible, Yellowstone NP will avoid adverse effects to historic properties that are identified in the APE through project redesign or implementation of protective measures. However, if avoidance is not possible, Yellowstone NP will minimize or mitigate effects. The specific means of avoidance, minimization or mitigation of effects will be identified in the route specific EAs, subject to review by the appropriate SHPO and the Council as provided in Stipulation VI. Whenever possible, the following standards will be followed for this undertaking:

A. If historic structures determined to be contributing resources to the overall eligibility of the road are to be demolished and the appropriate SHPO and the Council agree that there is no other feasible alternative, Yellowstone NP will complete documentation according to the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Representative features, including headwalls and culverts, will also be documented according to the HABS/HAER standards.

B. Contributing historic structures that will be affected, but not demolished by the undertaking will be treated in accordance with the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitation of Historic Buildings.

C. The stone headwalls that retain physical integrity and are visible from the road, other visitor use areas, or that are determined to be architecturally significant will be documented, dismantled, and later reassembled over the new culvert pipes. The other headwalls will be documented, dismantled, and the stone salvaged for rehabilitation of other stone structures in the park. The specifics of this activity will be discussed in the route-specific EAs.

D. The final choice of guardrailing will be based on meeting federal safety standards and historical compatibility of railing material.

E. New turnouts as well as turnouts proposed for rehabilitation will be designed and rebuilt to retain scale with the natural and historic setting. Use of native materials such as log, wood, and stone will maintain continuity and historic character. The addition of safety islands will be an addition of non-historic design features but will be constructed of comparable materials to blend with the historic landscape.

V. Treatment of Archaeological Properties

Yellowstone NP will ensure that a comprehensive Treatment Plan is developed for the mitigation of anticipated effects to archaeological properties resulting from improvements to the principle road system. Yellowstone NP will also ensure the development of location and property specific Data Recovery Plans (DRPs) for each individual phase or segment of the project. DRPs will be considered as supplements to the Treatment Plan. The appropriate SHPO and the Council will be afforded an opportunity to review and comment on the Treatment Plan and all subsequent DRPs in accordance with Stipulation VI.

A. Treatment Plan. The Treatment Plan shall be prepared in accordance with the guidance found in the Council's Treatment of Archeological Properties: A Handbook, and Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (Secretary's Standards).
The Treatment Plan shall specify, at a minimum:

(1) A brief description of the cultural areas with which Yellowstone NP is associated, and a discussion of previous research and existing information on archeological properties within Yellowstone NP;

(2) A Research Design that will contain the research questions and goals that are applicable to the project Area as a whole and that will be addressed through data recovery, along with an explanation of their relevance and importance;

(3) Fieldwork and analytical methods and strategies applicable to the Project area as a whole, along with an explanaton of their relevance to the research questions. Such treatment methods will be developed for each class of archaeological property identified to date in the project area;

(4) Proposed procedures for dealing with discovery situations;

(5) Provisions for the curation and disposition of all recovered cultural materials, samples, and records.

(6) Proposed contents of a comprehensive synthesis and final report concerning mitigation activities, meeting the guidelines provided in the Secretary's Standards, providing for it's submission to the SHPOs for review within two (2) years after completion of all fieldwork conducted under the terms of this agreement.

B. Data Recovery Plans

Each phase or segment specific DRP shall represent a dependent plan and document supplement to the Treatment Plan, providing specific direction for the conduct of data recovery associated with any given route specific EA. DRPs shall conform to the general requirements of the Treatment Plan, and shall incorporate information from the Plan. The DRPs shall specify, at a minimum:

(1) The historic properties to be affected and the nature of the effects;

(2) The research questions identified in the Treatment Plan that will be appropriate for the specific project segment and that will be addressed through data recovery, along with any additional research questions compatible with the Treatment Plan and an explanation of their relevance to the overall research goals as established in the

Treatment Plan;

(3) The specific fieldwork and analytical strategies identified in the Treatment Plan, as well as any other strategies that will be employed in the specified project segment; and

(4) A schedule for the submission to the appropriate SHPO(s) of a final report of work completed for the specified project segment.

The Annual Report required in Stipulation XIII will contain a progress report on data recovery activities carried out during the reporting period, including the status of fieldwork, analysis, and final report preparation.

VI. SHPO/Council Consultation

Reviews completed by the SHPOs and the Council of identification efforts, eligibility, and effects to historic properties resulting from actions related to this undertaking shall be phased. Route-specific EAs and supporting documentation will contain sufficient information for review of Yellowstone NP's identification efforts, and determinations of eligibility and effect for each route and will contain proposals for treatment or mitigation of adverse effects.

The route specific EAs will be submitted to the SHPO or SHPOs with jurisdiction and the Council with a cover letter requesting comments under the terms of this AGREEMENT. Review of the route specific EAs will constitute SHPOs and Council's opportunity to comment on all work proposed for specific routes. Where the proposed treatment calls for archaeological data recovery Yellowstone NP may submit the research design/data recovery plan as a separate document.

Unless otherwise specified in this agreement, the SHPO and Council shall be afforded 30 calendar days from receipt of appropriate documents to any Yellowstone NP communication regarding identification, evaluation, eligibility, effect determination, or treatment of effects. These reviews may be carried out concurrently. Should SHPO or Council not respond within this time limit, Yellowstone NP may assume SHPO or Council concurrence and can proceed with Yellowstone NP's proposed course of action. Yellowstone NP will document non-response by the SHPOs or Council in the case file.

VII. Avoidance

If direct or indirect effects on historic properties within the APE are identified subsequent to the review of the EA, but prior to implementation of the proposed work, Yellowstone NP will seek to avoid effects to those properties through project redesign or implementation of protective measures. Yellowstone NP will notify the appropriate SHPO of proposed avoidance measures. Documentation submitted to the SHPO shall include Wyoming and Montana site forms. Depending on the scope and magnitude of the project, a suitable reporting format will be used. If, within 15 days of receipt of documentation, SHPO concurs with the adequacy of avoidance measures, the project may proceed without further consultation. If Yellowstone NP determines avoidance is not possible or if, within 15 days of receipt of documentation, the SHPO objects to the adequacy of avoidance measure, consultation shall proceed in accordance with 36 CFR Part 800.4-6.

VIII. Dispute Resolution

A. Should any party to this AGREEMENT object within (30) days, or within other time frames provided in this AGREEMENT after receipt of any plans, specifications, contracts, or other documents provided for review pursuant to this AGREEMENT, or to the manner in which this AGREEMENT is being implemented, Yellowstone NP shall consult with the objecting party to resolve the objection. If Yellowstone NP determines that the objection cannot be resolved, Yellowstone NP shall forward all documentation relevant to the dispute to the Council. Within thirty (30) days after receipt of all pertinent documentation, the Council will either:

(1) provide Yellowstone NP with recommendations, which Yellowstone NP will take into account in reaching a final decision regarding the dispute;

(2) notify Yellowstone NP that it will comment pursuant to 36 CFR Part 800.6(b) and proceed to comment. Any Council comment provided in response to such a request will be taken into account by Yellowstone NP in accordance with 36 CFR Part 800.6(c)(2) with reference to the subject of the dispute.

Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute; Yellowstone NP's responsibility to carry out all actions under this AGREEMENT that are not the subjects of the dispute will remain unchanged.

B. At any time during the implementation of the measures stipulated in this AGREEMENT, should an objection be raised by a member of the public, Yellowstone NP shall take into account and consult as needed with the objecting party, the SHPO, and the Council to resolve the objection.

IX. Discovery Situations

Should Yellowstone NP find previously unidentified historic properties during the course of an undertaking, the procedures stipulated in 36 CFR Part 800.11 will be followed.

X. Human Remains

If human remains are encountered on federal lands Yellowstone NP will consult with Native Americans, or other appropriate groups, to determine treatment and disposition measures consistent with applicable federal laws (such as the Native American Graves Protection and Repatriation Act [25 U.S.C. 3002]). If human remains are encountered on state or private lands, Yellowstone NP will ensure that they are treated according to appropriate state laws.

XI. Public Participation

Yellowstone NP will undertake public participation pursuant to 36 CFR Part 800.1(c)(2)(iv) as well as the National Park Service's Management Policies, NPS-12, National Environmental Policy Act Guidelines and NPS-2, National Park Service Planning Guidelines.

XII. Monitoring

The Council, the WYSHPO, and MTSHPO may monitor activities carried out pursuant to this AGREEMENT, and the Council will review such activities if so requested. Yellowstone NP will cooperate with the Council and the SHPOs in carrying out their monitoring and review responsibilities.

XIII. Annual Report and Review

A. Annual Report

On or before December 30 of each year, Yellowstone NP shall prepare and provide to the appropriate SHPO and the Council an annual report addressing but not limited to the following topics in relation to the principal park road system:

1. Description of work completed under this AGREEMENT, including the progress report required under Stipulation V.

2. Number of historic properties listed on or determined eligible for the National Register of Historic Places.

3. Number of historic properties determined ineligible for listing on the National Register of Historic Places.

4. Number of historic properties for which the Criteria of Effect was applied.

5. Copies of correspondence initiating consultation with Native American tribes or other interested parties.

6. Actions taken to implement the terms of this AGREEMENT.

7. Recommendations for implementation during the coming year, including any

suggestions to amend the AGREEMENT.

B. Annual Review

The SHPO and Council will review the annual report and provide comments to Yellowstone NP. At the request of any party to this AGREEMENT, a meeting or meetings will be held to facilitate review and comment, to resolve questions, or to resolve comments that are adverse.

XIV. Amendments

Any party to this AGREEMENT may request that it be amended, whereupon the parties will consult in accordance with 36 CFR Part 800.13 to consider such amendment.

XV. Termination

Any party to this AGREEMENT may terminate it by providing thirty (30) days notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, Yellowstone NP will comply with 36 CFR Part 800.4 through 800.6 with regard to individual undertakings covered by this AGREEMENT.

XVI. Failure to Implement AGREEMENT Terms

In the event that Yellowstone NP does not carry out the terms of this AGREEMENT, Yellowstone NP will comply with 36 CFR Part 800.4 through 800.6 with regard to individual undertakings covered by this AGREEMENT.

Execution and implementation of this AGREEMENT evidences that the National Park Service has satisfied its Section 106 responsibilities for all work related to each specific route of the park roads, Yellowstone National Park.

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: Robert D. Bush Date 1/22/93

NATIONAL PARK SERVICE, ROCKY MOUNTAIN REGION

BY: Homer L. Rouse Date 10-27-92

YELLOWSTONE NATIONAL PARK

BY: Robert Barbee Date 12/15/92

WYOMING STATE HISTORIC PRESERVATION OFFICER

BY: John T. Keck Date 12/23/92

MONTANA STATE HISTORIC PRESERVATION OFFICER

BY: Marcella Sherfy Date 1-14-93

☆ U.S. GOVERNMENT PRINTING OFFICE: 1994 - 777-515 / M5882 REGION NO. 8

PART FOUR

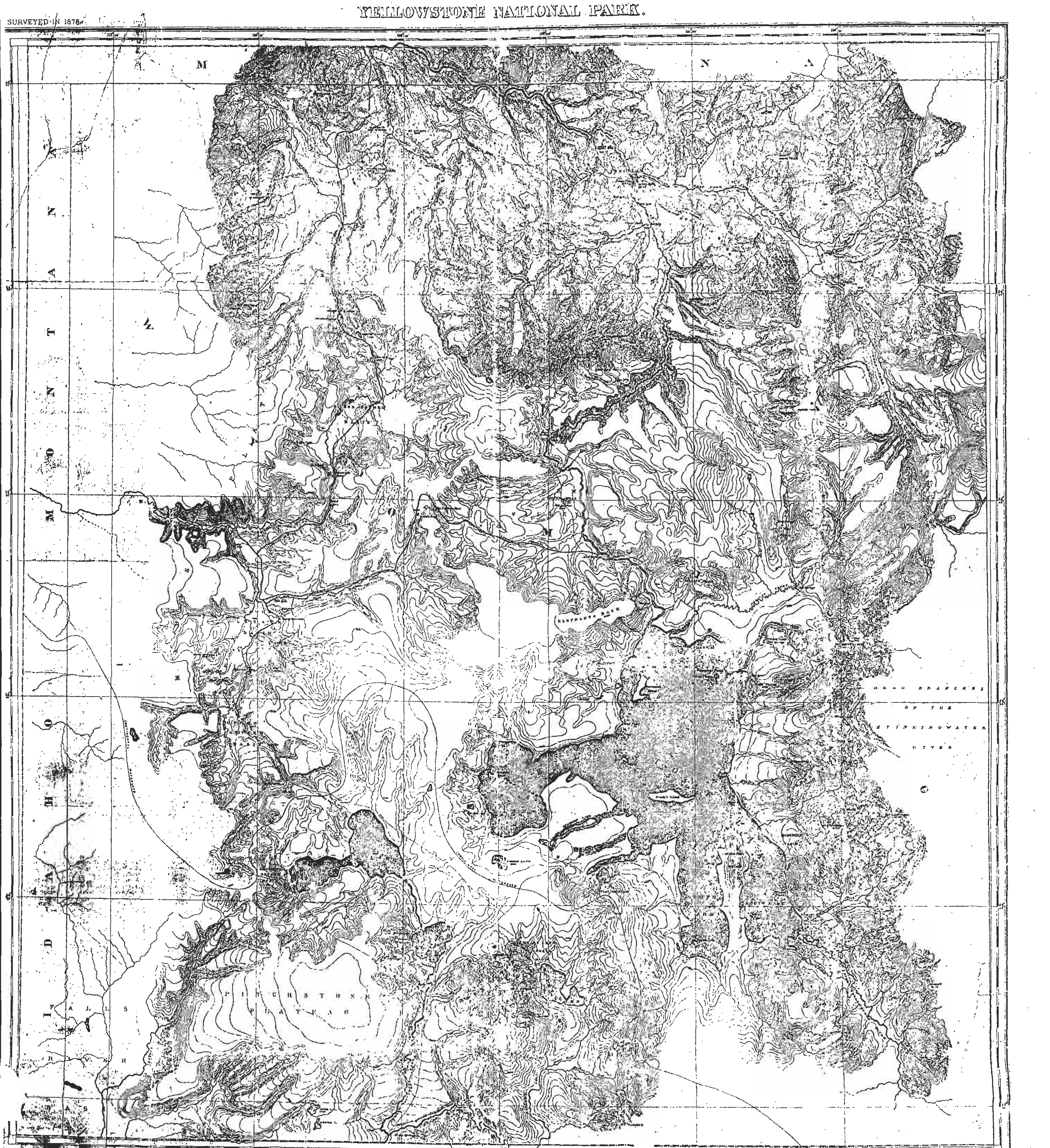
1878 MAP

and

HISTORIC BASE MAP

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F. V. HAYDEN, U.S. GEOLOGIST IN CHARGE

YELLOWSTONE NATIONAL PARK.



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HISTORIC BASE MAP

YELLOWSTONE NATIONAL PARK

WYOMING-MONTANA-IDAHO

YELLOWSTONE NATIONAL PARK, WYO.-MONT.-IDAHO