BY MOTOR THROUGH WONDERLAND:

HISTORIC ROADS
IN THE
NATIONAL PARK SYSTEM

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# TABLE OF CONTENTS

PREFACE........................................................................................................... 2

INTRODUCTION.................................................................................................... 6

PART I: HISTORY

   CHAPTER 1: EARLY ROADS--EXPERIMENTS AND SUCCESSES....................... 14
   CHAPTER 2: THE DEVELOPMENT OF PARK ROADS......................................... 33
   CHAPTER 3: TEAM WORK/COOPERATIVE EFFORTS........................................ 66
   CHAPTER 4: THE EVOLUTION OF PARKWAYS................................................ 104
   CHAPTER 5: INDIVIDUAL ROADS................................................................... 111
   CHAPTER 6: WORLD WAR II AND BEYOND................................................... 139

PART II: UNDERSTANDING AND MANAGING HISTORIC PARK ROADS--THE CHECKLIST.......................................................... 152

APPENDIX A: CHRONOLOGY.............................................................................. 185
APPENDIX B: HISTORIC REGULATIONS FOR PARK ROADS.............................. 199
APPENDIX C: INTERBUREAU AGREEMENT..................................................... 205
APPENDIX D: STANDARD ARCHITECTURAL DETAILS--HEADWALLS FOR CULVERTS.............................................................. 216
APPENDIX E: STONE AND LOG GUARDRAIL TYPES........................................ 220
APPENDIX F: PRELIMINARY STUDY FOR WARPING CUTS AND FILL SLOPES.................................................................................... 224
APPENDIX G: SLOPE FLATTENING AND SLOPE Rounding DETAILS.................. 227
APPENDIX H: PRELIMINARY STUDIES FOR ROAD DESIGN............................ 232
APPENDIX I: 1941 UPDATES, NP-PG-2015..................................................... 253

BIBLIOGRAPHY...................................................................................................... 257
I knew parks were different when I was a child on those long road trips. My father was a career military officer, and for most of my youth we were stationed on the east coast. On weekends and those not-frequent-enough vacations he and my mother loaded up all five of us rowdy children into the 1955 air force blue Chevy station wagon and whisked us off to Mannassas, Shenandoah, Blue Ridge, Great Smoky Mountains, Harpers Ferry, Antietam, and many other national park areas. Even then I could perceive something different, something special about national parks. The scenery changed even though it was just a couple of miles down the road from the "outside." The air was cleaner and the mountains were wilder and the water was crystal clear. The views were like no other place on earth. I was on top of the world. I pretended I was an early settler forging my way through the Smokies, I saw Virginia through the eyes of Thomas Jefferson, I imagined I was a young rebel soldier looking down from my crow’s nest in the mountains to troop movements in the Shenandoah Valley. From those days we have photographs that documented our travels--with all of us kids sitting on a stone retaining wall at an overlook in
Shenandaoh, or lined up along a split-rail fence in the Blue Ridge, or looking down on the Potomac River from the hills above Harpers Ferry. In each one of those photographs I might not be able to pick out the overlook where the photograph was taken, but I invariably know the park.

The scenic qualities of those areas I visited are indelible in my memory, as they are in the memories of millions of other people who have come to the national parks seeking solitude, recreation, and a sense of America. Much of the quality of the entire park experience is due to the thought that went into designing for and with the landscape. The park road is an integral part of that experience.

Park design includes numerous subtle and sometimes subconscious cues to the visitor. These features contribute to the sense of place of a national park. The park sign with the brown arrowhead and the rustic entrance station of log and stone begin the process. The comfort stations and the visitor centers often continue along with the same architectural theme. But the thread holding all of it together is the road. This is the main artery of the park. It brings the lifeblood of visitors (for without them we would have no parks); it provides the access; it controls the access. When executed properly the road reinforces the design theme and serves as a constant reminder to us that we are in a national park. The road takes us to some of the park’s prime resources, and gives us a feeling for the territory that the park encompasses. The road
also carries us to the trailhead, the campground, the restaurant, or the motel where our bed is for the night. And finally the road leads us out of the park, and out of that special place that is part of our American heritage and a prime contributor to our national sense of self.

Park roads are more than examples of the subtle art of landscape architecture or accomplished feats of engineering. Through them we can extrapolate information about ourselves—what we have valued in our national parks, and what some of our priorities have been as a nation. Through them we can see national park history and how our views of resource management, and even our perceptions of exactly what constitutes a resource, have evolved. Humble park roads, then, are more than just methods of access into national parks. The ways in which we built them, the features they possess, and the ways we choose to alter them are indicative of the values of our society.
INTRODUCTION
INTRODUCTION

During the late 'teens and 'twenties the park service pushed for appropriations for the construction of park roads and finally got them, urged the development of access roads to national parks, and supported the road network known as the National Park-to-Park Highway. When Robert B. Marshall was detailed temporarily from his position as head of the U.S. Geological Survey to the job of general superintendent of the national parks in 1916, he wrote of three functions of national parks: stimulating national patriotism; furthering knowledge and health; and diverting tourist travel to scenic areas of the United States.¹ Later annual reports of the director of the national park service and other documents for that time period showed clear motivation. Although many of the documents stressed the scenic and inspirational qualities of national parks, a recurrent theme throughout the literature involved increasing the economic strength of the nation through tourism, and thereby provide a practical justification for parks. Providing automobile access to national parks was the answer.

At the same time that these efforts were underway, the number of automobiles in the United States was increasing dramatically--from

8,000 in 1900 to 23 million in 1930. This prompted a major change in how parks operated. Initially the railroads made most of their money from the sale of passenger tickets, and made very little if any from concessions operations they might have had within park boundaries. In other words, their greatest profits came from outside the parks. Following the increase in autotourism, as environmental historian Alfred Runte pointed out, the profit-taking from park visitors shifted from outside the boundaries to inside the boundaries.

So the park service built roads, and the states built access and connecting roads. The only problem was that the service built them so well that sometimes the driving experience of a park road became a destination in itself. It evolved into one of the things you did when you went to a park. Few visitors went to Sequoia/Kings Canyon by automobile without driving the General's Highway, or to Glacier without driving over Going-to-the-Sun, or to Rocky Mountain National Park without driving Trail Ridge Road. In other instances specific features on the park road became signatures of the park experience. The carved entrance sign of the profile of the Native American leader Sequoyah along the road at the entrance to that park was one of those identifiable brands. In other cases specific landscapes or specific vistas of those landscapes developed into indelible images that were part of the collective scenic and

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2 Foresta, America's National Parks and Their Keepers, 27.

cultural heritage of the nation. The view of the Snake River from the Snake River Overlook at Grand Teton National Park was one of these.

Driving park roads became an integral part of the park experience for a reason: we designed them too well. The agency's thinking paralleled that of park service architect Herbert Maier. When he designed the museum at Yosemite, Maier wrote that he perceived development in national parks as a necessary evil; but, he argued, since the development was a fact of life, it should be well-designed and harmonize with the natural environment. That philosophy was the basis for the identifiable rustic design so prevalent during the 1920s and 1930s. A problem arose, however, when the rustic aesthetic enhanced the visitor experience so much that more and more visitors came pouring in. The roads made access not only easy but also something else to write home about in the way they introduced the wonders of nature to the American public.

As the visitors kept coming, roads fell into disrepair. Sometimes the problem was lack of adequate funding for maintenance. Other times the rugged terrain refused to accommodate a road. Some roads needed widening to accept larger vehicles. Highway safety standards improved tremendously, and most park roads did not meet those requirements for a variety of reasons. When the first official Park Road Standards was printed in 1968, the authors noted that park roads were different than other highways, and because of their locations in often fragile ecosystems they should be kept to
a minimum and treated with the utmost care. The Standards also commented on the subtle aesthetics of park roads.

As the need for work on park roads increased, funding was appropriated and money spent on construction. Controversy often arose on roads projects when issues concerning alterations for the sake of highway safety butted heads with preservation of scenic and historical values. In addition, a lack of consistency in dealing with road projects appeared between Federal Highways and National Park Service offices. Part of the problem was the lack of understanding about what features constitute an historic road, why those features are significant, and how they should be managed.

This study looks at the general development of park roads nationwide. The second section of this report includes information on the significant features that make up historic roads. In the appendices are examples of some of those features as they developed into accepted design standards during the 1920s through 1941. Mentioned throughout the document are some of the sustainable practices that were used in road development.

Landscape architect Charles Birnbaum summarized five essential points for dealing with historic landscapes, of which historic park roads are an essential element. These were: establishing a historical context; adopting a comprehensive preservation planning process; acknowledging that rehabilitation will probably be the most practical treatment; networking with allied professionals;
understanding the dynamic qualities of landscapes. The construction and rehabilitation of historic park roads goes beyond matters of cultural resource management, and even beyond safety, and aesthetics. The impact of roads is greater than that. Roads will continue to bring visitors to national parks. Perhaps it is time again to re-think appropriate use of those roads.

Facing our national parks today are a number of issues that may threaten the very existence of the parks and the resources within their boundaries. In addition to looking at national parks for the scenic, inspirational, and historical qualities, we now must consider the global impact of every thing we do to the fragile, limited natural resources of the earth, including the relatively pristine ones within our artificial Park Service boundaries. The political reality is such that national parks have and always will accommodate visitors. Our agency and our parks were authorized through legislation, and it would be foolhardy of us not to believe that they can be de-authorized in the same way. In the future the importance of parks may lie in their environmental significance as recharge zones, and as teaching tools for increasing understanding of our earth. But the parks should also remain places for some types of recreation, as well as places for solitude. We must allow access, but how much and of what type are the questions that must be answered.

Aldo Leopold wrote in A Sand County Almanac:
It is the expansion of transport without a corresponding growth of perception that threatens us with qualitative bankruptcy of the recreational process. Recreational development is a job not of building roads into lovely country, but of building receptivity into the still unlovely human mind.⁴

The opinions expressed in this document are solely those of the author. Any errors, too, are the author’s.

PART I: HISTORY
Early Federal Involvement in Road Construction. Trundling down an early nineteenth-century country road in the United States sometimes proved hazardous to the hardy travelers who ventured forth on them. Sometimes these were just tracks through the wilderness. The Santa Fe Trail, for instance, connected towns, villages, trading posts and forts, and followed water sources from point-to-point in the high plains of the southwest. As the nation expanded west, the development of reliable transportation systems that included the arteries of roads, canals, and rivers became the foundation that expansion.

Federal involvement in the process of building roads for the nation was necessary, but the new country was still struggling its economy. In 1801 Secretary of the Treasury Albert Gallatin suggested that one-tenth of the net proceeds of public land sales be applies to road building, but only if the state through which the road passed gave its consent. Congress finally passed the proposal in 1803, and eventually each state passed its own legislation. Ohio was the first, with three-fifths of the money from its public land sales earmarked for roads to and through
In 1807, the United States Senate requested Albert Gallatin to do an inventory of transportation resources and to make recommendations for improvement. His study, which was released the following year, looked at some of the most successful transportation systems of Europe. Gallatin investigated the most productive facilities of Europe, and he concluded that large, integrated transportation networks were the underpinnings of that success. Good roads connected to shipping ports, for instance, quickly brought meat and produce from farms to market. These arteries kept the heart of a country’s economy pumping.

At the time that Gallatin’s report was released, the Cumberland Road was under construction. This road was an attempt to put into practice the same principles. Begun in 1806, the purpose of the road was to connect the navigation headwater of the Potomac River in Cumberland, Maryland, to the Ohio River. The legislation for the road included road standards, and the financing for its construction came from sales of public land in Ohio. The first section of the road opened in 1813, but the road planners had not taken into account the heavy use the road was receiving. So many wagons loaded with freight trundled down the road that available funding could not cover the high costs of maintenance.

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1 *American Highways*, 17.

As the years passed, maintenance costs increased so much that in 1822 congress pushed for the Cumberland Road to become a toll road. The toll monies were to be allotted for maintenance. President James Monroe, however, jumped into the act and vetoed the bill. He reasoned that the collection of tolls implied that the federal government had jurisdiction over the roads. Federal jurisdiction was not permissible unless the states amended their constitutions. So, he argued, the federal government could provide funding for public improvements, but it had no jurisdiction or sovereignty over the land upon which the improvements were made. As a result of his veto, states eventually accepted the control and maintenance of the road.\(^3\) That set the precedent for the way in which roads built by the federal government were handled after construction.

Other transportation-related developments during the early nineteenth century included construction on the National Road and the Maysville Turnpike, land grants to states for wagon roads, and land subsidies for canals. Also in 1801, the federal government reached an agreement with the Choctaws and Chickasaws to construct a wagon road from the vicinity of Nashville to Natchez, Mississippi. The road, completed in 1803 and called the Natchez Trace, was planned as a military road to provide access to the port of New Orleans. The road was laid out over early Indian Trails.

Thus the country had started grappling with federal involvement in

road construction early on. The army, too, became active in road construction. Between 1807 and 1880 it constructed more than 100 other military wagon roads throughout the United States and its territories. That amounted to 21,000 miles of roads.\textsuperscript{4}

The Emergence of Road Design Ideas. During the middle of the nineteenth century a young horticulturist and writer on landscape architecture named Andrew Jackson Downing began producing volumes that dealt with naturalistic landscape gardening principles and design. Although most of his work concentrated on estates, he included as part of his work sections on road construction within parks. He stressed laying out roads following topography and the natural curves of the landscape. He emphasized planting copses of trees within the curves to make it appear as if the path of the road was laid out specifically to avoid those trees. Also he stressed bringing the road to precise points of interest to disclose particular vistas or natural features of interest.\textsuperscript{5}

Further expanding on the ideas of scenic road construction as a segment of overall park development was master landscape architect Frederick Law Olmsted, Sr. Olmsted expanded on Downing’s ideas and took them a few steps further. The concept of a loop drive, such as the one through Olmsted’s Central Park in New York emerged in the nineteenth century. This picturesque, designed landscape was

\textsuperscript{4}\textit{American Highways}, 24.

gently placed in the natural landscape in a way that revealed only a portion of what existed there. Olmsted, who also designed Franklin Park in Boston, spent considerable time with the design of roads in that park to blend them with the landscape. He wrote that he designed those roads not only to bring people to certain views, but also so that visitors could enjoy the simple rural scenery "while in easy movement, and thus by curves and grades avoiding unnecessary violence to nature."  

Another proponent of the importance of road design to the landscape of parks was Frank Waugh, a professor of landscape gardening at Massachusetts Agriculture College. In his book, The Natural Style in Landscape Gardening, Waugh recognized the importance of the kinetic aspects of the experience of passing over a road or trail. Waugh believed that at each vista the path should turn and rise upward to the next one. Waugh termed these "paragraphic" places, and he noted their importance in the entire process of experiencing a road or trail laid out to subtly direct the visitor to a specific vista or feature.

A Federal Roads Agency. The need for better, more dependable road systems increased in the late nineteenth century. The Agricultural Appropriation Act of 1893 set aside $10,000 for the secretary of

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7McClelland, Presenting Nature, 47.
agriculture to investigate road-building techniques and to assemble information on road construction so that it could be distributed to states and municipalities, federal agencies, and private citizens. The secretary established a temporary office known as the Office of Road Inquiry to fulfill that obligation. At the same time the department was forbidden from influencing any type of policy that might have a bearing on formulating road systems. Rather, the office was charged with disseminating information. The agency started by producing small bulletins on road construction. Also, in 1894, the new agency completed a "Good Roads National Map" that depicted all of the macadamized and gravel roads in the United States. The office sent copies of that map to each county, and asked the counties to update them. The new agency also started compiling general information on roads. A report for 1893, for instance, noted that farmers liked the permanent stone roads because of the increased weight of produce they could carry over them, and because of increased property values.

As the agency evolved, its name changed in 1899 to the "Office of Public Road Inquiry," (OPRI) and its duties expanded. The annual report for agency for 1901 included a summary of advance that had been made across the Atlantic. Martin Dodge, director of the agency, wrote that France had the best highways in the world in 1900, and that it had been testing road materials used in the

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8American Highways, 44, 47, 48.

construction of its national highways for 30 years. Dodge also wrote about the new testing laboratory in the U.S. Bureau of Chemistry where road materials were tested free of charge. When a sample was submitted to the bureau of chemistry it was subjected to an abrasion test "to determine its resistance to wear; a cementing test for determining its cementing or binding power; a toughness test; a hardness test. Also the material was assessed for density absorptiveness, nomenclature." Then the applicant who brought in the material was required to submit meteorological information about the location where the road material was to be used. Then, the bureau of chemistry analyzed all of that information and made recommendations about the appropriateness of the material or possible improvements to it. Dodge readily understood the benefits of learning from successful operations and studying the applications of different materials.\textsuperscript{10}

In 1900 the Office of Public Road Inquiries experimented with a variety of road materials from vitrified brick, to oiled roads, to steel roads. One of the big successes of the year was on the Queens Chapel Road in the District of Columbia. Besides rehabilitating the road, they coated a large section of it with residual oil or roadbed oil to settle dust and kill weeds--a system first recognized and used by the West Jersey and Seashore Railroad. At that time thirty other railroads throughout the United States were using the process, and most claimed that the crude oil made

\textsuperscript{10}Martin Dodge, "Report of the Office of Public Road Inquiries for 1901," USDA, Washington, GPO, 1901, 243-44. Correct the format in this footnote.
the road surface impervious to water, thus also free of frost and mud. The experiment was to settle the question about whether oil would supersede gravel and stone in the improvement of country roads. This experiment was typical of ones the bureau had underway.

By 1903 its budget of the Office of Public Road Inquiries increased so it could start doing more. At that time, the office had a construction team that travelled around the country building demonstration roads. They constructed approximately eight or nine road segments each year, varying between one-half to a mile and one-half long. In 1900 they had constructed an experimental brick road on the grounds of the Department of Agriculture in Washington, D.C. Also, the agency had experimented with oiling a 4,650-foot section of the Queens Chapel Road in Washington. The 1903 budget increase boosted the number of teams building demonstration roads around the country to four. While these demonstration roads were under construction, special agent and road expert E.G. Harrison of the office of road inquiry usually gave speeches about improvements in road design and often he had it printed up in the local newspaper. His intent was to increase awareness and support for road construction. In one of the articles Harrison wrote:


12American Highways, 67.
the U.S. is interested in the rural districts and wishes to help the farmers and others to get good roads. Therefore, the Department of Agriculture has established the Office of Road Inquiry which is seeking to gather all the information possible about the construction and maintenance of good roads and to impart it gratis to the people. The government will not be building your roads, but will place at your disposal all the information it has gained from experts, experiments and other sources. Here we have not even been building the best kind of macadam road. For that you must go to your cities and look at the boulevards. We have simply taken the material at hand and from it constructed the best road possible with the money we have. The boulders from which the stone is crushed were brought from the neighboring farms. They are of good quality and very hard. The consist of granite, trap, syenite, quartz, etc. This is much better than your soft limestone, or loose sandy, washed gravel.\textsuperscript{13}

He encouraged communities to look toward the best materials they had available locally and to use the expertise available from his department. The demonstration roads provided tangible examples that states and local communities could follow in carrying out their roads programs.

\textsuperscript{13}American Highways, 47-48.
Looking through the annual reports for the agency at the time showed greater concern with the technical aspects of road buildings, providing good roads to a relatively new nations, opening it up, and service the people. The aesthetics of road construction were not discussed in those reports. Instead the agency's bent was a purely practical one concerned with materials and maintenance.\textsuperscript{14}

Also the OPRI conducted a survey to get an idea about the condition of roads throughout the country in 1904. The questionnaire the agency sent out quizzed local authorities on road materials, mileage, taxation, sources of revenue, total expenditures, and surface type. The study concluded that 2,151,570 miles of rural public roads existed in the United States, along with 1,598 miles of stone-surfaced toll roads. Of the public roads, less than 7% had any type of surfacing.\textsuperscript{15}

At first the Office of Public Road Inquiry (OPRI) was established to fill a temporary need, but it continued to receive funding in the annual agricultural appropriations bills. The director of the agency then recommended that OPRI be made a permanent part of the department of agriculture. That recommendation was accepted, and in the Agriculture Appropriation Act of 1905 (33 Stat 882) the Division of Tests of the Bureau of Chemistry merged with OPRI to create the Office of Public Roads (OPR). Also the legislation

\textsuperscript{14}\textit{NARA}, Record Group 30, passim.

\textsuperscript{15}\textit{American Highways}, 50.
required that the head of the agency be a scientist. A man named Logan Waller Page was appointed to the position.16

Page had a strong background in road engineering, and he also was a proactive thinker. He began his career as the director of the roads materials laboratory of Lawrence Scientific School at Harvard University while he served concurrently as a geologist and testing engineer with the Massachusetts State Highway Commission. In the late nineteenth century France had the highest roads standards in the world, and Page took advantage of that pool of knowledge and attended the French Laboratory of Bridges and Roads. He brought his additional skills back to his jobs in Massachusetts. Following that he set up the laboratory for testing road materials with the Bureau of Chemistry in the Department of Agriculture, and he helped to set up testing labs in some of the states. When he received the appointment as directory of OPR in 1905 he continued that agency's practice of constructing demonstration or object lesson roads. He also expanded that program and shifted its emphasis in construction materials from macadam to locally available materials--most often earth, clay and sand. Even more importantly, however, Page wrote and disseminated additional information on road construction. In his writings he continually emphasized that proper construction and systematic maintenance--things that were cheap and affordable to most communities--would keep roads in good condition for long periods of time. Also, he noted, following that course of action provided a solid foundation for hard surfacing when that became a

16American Highways, 50-52.
possibility.\textsuperscript{17}

Under Page's direction the Office of Public Roads continued to progress in the fields of road construction and materials testing. Between 1908 and 1910 the Office of Public Roads oversaw the construction of 1300 miles of earth roads and 440 miles of sand-clay roads. In Mississippi the agency tried out an experiment that involved burning fires on a clay road until the clay lost its plasticity. Under Page's direction, the OPR engineers started drawing up specifications for different types of road construction based on the agency's experiences with demonstration and experimental roads. They published the specifications in bulletins that received wide distribution throughout states, counties, and municipalities, as well as through college reference libraries. OPR's specifications for bituminous road binders became the industry standard, and they were adopted by many state highway commissions.\textsuperscript{18}

Page looked closely at the practical applications of his work, and his agency cooperated with the Forest Service in laying out and constructing wagon roads and trails in forest reserves to facilitate lumbering. One engineer was assigned from the Office of Public Roads in 1906 to help out on the work there, but Page noted that the expertise of his people would be available more widely as

\textsuperscript{17}American Highways, 64-66.

\textsuperscript{18}American Highways, 67.
additional funds became available.\textsuperscript{19}

Page also saw the need to increase the size of his staff, and he wanted to do so with the best-trained people. To accomplish that task Page assess the way in which highway engineering was taught in technical schools and colleges. Then he established courses in highway design and construction to train a pool of civil-engineering students from which he could draw.\textsuperscript{20}

The need for qualified people was increasing. In 1912, Congress established the 10\% fund under which 10\% of the receipts from forest revenues went to road construction and rehabilitation. An additional $10 million--to be spent between 1917 and 1926--came with the Federal Aid Road Act of 1916. The Post Office Appropriation Act of 1919 allowed an addition $3 million for road construction in fiscal years 1919-1921.\textsuperscript{21}

After going through a gradual evolution, the American Association of State Highway Officials (AASHO) organized in 1914 for:

the purpose of providing mutual cooperation and assistance to the State highway departments and the several States and the Federal Government, as well as for the discussion of legislative, economic and technical


\textsuperscript{20}\textit{American Highways}, 75.

\textsuperscript{21}\textit{American Highways}, 133-134.
subjects pertaining to the administration of such departments.\textsuperscript{22}

The influence of AASHO was strong. The federal government had established a few road standards in the federal-aid regulations of 1916. Those standards stated that bridges, viaducts, and overpasses were to have roadways of not less than 16 feet, and clear head room of not less than 14 feet for a width of 1 feet at the center. This was one of the few occasions in which the federal government set standards. After that, the states established the standards through the AASHO, and made adherence to the standards a proviso for receiving federal aid.\textsuperscript{23}

In looking at road construction practices for that time, hot-laid asphalt was available for use and had been used in Europe and the United States since the early 1870s. The cost of using it on country roads, however, was prohibitive. Experiments with bituminous materials continued after the turn-of-the-century, and the penetration method and mixing method were both used. Even through the experiments were relatively successful, by 1916 the emphasis in road construction was shifting away from dust prevention methods to road preservation methods, where layers of tar or asphalt wearing courses were built up over macadam, slag, or gravel bases. Under the Office of Public Roads the series of experiments were a good training ground for the engineers and

\textsuperscript{22}Quoted in \textit{American Highways}, 79.

\textsuperscript{23}\textit{American Highways}, 88.
physical scientist who later did soils engineering and pavement design for the agency.\textsuperscript{24}

"The Motors are . . . Here to Stay." At the time that Logan Waller Page took control of the Office of Public Roads (1905) transportation patterns and methods were beginning to change. During that year a mere 78,000 automobiles existed in the United States, and nearly all of them were in the cities. Most of the country's roads were traversed by steel-wheeled, horse-drawn wagons that moved along at about six miles per hour. Automobiles, however, had started to push far beyond the boundaries of the cities. The numbers of automobiles increased dramatically, too. By 1915 there were 2.33 million automobiles on the road, and that number nearly doubled three years later.\textsuperscript{25}

As the numbers of vehicles increased, so did the interest in expanding their territory. In 1903 Dr. H. Nelson Jackson and his chauffeur Sewell K. Crocker had taken on the nation and driven from San Francisco to New York. This automobile that went entirely across the country was the first of millions to do the same.\textsuperscript{26} Although Dr. Jackson shunned publicity, word of his exploit spread quickly. As more people acquired automobiles, they began constructing a political base to support their auto-touring and road-racing habits. The Automobile Club of America started as a

\textsuperscript{24}American Highways, 68-70.

\textsuperscript{25}American Highways, 52.

\textsuperscript{26}American Highways, 60.
social club of people who enjoyed touring in their vehicles and often conducting long-distance road races. That group of people sought to protect themselves from any legislation that might restrict their driving freedoms. Another group formed just after the turn of the century was the American Automobile Association (AAA), founded in 1902. AAA furthered the cause of auto-tourism and worked with the National Automobile Chamber of Commerce to standardize motor vehicle laws in the different states.\textsuperscript{27}

The problem of providing some type of regulation for the ever-increasing numbers of vehicles was difficult. In 1901 New York began charging registration fees for automobiles, and it was the first state to do so. Although others followed suit most states did not allow reciprocity in licensing fees. As a result drivers who travelled cross-country had to carry individual licenses for each state through which they passed. Also automobile driving regulations could vary from county to county. Rural areas often were notorious for speed traps that provided a large percentage of support for small town or county treasuries.\textsuperscript{28}

By 1920 support continued to grow for touring the countryside by automobile, and the federal agency charged with providing technical support on roads projects was starting to recognize different types of roads. Often the early roads which had been upgraded from wagon roads to paved roads had rights-of-way that were too crooked and

\textsuperscript{27}American Highways, 56-60.

\textsuperscript{28}American Highways, 57-60.
narrow to be upgraded to the modern highway standards of the time. As a result new construction of the period often adopted straighter lines and more direct routes. At the time the Bureau of Public Roads distinguished between two classes of roads: those within parks that were intended as scenic roads; and commercial and industrial roads that provided the most direct routes between towns and cities. The Bureau at the time saw the straight routes as being the most economical. A report of the period noted:

Where there are costly influences entering the problem that make it impossible or impracticable to follow the straight line then the alignment should approach the straight line, and become a compromise of line, grade, and cost of construction.29

Summary. Federal involvement in road construction started early in the nineteenth century, and part of the sale of federal land went toward building roads. Concern with the aesthetics and design of park roads and their impact on the landscape made tremendous progress during the nineteenth and early twentieth centuries in the works of Andrew Jackson Downing and Frederick Law Olmsted, Sr., who worked at blending roads with the landscape through a variety of means. The establishment of a federal roads agency to provide guidance on road construction advanced the engineering aspects of road building. The most significant impact on roads at the turn-

of-the century, though, was the development of the automobile. Because of that new machine, more and more people wanted to travel across America.
Automobiles: Yeah or Nay. While interest in autotourism grew in the early twentieth century, the official stance of the department of the interior was that no automobiles would be allowed in the national parks. Typical of that time was the correspondence that W. Scott Smith, Superintendent of Hot Springs Reservation, wrote to the secretary of the interior in 1907, in which he recommended keeping automobiles off the mountain roads of the federal reservation "in the interest of the protection of human life." He stated that the only automobile company in Hot Springs had ceased doing business there, that only three automobiles existed in Hot Springs, and that only one of them had enough horsepower to ascend the mountain roads. He also argued that allowing automobiles on mountain roads would spoil the spa experience by depriving many visitors of the experience of taking carriage or horseback rides on the mountain roads.\(^1\) A handwritten note on that piece of correspondence stated "7/11 Letter to Superintendent, denying." Apparently motorized vehicles were allowed in Hot Springs Reservation in 1907.

In 1908 when the chairman of a group called the California

\(^1\)NARG 79, Entry 6, Hot Springs, Box 66, Letter, Superintendent W. Scott Smith to the secretary of the interior, 1 July 1907.
Promotion Committee officially requested that automobiles be allowed in the national parks the first assistant secretary replied that automobiles were only allowed in Mount Rainier National Park, and that their use there was limited by a series of regulations. The assistant secretary continued: "It has been the invariable rule of the Department to prohibit the use of automobiles in the other National Parks."\(^2\)

Despite that official ruling, the pressure for providing automobile access to the national parks was building, for less than a year later the secretary of the interior requested the opinion of the superintendent of Yellowstone on the advisability of allowing automobiles into Yellowstone. The park's superintendent, Major Harry Benson, was a man with thirteen years of park duty under his belt, and he adamantly counseled against it. He replied: "The character of the roads, the nature of the country, and conditions of the transportation in this park render the use of automobiles not only inadvisable and dangerous, but to my mind it would be practically criminal to permit their use." He based his reasoning on the potential conflicts between horses and automobiles. The transportation companies in the park at the time used between 1500 and 1800 head of horses for their stages during the tourist season,

\(^2\)NARG 79, Entry 6, PI-166, Yellowstone, Box 207, Letter, First Assistant Secretary to Chairman of the California Promotion Committee, 28 July 1908. Although the letter stated that the automobile regulations for Mount Rainier were attached to the correspondence, they were not included in this copy, nor did they turn up in the general files on automobile regulations in the parks. These 1908 regulations for Mount Rainier were probably the first ones written to govern the use of vehicles in national parks. Autos seem to have been allowed in Hot Springs Reservation in 1907.
and he did not believe it was possible to get the animals accustomed to seeing automobiles. He was concerned that up to one-third of the stagecoaches pulled by four-ups might be overturned when the animals were spooked by an automobile. Benson also cited the two superintendents who commanded Yellowstone before he did -- Col. Pitcher and Lt. Gen. Young, who both recommended that automobiles be prohibited from entering the park.3

But the push for automobiles in the national parks continued. A motoring club in Montana wrote to the secretary of the interior recommending the construction of a road to the boundary of Glacier National Park at Belton. Because private donations were being used--the road was being constructed with money out of the pockets of the club members--the letter requested that automobiles not be excluded from the park. Also autoists wrote that "it would be a great thing if one [a road] was constructed inside the Park around the Lake and in time extended over the mountain pass so people could get in from the East."4 Then the secretary began hearing from senators who had been contacted by their constituents, and the pressure was on. Senator Henry L. Myers contacted the secretary and requested his support of road development and automobile access for Glacier National Park after he received a letter from a

3NARG 79, Entry 6, PI 166, Yellowstone, Box 207, Letter, Superintendent Yellowstone National Park to the Secretary of the Interior, 29 March, 1909.

4NARG 79, Entry 6, PI 166, Crater Lake, Box 16, letter (letterhead and second page with signature missing) from Montana automobile association to the secretary of the interior, 22 March 1911.
constituent named Fred Whiteside of Kalispell, Montana. Whiteside wrote:

There is a small matter I would like to have you look into when you get to Washington. The government is planing (sic) to expend considerable money in the building of a wagon road in the Glacier National Park, which is in this county, and I believe the regulations covering the park will be formulated by the Secretary of the Interior very soon. We are very anxious to have the regulation so framed that automobiles may be used on the roads in the Park. In the Yellowstone Park nothing but horses are allowed, but we believe we have now reached the stage of civilization where it will be better to use automobiles even if the horses are to be left out.\(^5\)

Whiteside got his wish, and the regulations for allowing automobiles into Glacier National Park were drafted the following year, based on those for Mount Rainier.

The department of the interior was extremely interested in attracting more people to national parks, and that was one of the chief topics at a conference on national parks held in Yellowstone in 1911. There the railroads argued that their ticket prices were cheap enough to foster tourism in the parks, and the biggest

\(^5\)NARG 79, Entry 6, PI 166, Crater Lake (letter filed here instead of under Glacier), Box 16, Letter Fred Whiteside to Hon. Henry Myers, 24 March 1911.
Automobile Clubs. The influence that automobile clubs had on access to national parks was exceedingly strong. The American Automobile Association tried early on to have Yellowstone opened to automobiles, but without success. Following the appointment of a new secretary of the interior—Franklin Lane—things started to change. Lane had his assistant Stephen T. Mather look into the possibility of allowing vehicles into the park, and Mather set up an unofficial committee to discuss the issue. On the committee were Mather, Robert Marshall (head of the U.S. Geological Survey and Superintendent of National Parks prior to 1916), Colonel Brett of the U.S. Army in Yellowstone, and A.G. Batchelder who was the chairman of the executive board of the American Automobile Association. The committee came up with the road-use schedule which "governed self-propelled vehicles and muscle-drawn wagons, which practically kept the two forms of travel completely apart."

The A.A.A. also pushed for the construction of connecting highways between national parks through federal aid. Batchelder also wrote that "many of these road travelers will include the other National parks in a road itinerary which would be impossible of duplication in any other country in the world. Surely the day has arrived when the American will truly begin to get acquainted with his own country."

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6 Albright, The Birth of the National Park Service, 7.

7 NARG 79, Entry 6, Yellowstone National Park, Box 209, containing clipping from Chicago Automobile Club Journal, undated but 1916, article entitled "The Club Journal Starts Something."
Even though a few other national parks were open to the motoring public, the opening of Yellowstone to automobiles signalled the beginning of a new era. The automobile clubs believed they had won a terrific victory over the ultra-conservative officials of the department of the interior, and that most people who were heading to or from the west coast changed their itineraries to include Yellowstone National Park. One article noted that the "equine motors" in Yellowstone would have to be given a chance to get accustomed to the "invasion of these strange monsters from the outer world." But, the article went on to say, the time when all traffic in Yellowstone would be motorized was coming fast. That prediction proved to be correct.

In addition to the automobile clubs and their influence on providing better access to the parks scenic wonders of America, other factors also had an effect on tourism. One of these was the Panama-Pacific International Exposition in San Francisco in 1915, which became a prime reason that more people were becoming adventuresome in their motorcars and exploring their nation. Correspondence of the period, however, indicated that the political base of the automobile clubs was the principle factor that opened the parks to automobiles.

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that includes copy of 26 September 1916 letter, A.G. Batchelder, Chairman Executive Board, American Automobile Association, to E.G. Westlake, Chicago Automobile Club.

* NARG 79, Entry 6, Yellowstone National Park, Box 209, containing article "Land of the Geyser," Motor West, 15 August 1915, 22.
Automobile Regulations. Allowing vehicles into national parks required restrictions. Road conditions could vary tremendously in just a short period of time depending on weather. The conflict of horse-drawn vehicles and automobiles on the same narrow roads needed some type of regulation. Despite the problems that existed in with allowing automobiles into national parks, the department became more flexible by 1910-11. The office of the secretary of the interior drew up regulations governing the admission of automobiles in Crater Lake, Mount Rainier, General Grant, and Glacier National Parks. The secretary’s office first wrote the regulations following a boilerplate approach in which the general rules were similar, but they contained slight variations that tailored the regulations to the individual parks.

Each set of regulations began by citing the park’s enabling legislation and stating that the superintendent needed to provide written permission for entry into the park. Often automobiles were permitted on roads only during certain hours--about three hours in the morning and three in the afternoon--to minimize potential conflicts between automobiles and stages. Yellowstone’s regulations, for instance included a very tight schedule for road use. All of the early driving regulations required automobiles to pull over to the outside of the roadway regardless of direction of travel when teams passed. Also, when teams approached automobiles were required to stop until the team passed or until the teamster determined it was safe for his team to proceed. The speed limit on park roads was 6 miles per hour except on straight stretches where
no teams were in sight. In those areas drivers were allowed to increase their speed to no greater than 15 miles per hour. Because the roads were so narrow and often winding, the regulations dictated that drivers had to honk their horns at every turn so that teams would know that automobiles were approaching.⁹

What started as a trickle of vehicles admitted to national parks grew to a steady stream. The department of the interior first admitted automobiles to Mount Rainier in 1908, followed by General Grant in 1910, Crater Lake in 1911, Glacier in 1912, Yosemite and Sequoia in 1913, and Mesa Verde in 1914. By 1916 the department allowed them on a limited basis in Rocky Mountain, Platt, Wind Cave, Sullys Hill, Casa Grande, and Hot Springs. Yellowstone National Park’s concessionaire phased out the horse-drawn stages and replaced them entirely with automobiles during the 1917 season.¹⁰

See America First. In 1914 Europe was at war, and in August of

⁹NARG 79, PI 166, Entry 6, Crater Lake, Box 7, "Regulations Governing the Admission of Automobiles into the Crater Lake National Park, Oregon, During the Season of 1911;" same entry, General Grant National Park, Box 177, "Regulations Governing the Admission of Automobiles into General Grant National Park California, During the Season of 1910;" same entry, Crater Lake, Box 16, "Regulations Governing the Admission of Automobiles and Motorcycles into the Glacier National Park, Montana During the Season of 1912" (these are the regulations for the 1911 season at Mount Rainier, with cross-outs and changes to alter them for Glacier); and same entry, Yellowstone National Park, Box 209, "Regulations Governing the Admission of Automobiles into the Yellowstone National Park for the Season of 1915."

The army completed construction on this section of road near Nisqually Glacier in 1908. In this 1912 photograph, the rugged condition of the road was evident. Major Hiram Chittenden, who had been in charge of road construction in Yellowstone, supervised construction of this road. Horse-drawn carriages, bicycles, private automobiles, and concessionaire touring cars were allowed access.

National Archives, Record Group 79.
that year John Wilson, the president of the American Automobile Association, walked down the gangway of a luxury liner as it returned home from a trip abroad. His fellow passengers on the ship were people fleeing the war zone. As he stepped off the ship, Wilson wryly stated: "It is my guess that in 1915 many Americans who annually motor abroad will become much better acquainted with their country." 11 He was right.

He believed that if Americans stayed home for the projected duration of the European troubles—a "year or so" he predicted—that they could view the scenic wonders of their own country. Also, he noted that the natural marvels of the United States compared very favorably with those of Europe. He realized that access to Yellowstone, Yosemite, and the Grand Canyon was difficult, but he openly stated that more use by motorists would increase the demand for greater federal involvement in road construction and improvement. Even more important, however, Wilson noted the importance of roads in the war in Europe, and he believed that road development here would strengthen the nation. 12

Early Cooperation. As early as 1905 the Office of Public Roads was assisting the U.S. Forest Service in the development of roads in national forests. In 1912 the two bureaus worked out a formal

11NARG 79, Entry 6, Yellowstone, Box 208, containing news clipping from the Dallas News, 23 August 1914, "American Motorists Tour Home in 1915: 'See America First' Will Be Autoist's Slogan Next Year," no pagination.

12Ibid.
agreement to handle road work. Since 10% of forest revenues were allocated for road work, OPR had a good working budget for forest service lands.\textsuperscript{13}

Also OPR began doing some work in and around national parks. In 1910 a private organization called the Crater Lake Highway Commission was working on promoting access to and around Crater Lake National Park. They requested a road expert out of OPR to supervise construction of an approach road through Crater Lake National Forest to Crater Lake National Park. Also, they requested that the OPR employee plan a system of roads and trails for the park. This access road was financed through private subscriptions and county funds instead of through the ten-percent forest service fund.\textsuperscript{14}

This process of using private funding to assist in the development of national parks was a fairly common practice, and the use of donations for road construction was only one way in which monies were spent. In the early years of the park service Stephen Mather and Horace Albright cultivated powerful and often philanthropic support groups that included congressmen and senators, presidents, and businessmen. When congress refused to approve an appropriation for the construction of the Tioga Road that crosses the Sierra in Yosemite National Park, Mather and Albright dug into their own

\textsuperscript{13}\textit{American Highways}, 75.

\textsuperscript{14}\textit{American Highways}, 75. Check with Steve Mark about this, and also check with Stephanie Toothman and Cathy Gilbert.
Artificial attractions such as this drive-through tree, known as the Grizzly Giant or the Wawona Tunnel Tree at Yosemite National Park, destroyed resources but helped people gain an understanding of the scale of some of nature's wonders. Thousands of visitors drove through this tree until it toppled in the 1960s.

National Archives, Record Group 79.
pockets and also tapped the purse strings of their cohorts to finance it.\textsuperscript{15}

Work in forest and park areas increased quickly, especially with the combination of federal and private funds. In 1914 Logan Waller Page, the director of the Office of Public Roads, sent an engineer and a survey party to Yosemite to begin work there. So much work existed that Page had established a separate Division of National Park and Forest Roads within the OPR to handle the projects, and he placed T. Warren Allen at the head of the new division.\textsuperscript{16} That same year Assistant Secretary Adolph Miller wrote to the superintendent at Mount Rainier that he had established a tentative plan of cooperation between the department of agriculture and the department of the interior for the construction and maintenance of roads in national parks. That tentative plan grew into the first cooperative agreement between the office of Public Roads and the Department of the Interior. Also the assistant secretary stated that Mr. Allen was on his way to visit Mount Rainier with an idea of eventually placing a survey party there to work on park roads and trails.\textsuperscript{17}

"There are Roads to Be Built . . . .". Between 1913 and 1915, T. Warren Allen had spent a large amount of time in Yosemite, Glacier,  

\textsuperscript{15}Foresta, 22.  
\textsuperscript{16}American Highways, 75.  
\textsuperscript{17}NARG 79, Entry 6, Mount Rainier, Box 135, Letter Adolph Miller, Assistant Secretary of the Interior to Ethan Allen, Superintendent, Mount Rainier National Park, 15 April 1914.
Sequoia, and Mount Rainier working on surveys and preparing plans for roads in those parks. In addressing the 1915 National Park Conference, Allen stated his philosophy of park roads. He believed that roads should be constructed in abundance in and around national parks; that the entrances needed to be accessible during the early spring and late fall for long visitor seasons; and that parks would not be attaining the highest and best use for which they were set aside unless they were accessible to the rich as well as the poor. In his view after the roads were constructed to the park entrances, then they were to continue on to the primary points of interest in the park.

Allen stated that the construction of park roads was often similar to the construction of forest roads. Parks and forest were huge tracts of land that in his view warranted development for two reasons: these land areas often were or contained obstacles to connecting the larger network of roads; and the construction of the roads provided access to the pleasuring grounds of national parks. He firmly believed that "There are no places where so great relaxation of overtired bodies and brains may be obtained as in the woods, and it should be our endeavor to make them readily accessible to all."

Allen's philosophy of making the parks accessible to everyone was supported by the first director of the National Park Service. Stephen T. Mather also believed that the parks belonged to everyone. He firmly believed in bringing more and more of the
American citizenry to the national parks to improve the nation. When someone commented on the increased litter the new crowds had started to bring, he noted: "We can pick up the cans, it's a cheap way to make better citizens." Also, Mather envisioned bringing people to some new areas of national parks where no roads had existed previously.

Allen's philosophy extended beyond merely providing good access, and he wanted to build roads that harmonized with natural features, that were inconspicuous, and that showed the natural beauty of an area to best advantage. He stated that although initial survey and layout costs may be slightly more than on a normal road, the actual road construction costs were probably equivalent.

He explained to his audience at the proceedings of the 1915 National Park Conference how he laid out and constructed roads. First, he looked at a park area from the outside in, and generally plotted where through-traffic would go if no natural obstacles (like the Sierra Nevada) were in the way. Then he picked areas suitable for development such as natural features warranting inclusion in a park auto tour, and potential campground and hotel sites. With this information he laid out the primary road on a topographic map and made certain that the road had only very light grades. Then he field-checked the work and waked the route, because sometimes roads laid out on a map might not fit the ground.

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18 Foresta, 28.

19 McClelland, Presenting Nature, 73.
He continued:

... it may be that the paper location should be varied to permit a view of a beautiful waterfall, to get an attractive water, sky, or landscape effect; it may be found that these effects may be introduced when absent, and the road location should be made with such objects in view. ... The proposed roadway should then be carefully studies from selected points, both upon the roadway site and at a distance from it, in order to determine if there may not be made changes which shall add to the attractiveness of the views which may be obtained by travelers or to insure that the roadway may have an harmonious setting when viewed from the outside. It will be necessary, in order to make sure of not missing attractive views which might be brought out by a little change, to occasionally climb a tree along the route and study the possibilities from such vantage point. It may be advisable for some reasons to locate the road through an open or bare spot. Such places should not be avoided on account of unattractiveness until a study has been made to determine whether the unattractiveness may not be eliminated by a judicious planting of trees and shrubs or possibly by the introduction of a small lake or pond. No pains should be spared. ...20

Then, Allen explained, the road construction was similar to the construction of a typical country highway: placing center-line stakes at each 100-foot station and establishing cross-sections. After he completed the initial layout, he required a close inspection to see how the road actually fit the ground. Wherever culverts were scheduled for construction or cuts-and-fills of any significance Allen wanted strong consideration given to the scenic and landscape effects that the construction produced. He also emphasized that the plans and specifications should include the same level of detail whether they were to be constructed by contract or by the government so that the final results would be correct. He also said that the design of the road should be chosen so that it could be upgraded to a higher level in an economical fashion if that was ever requested. This last comment coincided with the standard approach that the Office of Public Roads had taken for many years.

T. Warren Allen was a man of vision. He concluded his remarks at the conference by stating "I, as a road builder, have dreamed of road development in the various parks, and have dreamed of seeing such roads, lined and banked with the flowers which grow wild in the meadows of the parks and upon the mountain sides, winding unassumingly along the brook, beneath the waterfall, and skirting timidly the majestic mountain." Allen's views coincided with views of other roadbuilders of the time. S.F. Ralston, the

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21Ibid., 27-28.

22Ibid., 32.
supervisor of Glacier National Park in 1915, also believed that roads in national parks should be different than other roads. They needed to display the natural scenic beauty of the national parks and encourage greater visitation, which would enrich the coffers of the country.\textsuperscript{23}

The supervisor of Yosemite National Park Gabriel Sovulewski echoed Allen's sentiments. Sovulewski had come to the national parks by way of the army. He had been stationed at Sequoia and Yosemite with the army, and he resigned from that and joined the ranger ranks. He had extensive experience in trail construction at Yosemite, and he noted to the same audience at the 1915 National Park Conference that much of what he dealt with in trails was applicable to roads. In his words, "Diversion from a straight path to points of interest, regardless of expense, is important and necessary."\textsuperscript{24} In his view it was mandatory to bring roads and trails through different types of landscapes and to expose the traveler to a variety of points of interest.

Another expert, David A. Sherfey, discussed log bridges. For log highway bridges of the time, Sherfey designed one capable of carrying a 10-ton roller in addition to supporting its own weight. With beams spaced three feet on center, yellow pine logs safely could span 24 feet. Mr. Sherfey, however, favored reinforced concrete or stone bridges instead, such as ones he saw at

\textsuperscript{23}Ibid., 71, 72.

\textsuperscript{24}Proceedings of the 1915 National Park Conference, 51.
Yellowstone. Also, Sherfey and others tended to reject truss bridges as being unharmonious with the landscape; also many likened looking at the scenery through the chords of a truss as equivalent to looking through the bars of a prison.\textsuperscript{25} What Allen, Sovulewski, and Sherfey were doing, then, was exhibiting the natural landscape and its features to best advantage and when necessary even enhancing nature by the addition of other features if the scenery was too dull.

Other technical practices in road building were common at the time, and one roads expert considered three elements essential to a good road. These were grades, drainage, and road material. Also, Mr. S.F. Ralston, the supervisor of Glacier National Park, at the same conference discussed how he favored roads constructed on higher ground. Most often these routes were more scenic, and they often avoided land that was of greater value to commerce and agriculture. Ralston discussed studying soil conditions prior to construction, and paying particular attention to the road crown. According to his experience if the drainage is perfect, then the crown needs slightly less attention. Ralston also noted that:

\begin{quote}
The roads to be built in the national parks should differ from the ordinary road, in that their purpose is to better display the natural scenic beauty of our national playgrounds and thereby encourage our own people to visit these spots of scenic interest and save to our country
\end{quote}

\textsuperscript{25}Ibid., 60-66.
the wealth now annually contributed to Europe through the
medium of the American tourist.

For dirt roads, Ralston recommended using a plow first over the
area, and then coming across with a blade grader. With the grader,
the operator moved the earth toward the center of the road and made
the crown. The ratio he used was from 1/2 to 5/8 inch of crown for
each foot of road width. Also, Ralston noted that the culverts were
constructed before the grading started, and the drainage ditches
were constructed as the grading progressed.

The early influence of the Office of Public Roads was strong in
national parks. When the National Park Service was created in
1916, 1916 OPR maintained 160 miles of roads, had constructed 170
miles, and had surveyed and planned for 477 additional miles of
park roads.26

Parks through the Eyes of the Autotourist. On August 1, 1915,
Yellowstone National Park was opened to automobiles. Newspaper
articles and those in motoring magazines provided glowing reports
on experiencing the park by automobile. One column discussed how
much the "motoring fraternity" appreciated being able to take its
machines into the park.27 Another article described the experience

26American Highways, 76.

27NARG 79, Entry 6, PI-166, Yellowstone National Park, Box 209,
press clippings containing article "May Autos Traverse National
Park Roads: The Yellowstone Privilege Appreciated by the Speeders-
-Record of Entrances," no date, no newspaper listed, printed just
after August 1, 1915.
of driving through the park as "pleasant beyond description." The piece continued in its accolades, saying that the Montana Automobile and Good Roads Association enthusiastically pronounced Yellowstone "the happy touring ground for the motorist of America." 28 The same article stated that the park motor tour road was far superior to most of the roads found in the west.

Stages still served Yellowstone in 1915, but the automobile quickly became the vehicle of choice for most park visitors. Touring in the national parks provided new and exciting experiences for early motorists. The automobile club magazines gave detailed descriptions of drives through the parks, and they often included information on regulations as well as suggested itineraries. The layout of the road and the spectacular scenery gave motorists a new view of the natural wonders of their world. In Yellowstone the drive to the summit of Mount Washburn proved so breathtaking that one writer for a motoring magazine described its wonders:

The grade to Mount Washburn is not too steep for the average motor, and there is an exclamation point at every turn. Here the road hugs the cliff above a sheer drop of a thousand feet. There it suddenly swerves around a sharp turn, leaving the motor suspended between sky and earth with nothing but space before. When the top is reached, past banks of snow, a view one hundred miles in

every direction is obtained, where Lake Yellowstone's mirror, the gash of the grand canyon through the smooth swells of pines, and the occasional filmy blur of a geyser mark the way traveled.29

The article also stated that the Secretary of the Interior Lane and Assistant Secretary Mather had "good reason to feel satisfied with the motor-car introduction in Yellowstone."30 According to some, motoring was the best way to see the park.

The New Bureau. Although there had been a move afoot for some years to create an agency to oversee the national parks, it did not happen until 1916. Instrumental in the development of this new agency was the American Society of Landscape Architects which urged things like the development of comprehensive plans for national parks and the construction of facilities such as roads, trails, and building only as needed and only then without harming the landscape.

As early as 1908 Dr. J. Horace McFarland of the American Civic Association address a conference of governors called together by President Theodore Roosevelt to study the issue of conserving the nation's natural resources. McFarland told them:


30Ibid., 595.
The United States Army under the supervision of Captain Hiram Chittenden constructed this road to the top of Mount Washburn in Yellowstone National Park in . A motoring magazine from 1915 described the grade to the summit as being "not too steep for the average motor, and there is an exclamation point at every turn. Here the road hugs the cliff above a sheer drop of a thousand feet. There it suddenly swerves around a sharp turn, leaving the motor suspended between sky and earth...".

National Archives, Record Group 79.
The scenic value of all the national domain yet remaining should be jealously guarded as a distinctly important natural resource, and not as a mere incidental increment. In giving access for wise economic purposes to forest and range, to valley and stream, the Federal Government should not for a moment overlook the safeguarding to the people of all the natural beauty now existing. That this may be done without preventing legitimate use of all the other natural resources is certain.31

Assistant to the Secretary Stephen T. Mather had in his employ a man named Mark Daniels. Daniels had come to the department when he was hired as general superintendent and landscape engineer to start working in Yosemite at the time that the army was moving out. In an address at the 1915 National Park Conference Daniels bemoaned the fact that the national parks "like all other things which involve idealism or estheticism" were under a constant challenge for justifying their existence. Yet he saw the parks as having two worthwhile justifications: aesthetic and economic.

Daniels stated in 1915 that the parks were not developed, and the work had just begun. He asserted that there were roads, bridges, trails, and hotels to be built.32 He stressed that in 1915 between four hundred and six hundred million dollars in coin was being spent by Americans overseas, and that large an amount of cash

leaving the country was affecting the gold reserve. If Americans were willing to purchase scenery, Daniels reasoned, they needed better opportunity to do so in their own country. He cited Switzerland as an example of a place where Americans spent money. He noted that some of the scenery in the Sierra surpassed that of Switzerland, but that Americans could stay more cheaply in the Swiss alps because of the large numbers of good, reasonably priced accommodations and the ease of access than they could in California.

But Daniels and others within the department knew very well that tourists would not go to the national parks unless they knew that they first existed. Then he knew that visitors would only show up if they had adequate transportation facilities and good accommodations. Daniels and his staff started considering offering a variety of accommodations in the national parks. And the staff began looking at transportation facilities and access to the national parks. The secretary of the interior began politicking to get the word about the parks out to the public through the newspapers and organizations. Some organizations took it upon themselves to promote national parks. The General Federation of Women's Clubs, for example, took their own initiative and organized members across the United States to form a "campaign for natural scenery" which included division heads for natural scenery and national parks, and for the establishment of good roads. Their club included nearly two million women in the United States and through them they hoped to "arouse public opinion to the value,
both ethical and economical, of the natural scenery of our national parks. "\(^{33}\)

Daniels foresaw the growth of tourism in the parks as a result of these efforts. He estimated that 15,000 tourists would visit Yellowstone in 1915, and enormous numbers like that demanded "some sort of civic plan in order to properly take care of the people who visit it."\(^{34}\) In 1915 the secretary had plans underway for Yosemite, Crater Lake, Mount Rainier, and Glacier. These studies looked at the parks internally, but they also considered the larger geographical context:

If a plan for the physical development of any area, as well as a national park, is to be in any way successful or practical or efficient, it has got to be functional. In other words, it must be so drawn that it suits the various conditions--not only the topographical features, but all the physical conditions. Therefore, before we could plan the villages it was first necessary to make a very careful and thorough study of the parks and determine form which direction the majority of the travel would come, at what angles the tourist roads came into the park, whether any of them could be used, and from what central point the larger portion of the park could

\(^{33}\)1915 Proceedings of the National Park Conference, 140-142.

\(^{34}\)Proceedings of the National Park Conference, 19.
Also, Daniels stated that the department had put considerable thought into the selecting the type of architecture for the greatest amount of "picturesqueness." Daniels' vision was great, and he frankly recognized the lack of financial support on his plans from congress. But, he reasoned, even though the money was lacking, the department was trying hard to increase visitation and thereby demand that Congress come forth with the appropriations because the public would be clamoring for dollars to the parks.  

In 1916 the secretary of the interior assigned the administrative supervision of the national parks to Stephen T. Mather, with the hopes that Mather could promote the parks as the primary destinations for American tourist travel for the duration of World War I and beyond. Mather began his educational campaign by employing the talents of Robert Sterling Yard and producing the first of many National Parks Portfolios, the publication of which was funded largely by 17 western railroads who contributed $43,000 to print the document. The state of the parks at that time was such that Yellowstone and Yosemite were the only parks that had a few miles of highway constructed through them. Mather, however, had Robert Marshall create maps of the two parks showing roads and distances, hotels, camps, and supply stations.

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36 Ibid., 22.
One major change was occurring by the time the National Park Service was created in 1916. Automobile use in national parks was increasing by leaps and bounds, and as a result revenues for the parks continued to grow. Mather wrote:

Whatever may be done in this connection, the fact remains that American motorists are intensely interested in the national parks, are visiting them in ever increasing numbers, and are contributing by way of automobile fees large sums of money toward park improvement and administration. They have the right, then, to expect that the Federal Government will pursue a broad policy in the extension of road systems in the several parks, and that they shall enjoy all privileges not inconsistent with good administration of the parks' management and protection. Taking everything into consideration, no policy of national park management has yielded more thoroughly gratifying results than that which guided the admission of motor-driven vehicles to the use of the roads of all of the parks. 37

In response to increased use of automobiles in national parks, Mather reduced most of the park entrance fees. Yellowstone’s entrance fee, for instance, dropped from $10.00 to $7.50, while

Mount Rainier’s plummeted from $6.00 to $2.50.\textsuperscript{38}

Mather was also under orders to adjust other aspects of development based on the amount of traffic. Secretary of the Interior Franklin Lane stated to him that he wanted a wide variety of accommodations in national parks "'wherever the volume of traffic warrants the establishment of these classes of accommodations.'"\textsuperscript{39}

In another report issued in the late fall of 1916, Mather noted the huge increase in motor vehicles in Yosemite National Park, and he remarked that the removal of restrictions on automobiles was one of the most important factors influencing park development. The numbers of automobiles in Yosemite increase from 674 in 1914 to 3,938 in 1916. Also he noted that motorists were spending longer periods of time in the Valley. Despite that huge increase, however, the Yosemite roads of the period were far inferior to those of Yellowstone.\textsuperscript{40}

According to Horace Albright, Stephen Mather believed that each park should have one good highway so that people could get into the national parks. He believed that the remainder of the park area should be experienced by foot or on horseback.\textsuperscript{41} Mather’s

\begin{itemize}
\item \textsuperscript{38}Ise, \textit{Our National Park Policy}, 203. These fees were reduced further in 1926.
\item \textsuperscript{39}Foresta, \textit{Our National Parks and Their Keepers}, 28.
\item \textsuperscript{40}Mather, \textit{Progress in the Development of National Parks}, 18.
\item \textsuperscript{41}Albright, \textit{The birth of the NPS}, 195.
\end{itemize}
commitment to automobile access in national parks was so strong that he even supplied some of his own money to do so. When congress refused to appropriate money for acquiring the Tioga Road in Yosemite he dipped into his own pocket and rounded up additional funding from other philanthropists and business associates to buy the road.

The Emergence of a Design Ethic. Shortly after the new agency was created Secretary of the Interior Franklin Lane issued the first official statement of policy to govern the management of the parks. Among some of the significant items included in four-page memorandum were a number of items that show how the secretary and his department perceived national parks at the time, and in what ways he planned to deal with them. Lane described the building-up of the parks as the construction of "the national playground system." He also wrote the oft-quoted paragraph on park development:

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 employments of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the esthetic 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.\textsuperscript{42}

In that statement he showed his commitment to the scenic and aesthetic qualities of park landscapes, but he also looked toward regional planning efforts to ensure their future. In the same policy statement he also affirmed accessibility to the national park "by any means practicable" in ways that best satisfied the individual tourist including permitting automobile and motorcycle access in all national parks.

Summary. Opening up the parks to automobiles changed the nature of the park experience and the nature of the national parks themselves. Some of the pressure for change came from the motoring public, who became enamored with the prospect of the freedom of the open road and clamored for access to the natural wonders of America. The parks, which were perceived primarily as scenic and aesthetic resources, became destinations for the adventuresome and for those seeking spiritual replenishment from nature. On the more practical side, internal changes within the department of the

\textsuperscript{42}NARG 79, Entry 18, Records of Key Officials, Arno B. Cammerer, 1922-1940, Box 10, containing memo Secretary of the Interior Franklin Land to Stephen T. Mather, May 13, 1918, 2. This "Statement of National Park Policy" also is included in the Report of the Director of the National Park Service to the Secretary of the Interior for the Fiscal Year Ended June 30, 1918, 273-276.
interior also encouraged automobile use in national parks to increase visitation, enlist further support for the national park idea, and escalate appropriations for running the parks. Areas that were once inaccessible other than by foot or horseback became readily accessible by automobile.

Reasons for the change in thinking were many. The "See America First" campaign encouraged Americans to spend their money at home. This accomplished two goals. The money stayed in the United States and boosted the economy, and Americans became acquainted with the natural wonders of their own land. The national parks were advertised as "pleasuring grounds" that were significant for their interpretive and meditative value.

The way in which people arrived at the parks began to change, too. In 1916, for instance, 14,527 people came to Yosemite by automobile, and a slightly smaller number arrived at the park by rail. This foreshadowed the change from the iron horse to the horseless carriage as the preferred method of getting to and around national parks.

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43 Alfred Runte, Our National Parks and the American Experience, 156.
CHAPTER 3
Early Park Road Development. In most instance park roads were constructed under the supervision of an engineer from the war department from 1883 until 1917, when engineer George Goodwin went to work for the agency. Roads constructed during that period of time under the aegis of the army included the road over Mount Washburn, the Golden Gate Viaduct (eleven concrete arches built into the cliff wall of Golden Gate Canyon), the 120-foot steel and concrete arched Chittenden Bridge over the Yellowstone River at Yellowstone, and the entrance road into Mount Rainier from Nisqually (form 1903-1906. By 1910 that road went as far as Paradise. Chittenden believed in only constructing what was necessary to keep the park in its most natural state as possible. He argued that once a road was found necessary, however, that it would detract far less from the scenery if well-built rather then left in an incomplete or rough state. He concluded that "The true policy of government is 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."

A New Vision. Following the creation of the National Park Service in 1916, the push for park development continued, and a big portion of the boosterism for providing access to national parks came from within the agency and the department of the interior. When the

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1McClelland, Presenting Nature, 103.
agency was progressing into its second decade its annual appropriations remained tied to visitation numbers. The park service directorate had a vision that included saving the greatest natural resources and the most spectacular scenery of the country while accommodating the recreational and vacation needs of a civilization that possessed automobiles and a growing affluence. The days of the great train trips across the continent to visit the national parks were coming to an end. In their stead were families coming to parks seeking camping opportunities to spend their vacations on the edge of the wilderness. This provided a chance for the new agency to increase its constituency. The tremendous growth in the numbers of automobiles in this country had a major effect on park development. In 1900, there were only 8,000 automobiles in the United States. By 1930, 23 million of them swarmed the roads.¹

Automobile Access and Park Road Development. While the Bureau of Public Roads had always pushed the idea of entire road systems rather than individual roads, road construction in and around national parks was only a very small percentage of the work that the agency did. Many of the annual reports submitted to the secretary of agriculture included mention of work in forest reserves but little or no mention of work in national parks. In the 1921 report, however, bureau chief Tom MacDonald noted that a growing demand for roads existed--farmers wanted roads from shipping points and agricultural center to produce areas, and

¹Foresta, Our National Parks and Their Keepers, 27.
This photograph, taken at Yellowstone National Park, includes from left to right President Warren Harding, Secretary of the Interior Hubert Work, National Park Service Director Stephen Mather, and Yellowstone Superintendent Horace Albright. All four of these men pushed road development in national parks to introduce the American public to the scenic, recreational, scientific, and inspirational wonders of the parks.

National Archives, Record Group 79, Haynes Collection.
manufacturers wanted roads that facilitated the transportation of raw materials and commodities. In addition, he wrote that tourists also were interested in the development of smooth, hard-surfaced roads that connected cities and areas of natural interest because of the recreational opportunities they could provide.  

3 He saw the ever-increasing demand of automobile access as an integral portion of pursuing leisure activities in scenic natural areas.

Echoing his sentiments and analyzing some of the idealistic reasons for this demand was Secretary of the Interior Hubert Work. In 1925 Work wrote about access to park areas and the need for it to the hundreds of thousands of visitors who were on their way:

The national parks are playing a prominent role in our national life. They are giving the people a glimpse of the simpler things of life and are increasing our appreciation and understanding of nature. They are providing education opportunities that otherwise would not exist. And finally they are bringing us closer to the scheme of creation and educating our children 'through nature up to nature's god.'

4 His view of one of the national parks as having an inspirational

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purpose was similar to many others of the period—including park service director Stephen Mather and his assistant Horace Albright. Even congressmen echoed that sentiment. Representative Nicholas Sinnott of Oregon was a serious booster of national parks. Standing at the Lookout on Mount Washburn in Yellowstone one day, Sinnott quoted from Isaiah 49:11: "I will make all my mountains a way, and my highways shall be exalted." Horace Albright, then superintendent of the park, was with Sinnott at the time, and he had the park staff paint a small sign with that quotation on it placed at the lookout. For years visitors had their photographs taken next to the sign.

The roads program within national parks continued to grow, and director Stephen T. Mather viewed road construction as key to park development.

It is not the plan to have the parks gridironed with roads, but in each it is desired to make a good sensible road system so that visitors may have a good chance to enjoy them. At the same time large sections of each park will be kept in a natural wilderness state without piercing feeder roads and will be accessible only by trails by the horseback rider and the hiker. All this has been carefully considered in laying out our road program. Particular attention also will be given to laying out the roads themselves so that they will disturb

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5Albright, *The Birth of the National Park Service*, 195-196.
as little as possible the vegetation, forests, and rocky hillsides through which they are built. In this work the landscape engineering division cooperated closely with the civil engineering forces, and the latter also by separate instruction have been ordered to exercise the greatest care in the protection of the landscape in all road construction work. Especially fine work along this line has been accomplished in Yellowstone, Lafayette [Acadia], and Sequoia national Parks.  

The reasons for park development, however, were both idealistic and practical. On one hand the park service director viewed the importance of parks from an economic perspective, and he stressed the development of parks to keep tourist dollars at home. Switzerland, he argued, lived almost entirely by selling its scenery, and other European countries pushed equally hard for American tourist dollars following the conclusion of World War I. Mather looked at other countries that were developing their own park systems such as Canada, Australia, and Japan, from the standpoint of the competition they would be giving American national parks.

Road Networks. The Park Service directorate in the 'teens and 'twenties had recognized the importance of tourism to the economy

6USDI, Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal Year Ended June 30, 1924, 14.

of the western states. Mather, for instance, supported the National Park-to-Park Highway Association, which promoted building a system that connected all of the western parks into one circuit. Roads over the Sierra at Tioga Pass in Yosemite and over Logan Pass in the Rockies of Glacier were in part constructed to take advantage of cross-country travel. In that way autotourists crossing the continent had additional encouragement to see the parks.8

The park service joined the fairly informal consortium that encouraged the construction of a network of roads that connected highways and national park roads. Park service assistant director Horace Albright and chief civil engineer George Goodwin worked closely with the Western Association of State Highway Officials.9 At a meeting with that outfit in Yellowstone in 1924, Horace Albright asked the highway officials to support road construction in national parks. Albright argued that because so many roads led to the national parks, the traffic went to the parks concentrated there. Albright expressed interest in building park roads to carry the higher concentrations of traffic inside parks than that on the state roads outside parks. He wanted the park roads constructed to carry these higher volumes of traffic and given enough attention so that the public could appreciate and enjoy them in a convenient manner.

8Forest, America's National Parks and Their Keepers, 27.

9NARG 79, Entry 22, Box 4, Letter George W. Borden, President, Western Association of State highway Officials to George Goodwin, 13 August 1924.
At the same meeting George Goodwin gave a talk about the problems he encountered with park roads. Goodwin complained that many of the park roads of the period (1924) were not properly located, but they still had to be maintained to carry high volumes of traffic. So much money had been invested in maintaining the roads that Goodwin believed that it was prohibitive to abandon the roads, especially when there was no funding to survey and lay out new roads to replace them. Also, Goodwin commented, line and grade were sometimes sacrificed in the old park roads so that natural features and scenic vistas could be incorporated along the road. Goodwin commented hopefully that the new appropriations granted to parks for road construction starting in 1924 would allow new roads to be constructed with the most up-to-date practices in highway construction while preserving the "scenic beauties as near as possible as nature created them." Goodwin also requested copies of the pamphlets "A System of National Highways" and "A National Highway System" from the American Automobile Association, copies of a speech by Senator Phipps on roads in national Parks, report of the forester for 1922, and the Interior Department bill approved on January 23, 1923.

Park Road Funding: 1924. Congress responded by approving $2.5

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10NARG 79, Entry 22, Box 4, Letter George W. Borden, President, Western Association of State Highway Officials to George Goodwin, 13 August 1924, including meeting notes from Western Association of State Highway Officials at Yellowstone National Park.

11NARG 79, Entry 7, File 630, Box 154, Letter A.E. Demaray to Mr. Hites, 7 March 1923; and Letter, Editor In Charge of Travel and Education to George Goodwin, 7 March 1923.
Bringing congress to the parks always improved the rather meager financial coffers of the national parks because members received a firsthand look at conditions. Here the Appropriations Committee drove past National Park Mountain in Yellowstone.

National Archives, Record Group 79, Haynes Collection, no date.
million a year for three years beginning in 1924, but funding for the first year was put off due to financial obligations that the country had to its soldiers following the World War I. The service was ready to go forward with roads projects as soon as the money came. Mather stressed that motorists were contributing large amounts of money to the federal government through fees charged for park access, and the director believed that park users were "entitled to the utmost consideration and return in the way of good roads that the condition of the Federal Treasury warrants." The director argued that while the amount coming into the federal coffers from automobile license fees came to $1.8 million between 1917 and 1924, the amount spent on roads amounted to only $1.4 million. The director pushed for additional federal aid for approach roads to national parks to accommodate the tourists. At the time 1,060.5 miles of roads existed in national parks, and Mather proposed reconstructing about one third of them through widening, reducing the grade, or improving the base so that when hard surfacing was possible the base would be adequate to handle it, just as the Bureau of Public roads suggested. Also, the Park-to-Park Highway was in full swing.

The passage of the 1924 Roads and Trails Act started the formal fiscal commitment for construction, reconstruction, and improvement of roads, trails, and bridges in national parks. At the same time it provided appropriations to do so. Those amounted to 6.5 million

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from 1924-1928, and 2.5 million under the appropriations act of 1928. By October of 1927, 184.65 miles of roads were under construction, and 89.38 miles had already been completed. Surveys were completed or authorized on another 1,000 miles of park roads. Adding further impetus to this was the Leavitt Approach Road Act of 1931 that authorized the national park service to spend money outside park boundaries on approach roads that led to the parks.\textsuperscript{14}

\textbf{Development of the Interbureau Agreement.} On January 18, 1926, the National Park Service and the Bureau of Public Roads signed the Interbureau Agreement that established formal working procedures between the two agencies. The agreement rose out of years of working together on a more informal basis. In it, the National Park Service was responsible for the aesthetics of park roads, and the Bureau of Public Roads was to survey, construct, reconstruct, and improve roads and trails within national parks by using the best construction practices of the time. The way the process worked was that the park service landscape engineers completed preliminary reports on proposed roads and identified significant landscape features. The bureau worked up cost estimates and preliminary construction data. After these reports went to the park superintendent, the bureau engineer supervised the project and ran the survey, prepared the plans and specifications in close consultation with the park staff and landscape engineer. The contract then went to bid, and the secretary of the interior awarded it.

\textsuperscript{14}McClelland, \textit{Presenting Nature}, 108.
In 1927 Frank Kittredge, who have worked as a special assistant to L.I. Hewes of the Bureau of Public Roads came into the position as chief engineer of the National Park Service. Director Mather stressed that roads should be constructed in national parks with as little injury to the park's chief scientific features as possible, but also he emphasized that "preservation of the forests and other natural features along the line of the roadbed, the cutting of vistas, and the harmonizing of the necessary culverts and bridges within the landscape."\textsuperscript{15}

So during the 1920s the landscape engineers had made significant contributions to the enhancement of road design in the national parks. Following principles of naturalistic landscape architecture, the roads gently followed the topography and employed the use of native materials in structures adjacent to the roadway such as log or stone guardrails. The designers built the road to incorporate specific vistas and natural features such as bedrock outcrops, rivers, and waterfalls.\textsuperscript{16} Although the agreement was a significant event for the National Park Service, it amounted to such a small item for the Bureau of Public Roads that it was not even mentioned in the latter agency's annual report for fiscal year 1926.

\textbf{Development of The Branches of Engineering and Plans and Design.}


In the early years of the National Park Service a man named Charles Punchard oversaw landscape issues in national parks. Punchard had been in charge of all landscape development in public parks and reservations in Washington, D.C., and he worked for the Office of Public Buildings and Grounds. When hired by the national park service in 1918, he was detailed to analyze the conditions and landscape issues at each national park, and prioritize those according to ones needing immediate attention and ones needing attention in the future. Punchard wrote and article for Landscape Architecture in which he stated that the job of the landscape engineer was to balance the aesthetics of scenery with development for visitor use. Punchard saw the landscape engineer as the arbiter of aesthetics for the national park, and the person who decided upon the location of roads, vista clearing, preservation of timber along the roads, as well as the architectural character. He was also the village planning commission, who oversaw the development of concessionaire and national park service improvements.

Punchard wanted to achieve the balance between preserving natural scenery and developing facilities by adopting careful planning and then following through.\textsuperscript{17} During his short tenure with the national parks--Punchard died from tuberculosis in 1920--he pushed for naturalizing borrow pits that had been used in construction, especially those along roadways. He encouraged that new ones be located out of visitors' sight. He stressed the importance of

\textsuperscript{17}McClelland, Presenting Nature, 80-82.
scenic details to the aesthetics of the park. He pushed for roadside clean-up and the removal of dead or downed timber around scenic features. He stressed framing vistas to present the scene to greatest effect. He screened things considered unsightly, such as utility areas. In short, he expanded on some of the principles that Andrew Jackson Downing had employed during the 19th century. Following the death of Charles Punchard, landscape engineer Daniel Hull took his place.

The second strong personality to come into play in park design was an engineer named George Goodwin. Mather and Albright met engineer George Goodwin at Crater Lake in 1915. Goodwin's work impressed them so much that they hired him away from the Corps of Engineers and made him chief engineer of the National Park Service, with an office in Portland. Goodwin served as a counterpoint to Charles Punchard, the head of the division of landscape engineering. Mather wanted to ensure that the national parks received adequate treatment for their scenic qualities, and that all improvements harmonized with the landscape. He figured he could accomplish that with the team of Punchard and Goodwin.

During the 1920s additional changes occurred in the National Park Service. Thomas Chalmers Vint began working for the National Park Service in 1922 as chief of planning, headquartered in Yosemite. The following year his office moved to Los Angeles, and in 1927 the

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18McClelland, *Presenting Nature*, 82-84.
19Albright, *The Birth of the NPS*, 104.
office moved to San Francisco. Between 1927 and 1935 this branch—which became known as the Branch of Plans and Design—grew from three employees to 120, and when the Emergency Conservation Work projects came into being and when the Branch took over responsibility for state park work in 1936, the number swelled to 220. The Branch was responsible for preparing master plans governing development in the parks and monuments, providing advice to the director and to superintendents on matters varying from architecture and landscape architecture to development policy. Also included in its duties was collaboration with the Public Roads Administration and the Bureau of Public Roads in the survey, planning, and construction of parkways and park roads.20

The field office that Mather established in San Francisco in 1927 contained a group of people to oversee park development and management. The branch of engineering programmed funds for roads and trails work and provided services to those parks without resident engineers. The landscape division produced landscape plans and architectural drawings for bridges and buildings, and they reviewed building proposals from concessionaires. By the late 1920s, the landscape division had grown to include a broader-scoped park planning based on the early design principles of the park service: design in harmony with the landscape. Under Vint's leadership the Branch of Plans and Design developed a design ethic that sometimes became idiomatic in its use and re-use of design with nature.

20Kieley, A Brief History of the National Park Service, 23-24.
The Branch of Engineering had its roots under the guidance of George Goodwin, who continued working there through the passage of the 1924 Roads and Trails Act in which funds for park roads were first appropriated. When Goodwin resigned after a disagreement with the director, the park service put all major road-building activities in the hands of the Bureau of Public Roads, and Bert Burrell became acting chief engineer. After the bureaus signed the Interbureau Agreement, Frank Kittredge took over responsibilities as chief engineer in 1927, and the small office moved out of Yellowstone to San Francisco where it shared space with the Landscape Division. After 1930 a shift in development occurred as congress proposed the establishment of more parks in the east. As a result a field office for engineering was established in Washington to meet the demand posed by areas such as Shenandoah, Great Smoky Mountains, and Blue Ridge Parkway.

The gradual increase in eastern work for the engineering division continued through 1933, at which time a number of other areas including national military parks and monuments were transferred into the National Park Service. As a result, the workload grew tremendously. During the 1937 regionalization of the service the office of the chief engineer moved to Washington.21

The Development of Road Standards. Some ideas about park roads were readily adopted by the professional design staff of the National Park Service. Frederick Law Olmsted, Sr., for instance, 21Kieley, A Brief History of the National Park Service, 24-28.
suggested a one-way loop road for the Yosemite Valley during the 19th century. Also separation of traffic paths by type of use in national parks was helpful, such as main park tour roads, bike or auto trails, fire roads/truck trails. The road and trail systems at Acadia and Shenandoah were built following that principle. At Acadia the well-landscaped carriage roads were built at different grades and along different paths than the main park tour road. Shenandoah had the Appalachian Trial, Skyline Drive, fire roads that led down into the hollows and served primarily as administrative roads for patrolling the boundaries, and separate hiking trails to individual features such as mountain tops or waterfalls. The landscape architects ensured that the resources were always protected from any damage that might occur during construction, and to ensure design in harmony with the landscape of the park. So these were all parts of larger systems.

Other issues that the park service designers readily embraced dealt with the process of experiencing a road or a trail. A feature, such as a river, could be viewed from a variety of different points, so even though it was the same river, the driver could experience more aspects of the river than a single view would provide. Henry Hubbard believed in laying the road so gently on the land that the natural topography was disturbed as little as possible, and simulating the natural surface of the landscape as much as possible.

In 1926 Mather directed George Goodwin to develop new standards for
park roads based on some of the ideas that Dr. Lawrence Hewes of the Bureau of Public Roads had put forth at the superintendents’ conference at mesa Verde in 1925. Goodwin believed that it was impossible to build roads to those standards under the existing budget, so Mather accepted his resignation. Mather then asked Hewes to complete the road standards, and Albright worked with Hewes in developing the Interbureau Agreement between the Bureau of Public Roads and the National Park Service that covered the planning and supervision of road construction in national parks.²² The standards that evolved for road construction became a cooperative effort between the National Park Service and the Bureau of Public Roads.

By the mid-1920s a number of advances occurred in park road design. Some of the efforts included eliminating hazardous curves, switchbacks, and steep grades. Engineers from the Bureau of Public Roads and the National Park Service worked on details such as drainage, surfacing, and construction of revetments. The park service landscape engineers worked on aesthetics including location, viewpoints and vistas, architectural character, and following the natural contours.

The landscape engineers took into account not only the view from the road during the entire driving experience, but the view of the road itself from other locations in the park. They made every effort to blend the road in with its natural surroundings and to

²²Albright, The Birth of the NPS, 194-195.
naturalize the landscape following construction through a variety of means. In the joint effort between the two agencies, the designers made advances in road engineering, too. Cut-and-fill operations became more commonly used in maintaining an even grade. Curvilinear stretches with radial curves superseded the tangents that had been used earlier in road construction. The engineers began using superelevations in both roadways and bridges for a smooth driving experience at higher speeds. As the designers progressed into the parkway designs of the 1930s, they also began using a combination of transitional curves based on spirals and superelevations. Most park roads kept to a 5 percent grade, although some rough park topography dictated 8 percent grades in a few areas.  

Other standards became more specific. In 1934 landscape architect Tom Carpenter sketched out a draft of "Approved Procedure for the Carrying out of the Design and Construction of Major Road Projects in National Parks for the Transaction of Business Between the Branch of Plans and Design in the Office of National Parks and the District Regional Offices of the Public Roads Administration." Although the Interbureau Agreement contained the general procedures that the two agencies used, problems often arose in their implementation. Carpenter’s document provided guidance in how the agencies could work together so that each agency could achieve its goals.

23McClelland, Presenting Nature, 102-104.

24WASO file 630, Roads, General, January 26, 1934.
Next, the National park Service adopted General Specifications for Forest and Park Projects, F.R. 50, 1935 edition, with a few modifications to the provisions recommended again by landscape architect Tom Carpenter. Some points were minor. The General Specifications stated that the engineer would indicate to the contractor the trees and vegetation that needed to be protected from injury during the course of road construction. Carpenter recommended that all trees and vegetation not to be cleared be protected from injury. Carpenter was concerned, for instance, that the obliteration of old roads did not include the use of duff for a cover. His greatest criticism came in the specifications for stone masonry. The 1935 edition of General Specifications were far too general. Instead, Carpenter pushed for the use of the 1932 "Specifications for National Park Road Construction." Those stated:

Where rock supply is of blocky types (such as granite, basalt, some limestones, or river boulders) individual stones shall have face heights between eight and thirty inches and face lengths between 20 and 72 inches, the object being to use stones whose average length is 2-1/2 times their height, with a minimum ratio of 1-3/4 to 1. Such stones shall have minimum face areas of 200 square inches, maximum areas of 2100 square inches, and shall average 600 square inches or larger. Stones with more than two right angle corners will not be permitted. Where rock supply is of elongated types (such as
stratified limestone, sandstone, shale) individual stones shall have face heights between 60 and 20 inches and lengths between 24 and 90 inches, the object being to use stones whose average length is four times their height, with a minimum of 2-1/2 to 1. Such stones shall have minimum face areas of 150 square inches, maximum areas of 1800 square inches and shall average 400 square inches or larger. Rectangular stones may be used. Exception is made to this in headwall for pipe culverts [where] . . . individual stones shall have minimum dimensions of 6 x 15 inches, the object being to average the wall with stones, whose wall lengths are 2-1/2 times their wall heights. Selections may be made with as low a ratio of length to height as 1-3/4 to 1, and as high as 3-1/2 to 1.\textsuperscript{25}

Carpenter also stated that the new specifications should establish the proportion of weathered and unweathered stones in a project. Also, he wanted the size of the mortar joints to be in proportion to the heights of the stones used. Wider-sized joints should be used with stones of greater height, and the smaller ones used with stones of lesser height. He anticipated that most joints would be from 1 to 1-1/2 inches wide; but that none would be less than 3/4 inch or greater than 2-1/2 inches.\textsuperscript{26}


\textsuperscript{26}\textit{Ibid}, 9.
This road on the North Rim of the Grand Canyon exemplified some of the standards that had developed through the 1920s and 1930s. The crews revegetated the slopes with duff taken from the site and redistributed it following construction. As a result the native grasses and wildflowers took hold. The road itself wound gently through the landscape, and the gutters and slopes had the same gentle undulations. The edges of the aspen forest were cut back at varied distances to expose some of the shape of the land, to provide a longer vista, and to relieve the monotony of a uniform setback.

National Archives, Record Group 79, no date.
During the evolution of these standards, Tom Vint's shop began producing standardized plans of certain types of road construction details. Some progress had been made on the development of slopes by the mid-1920s, but in 1929 Vint's shop issued cross-sections showing a variety of slopes with rounded tops. The use of these not only reduced erosion and disturbance, but they also added a graceful curve to the landscape, which harkened back to the work of the landscape philosophers such as Olmsted and Hubbard. The tops of the banks had no overhanging "eyebrow" with an eroding bank underneath. Instead the top was rounded off, and the entire slope was naturalized. Prior to construction the contractors or later during the 1930s the CCC crews removed duff from the slope, and then replaced it after construction. This process encouraged the growth of the native vegetation, and assisted in the slope stabilization process.

Additional methods of stabilizing slopes included re-sodding slopes, installing wooden cribbing, or concrete cribbing that was later camouflaged by rubble masonry set in the embankment. Road construction and rehabilitation often involved widening the right-of-way and removing some trees along the edge. To relieve potential monotony, road edges often had variations in forest setback which gave a gentle, undulating line to the edge. All of these contributed to improved aesthetics of the park road.

During the 1920s and 1930s several types of edging materials were developed for park roads. Log and stone were the primary building
In areas of steep, unstable slopes, the Branch of Plans and Design often devised other methods of stabilizing slopes. At Hot Springs National Park, interlocking concrete cribbing stabilized the slope.

National Archives, Record Group 79, Porter Collection, 1936.
After the slope was stabilized, the specifications called for the erection of a boulder facing, with weathered sides out.

National Archives, Record Group 79, Porter Collection, 1936.
The slope received soil above the boulder facing and as an in-fill between the weathered stones. The entire slope, including the in-fill, was revegetated. A stone-lined gutter completed the design. On the opposite side of the road a log guardrail edged the downslope.

National Archives, Record Group 79, Porter Collection, 1936.
materials for guardrails. Between 1929 and 1942 the national Park Service issued several standardized designs for both types of guardrails (see Appendix E). The stone guardrail designs included specifications that emphasized rustic masonry: larger stones toward the base of the wall; weathered surfaces to the outside; random patterns; avoidance of straight lines; blending stonework with the surrounding outcrops. Variations from the simple wall included the guardrail with the crenelated top, used in some parks. Sometimes individual variations occurred in parks, such as the guardrail at the overlook on the Yakima Park Road at Mount Rainier, which included a large pyramidal shapes mimicking a mountain every fourteen feet, or the blocky coping stones that edged the road at Acadia National Park. The walls normally varied from eighteen to twenty-four inches in height, which allowed tourists to look across them an observe the view while they were driving. The masonry specifications called for using different types of stone in different manners. All, of course, used native stone. The log guardrail designs were usually simple--either squared or simply peeled logs--and consisted of a log pier with a connecting log post.27

In most instances the structural aspects of bridges were left to the park service civil engineers who coordinated their efforts with engineers of the Bureau of Public Roads. The choice of materials for the site and the design were the responsibility of the park service landscape engineers. During the 1920s bridges such as

those at Christine Falls and Narada Falls at Mount Rainier formed graceful arches that incorporated the radial curves and superelevation of the road, the guardrails, and the abutments into masterful structures of native materials that blended with the landscape. Headwalls on culverts received a similar treatment in attention to rustic detail.28

One of the most practical aspects of tunnel construction was how much of the landscape could be preserved by the construction of the roadway through the tunnel. In areas such as Yosemite and Glacier, the use of tunnels on the Wawona Road and Transmountain Road respectively minimized damage to the landscape that excavation for the road would have required. The amount of material excavated for the tunnel was comparatively small. Portals were either hewn out of the natural rock, or often enhanced to appear as if they had been. When the designers called for native stone facings, the specifications were similar to those for culvert headwalls. Tunnels often had the added bonus of viewing galleries that the designers added to relieve the monotony of the dark tunnel, provide for ventilation, and allow the visitor to experience the gradual change in elevation in the road.

Another practice that became standard was roadside cleanup following construction and on a maintenance basis. John D. Rockefeller visited Yellowstone National Park in 1924, and received a tour personally escorted by then superintendent Albright.

Rockefeller viewed conditions along the roadside in Yellowstone in the same way he saw them at Lafayette (Acadia): he wanted to do something about them. At Yellowstone two sets of telephone poles and wires served the concessionaire and the park service respectively, and dead and downed timber littered the road edges. Rockefeller saw the need to improve the scenic quality of the park. That fall Rockefeller sent a check for $12,000 to Yellowstone for roadside cleanup. He specified, however, that the money not be used for consolidating the telephone lines on to one set of poles, because he believed the government should be responsible for that. Instead he wanted it used for removal of debris.

The results of the roadside cleanup were so spectacular that Albright prepared a detailed report, complete with photographs, for Rockefeller. The philanthropist was so impressed with what the park service was able to accomplish along the road between Norris Geyser Basin and Mammoth Hot Springs that he sent the agency an additional $50,000, which Albright spent over the following four years. The park service pointed to this success at Yellowstone and finally convinced congress to appropriate funds for moving the phone lines further back in the forest. An additional benefit was that the park service included the cost of roadside cleanup in estimates for all new roads.29

A final item dogging road development was the question of a center line. Park Service Director Arno Cammerer was concerned about a

29Albright, The Birth of NPS, 162-3.
John D. Rockefeller believed so strongly in the aesthetics of national parks that he funded roadside cleanup projects at several parks including Lafayette (Acadia) and Yellowstone. This photograph, taken at Yellowstone in 1927, shows how some of the philanthropist’s money was spent in removal of downed timber along the road edge.

National Archives, Record Group 79.
The slopes bordering this culvert at Cades Cove in Great Smoky Mountains National Park received a mulch of local straw to hold native grasses. Cut saplings pegged into the ground stabilized the mat.

National Archives, Record Group 79, no date.
number of aesthetic issues dealing with park roads, and he stated that he found nothing as disconcerting as the red center stripe on the roads at Yellowstone. He also noted the lack of consistency in colors in the center stripes. Although Yellowstone's was red, Mount Rainier's was yellow, and some other parks had white stripes. He wrote to the head of construction at the Bureau of Public Roads about that, and his preference for more rustic stone work along roads. In November, 1935, Cammerer wrote a memorandum to all Superintendents stating that he was convinced that the use of a center line on park roads was not in harmony with National Park policies. He stated that he realized that some exceptions were necessary in light of traffic congestion and safety, but that the park engineer and the park landscape architect should make the recommendation. He reasoned that he wanted to keep the parks "as rustic as possible and avoid doing anything that will give them a sophisticated or citylike appearance." Cammerer's idea of keeping the roads pristine was not practical, however, in light of the levels of traffic in most park areas.

Road Development through the 1920s and 1930s. By the mid-1920s, Hull and Vint spent a good deal of their time concentrating on park roads. The usual method in which they cooperated with the Bureau

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30WASO files, 630, Roads General, Arno B. Cammerer to H.K. Bishop, Chief, Division of Construction, Bureau of Public Roads, October 21, 1935.

31WASO files, Roads, General, 1934-1936, Director Arno B. Cammerer to Superintendents and Custodians, November 21, 1935.
of Public Roads was that the NPS landscape engineer worked with the BPR survey crews in the initial layout of the road. In all matters regarding aesthetics and scenery, the park service had the upper hand.

Vint's landscape architects began feeding their road designs to the Bureau of Public Roads engineers for inclusion in roads projects. Vint's men completed tighter specifications for stonework on bridges, guardrails, and culvert headwalls, and designs for loop developments such as turnouts and picnic areas. They supervised the selection of borrow pits, selected stone to be used in construction, ensured the preservation of scenery and the parks natural resources. The park service strengthened regulations on blasting and burning to preserve the natural features.

In 1929 the Landscape Division developed a standard list of general provisions that could be incorporated into the specifications for many projects. They contained general standards for masonry work, they prohibited excavation through blasting despite the fact that it might save time, and they stressed landscape preservation. The park service called for restoration of any landscape features or timber harmed by the contractor.\(^{32}\)

By the early 1930s the National Park Service and the Bureau of Public Roads had completed a number of outstanding projects including the Wawona Road and tunnel at Yosemite, Trail Ridge Road

\(^{32}\)McClelland, *Presenting Nature*, 120.
in Rocky Mountain National Park, Going-to-the-Sun Highway (Transmountain Road) at Glacier National Park, Colonial Parkway, the Red Lodge-Cooke City Road, and the General's Highway between Sequoia and General Grant National Parks. Skyline Drive at Shenandoah had been started, and the road up Cadillac Mountain at Acadia had been surfaced. In 1930 Director Horace Albright noted that year:

...is important in the annals of this division as the year in which the fruits of its labors to protect the roadside and the natural landscape generally during road and trail construction became definitely apparent, to the casual visitor as well as to the specialist. There is now a distinct contrast between carefully planned park roads and other plans on a strictly engineering basis. The cooperation of the road engineers aided greatly in achieving this result.  

The Bureau of Public Roads also recognized that the agreement between the two agencies had been successful.

Albright made improvement of roads and trails one of his priorities when he became Director, and he was able to convince Congress of the necessity.  

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33 McClelland, Presenting Nature, 135, citing the Annual Report...1930.

34 Albright, The Birth of the National Park Service, 265.
During 1932 Louis Cramton, special attorney to the Secretary of the Interior, summarized the regulations and policies governing national parks. He cited that national park areas maintained as such should have features of outstanding scenic, scientific, or historical value and "the resultant national interest in its preservation." Among the other topics he discussed were recreation, administration, and management:

Recreation in its broadest sense, includes much of education and inspiration. Even in its narrower sense, having a good time, it is a proper incidental use. In planning for recreation use of the parks, in this more restricted meaning, the development should be related to their inherent values and calculated to promote the beneficial use thereof by the people...Such administration must deal with important problems in forestry, road building and wild life conservation, which it must approach from the angles peculiar to its own responsibilities...in road building, the route, the type of construction and the treatment of related objects should all contribute to the fullest accomplishment of the intended use of the area...Safe travel is to be provided for over suitable roads and trails...Roads, buildings, and other structures necessary for park administration and for public use and comfort should intrude upon the landscape or conflict with it only to
An Ominous View of the Future. Despite all of the boosterism and pushes for increasing tourism in national parks, several people looked into the future and spoke ominously of what he saw. By the mid-1930s private citizens were noticing that too much development was destroying the High Sierra. Nearly all of the members of the Commonwealth Club of San Francisco voted in favor of a resolution that declared:

That California's undeveloped high mountain areas have been reduced dangerously near to a minimum for the welfare of the state, and that no further intrusions by the building of roads should be allowed without convincing proof of public necessity.  

Even as early as 1922 Robert Sterling Yard stated that "while we are fighting for the protection of the national park system from its enemies, we may also have to protect it from its friends."  

Summary. The signing of the Interbureau Agreement between the Bureau of Public Roads and the National Park Service in 1926 established the procedures for the working relationship between the

35Kieley, A Brief History of the National Park Service, 10-12.
36WASO files, 630, Roads, General, 1934-1936, containing a copy of an article from the San Francisco News, July 15, 1936.
37Alfred Runte, National Parks: The American Experience (Lincoln, Nebraska: University of Nebraska Press), 169.
two agencies. The National Park Service continued its responsibilities overseeing the aesthetics of park roads, while the Bureau continued advancing in road engineering. The development of standardized specifications and construction details in the Branch of Plans and Design ensured a uniform quality in the park's built environment. Park road design had advanced to the level of master work, and the agency accomplished what it set out to do: increase visitation. Even during the 1920s and 1930s, however, some small voices forecast problems that the roads might bring.
CHAPTER 4
The National Park Service wrote up a document that provided the distinction between parkways and highways. The document stated that a parkway was different than the usual highway because:

a. It was designed for passenger car traffic and was largely for recreational use, aiming to avoid unsightly buildings and other roadside developments, which marred the ordinary highway.

b. It was built within a much wider right-of-way in order to provide an insulating strip of park land between the roadway and the abutting private property. It thus eliminated frontage and access rights, and protected and preserved the natural scenic values. In other words, an elongated park was provided to contain the roadway.

c. It was preferably located through undeveloped areas of scenic beauty and interest, and avoided built-up communities and intensively farmed lands.
d. It aimed to make accessible the best scenery in the country it traversed. Therefore, the shortest or most direct route was not necessarily a primary consideration.

e. Grade crossings between the parkway and main intersecting highways and railroads were eliminated.

f. Points of entrance and exit were spaced at distant intervals to reduce the interruptions to the main traffic stream. A secondary parallel road was frequently provided to carry local traffic to an access point.

g. Scenic easements were introduced in order to secure a maximum of protection without increasing the amount of land to be acquired in fee simple.¹

Even today, the large commuter-type parkways that come under the jurisdiction of the National Park Service receive rave reviews from their users. An article in the Washington Post in December, 1993, stated:

Among local road-buildings, the national Park Service is the tortoise. The agency seems to take forever to finish a project. But when it’s done, it looks beautiful. The

trouble is getting to the finish line... What other agency plants tulips and daffodils along its roadways? The Suitland Parkway, built as a connector between Washington and Andrews Air Force Base during World War II and left incomplete when the war ended, is being rebuilt to make a dangerous two-lane road into one that is four lanes wide and divided, and the segments that are finished are something to behold. Smooth road surface: a wide, grassy median; low stone walls; large grassy areas on both sides, with buffering trees blocking out development; flowering crab-apple trees along the roadway to vie something of the effect of the Tidal Basin in spring.²⁵. PARKWAYS. Associate Director A.E. Demaray of the National Park Service presented a paper before the council meeting of the American Planning and Civic Association in Washington in January, 1936. In it he gave a brief history of federal parkway legislation. The first reference to such legislation was in the Act of May 23, 1928 that provided for the Mount Vernon Memorial Highway. The Act called for a highway and included provisions for the "planting of shade trees and shrubbery and for other landscape treatment, parking and ornamental structures," and a right-of-way with a minimum width determined by the commission to oversee it. Next came the legislation for George Washington Memorial Parkway in

May, 1930. Two months later Congress established Colonial National Monument and included the condemnation of rights-of-way not to exceed 200 feet in width to connect Williamsburg, Jamestown, and Yorktown. In May of 1934, the legislation for Natchez Trace Parkway was passed, to construct a national road along an old Indian trail. Under the National Industrial Recovery Act, the first step toward parkway construction was begun after the President had approved the construction of a parkway connecting Shenandoah and Great Smoky Mountains National Park, and he requested work begin as soon as possible. Demaray again summarized how parkways were different from regular highways: they were designed for passenger traffic and recreational use; they had a wider right-of-way than a normal highway so they were insulated from private property; they went through areas of scenic beauty and interest; they provided access to the best scenery if it meant making the route longer; grade crossings were eliminated; parkways had minimal exits and entrances; they used scenic easements to protect the land but not acquire it fee simple. The scenic easement prohibited the construction of buildings, pole lines, or structures other than farm buildings; no private road construction; no dumping; no billboards.3

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In 1938 the basics layout of Blue Ridge Parkway connecting Shenandoah and Great Smoky Mountains National Parks was underway. This photograph was taken at Ice Rock in 1938.

National Archives, Record Group 79, Rhinehart Photo.
Glimpses of Appalachian culture were visible along the parkway. This photograph of an ox cart trundling along the road was taken near Bluff's Park in April, 1938. The contrast between the technically advance on-going construction work and the primitive local conditions was sharp.

National Archives, Record Group 79, Rhinehart Photo.
CHAPTER 5
The road systems in each of the national parks developed differently. Many were started prior to the establishment of the National Park Service. Some were old mining roads that were suitable enough to be upgraded into wagon and motor roads. The army built others for patrolling purposes, and then at the request of the department of the interior and through congressional appropriations expanded some of them into touring roads. As more parks were added, some of them came with existing road systems, and others such as Bandelier National Monument came with no roads at all.

In this chapter some of the patterns of development of roads are explored to show the ways in which some of the road systems in the national parks developed.

Yellowstone. Yellowstone National Park is famous for its grand loop road. Yellowstone received its first appropriation for road construction in the 1880s, and the responsibility for it was placed with the Corps of Engineers. In 1883, Captain D.C. Kingman was the first officer detailed as an engineer for road construction at the park. The majority of the layout, however, came under the command of General Hiram Chittenden who came to Yellowstone at the end of
the Spanish-American War. Between 1902 and 1905 congress appropriated more than a million dollars to reconstruct roads in Yellowstone. Besides the repair work that was completed during this time, the army constructed a new stage road from Canyon to Mammoth Hot Springs by way of Dunraven Pass and Tower Falls. This completed the loop road around the park.¹

Stephen Mather led the auto tour that officially opened the Grand Loop Road at Yellowstone.² The road wrapped around the park through more than 100 miles of territory, and it brought visitors to some of the most scenic areas of the park.

During the 1915 National Park Conference, Major Fries who was in charge of road construction at Yellowstone stated that the army was in the process of constructing some high-class roads of broken stone with an oil finish. For cheaper roads the army usually spent about one hundred dollars per mile. In one stretch of that type of cheaper road, they had already constructed 55 wooden bridges.

Also Major Fries described the work situation at Yellowstone, where often 300 miles of roads were being repaired or constructed at one time, and there was only a very short working season. Sometimes 400 to 500 men were working at the same time. Also road construction during 1915 still required the use of horse and mule teams, and the teams required forage. Also Fries stated that he

¹Kieley, A Brief History of the National Park Service, 24-25.
²Foresta, America’s National Parks and Their Keepers, 27.
In Yellowstone, the army constructed the road over Dunraven Pass that connected Canyon and Mammoth Hot Springs between 1902 and 1905. This completed the loop road around the park. Dunraven Peak rose above the road in the background.

National Archives, Record Group 79.
At Yellowstone, the construction of the Spiral Bridge at "S" Hill over Sylvan Pass on the Cody Road followed traditions established in railroading in the west. When steep grades over passes were difficult, a loop over a bridge accomplished the change in grade.

National Archives, Record Group 79, no date.
The construction of the Cody Road with its Spiral Bridge depicted the early emphasis in park road construction. Engineering was of primary importance; aesthetics were secondary.

National Archives, Record Group 79, no date.
planned to put some steel bridges in the park with concrete decks. In addition, he hoped to reduce all grades in Yellowstone to 6 percent. Oil macadam roads of any steeper grade were usually impossible for stock.³

As noted earlier, when automobiles were first introduced to Yellowstone the park manager established schedules to accommodate both the horse-drawn and motorized vehicles. He hoped to minimize any disruption that one type of transportation might cause the other. By 1916, however, horse-drawn vehicles were being phased out, so that the entire road system was in the process of being turned over to motorized vehicles. That same year Mather stated that road construction and improvement at Yellowstone stayed with the engineer corps of the army, but he also cautioned that the national park service should take on planning and supervision of those improvements.⁴

By the 1920s small annual appropriations were available for road repair and reconstruction, and some of the funding was used for road widening.⁵

Mount Rainier. In 1915 road development was one of the major factors facing Mount Rainier. By that time only 20 miles of road

³1915 Proceedings of the National Park Conference, 73-75.
⁴Mather, Progress in the Development of the National Parks, 11-12.
⁵Kieley, A Brief History of the National Park Service, 25.
had been constructed within the park, and repairing and maintaining those roads proved an arduous task. The road went up as far as Paradise Valley, and the state of Washington was building a road from North Yakima to the east side of the park. The original plan called for constructing roads to encircle the park. In that year the state was nearly ready to move forward with appropriations on approach roads to connect with the park roads at various locations, but the department of the interior was lagging behind and had not yet decided where the roads were going within the boundary and where those connections should be made. The secretary of the Tacoma Chamber of Commerce verbalized the views of his organization:

We have in mind a great highway crossing from Puget Sound to the southern border of the Mount Rainier National Park, down into the great fruit valleys, and it will be an inspiration that one will never forget, when, after a comfortable breakfast, he can get into an automobile and take that morning drive through those heights, always with this magnificent dome in sight, and have his dinner in the great fruit valleys of the Yakima. What an inspiration!6

As in other areas, the push at Rainier was part of a larger scheme, and here it included developing the park in conjunction with the broad region of the Pacific Northwest.

61915 Proceedings of the National Park Conference, 161.
In 1916 the Rainier National Park Company operated an automobile service between Seattle, Tacoma, and destination points in the park. At that time the only road entering the park went from Nisqually to Paradise. Mather noted: "In an automobile one may travel from the cities of Tacoma and Seattle to Paradise Valley and return in one day and in a few hours of this period cover every foot of road in Mount Rainier Park." Also the park service was surveying the Carbon River Valley from the town of Fairfax, with hopes of making accessible Spray and Moraine Parks. In conjunction with that the State of Washington was considering extending the state highway from Orting to the beginning of the new park highway, which would open up the north and west sides of the mountain.

By the mid-1920s things had changed. The Rainier National Park Advisory Board submitted fliers to congress and the national park service pushing for additional road development inviting the federal government to make good on its promises. The state of Washington and the four counties surrounding the park had managed to construct the approach roads to four corners of the park, with some assistance from the forest service and federal aid funds. The company chided that congress was unwilling to appropriate funding for road building inside the park until the connecting roads were completed, and the company demanded that congress now satisfy its

7Mather, Progress in the Development of the National Parks, 22.

8Mather, Progress in the Development of the National Parks, 22.
part of the bargain.⁹

1924 was the first year that the road into Longmire was kept open during the winter. The park used a snow-plow ahead of a caterpillar to move the snow. That same year the Nisqually road from the park entrance to Paradise Valley was open to two-way traffic. This shortened the driving time from Seattle and Tacoma by one hour.¹⁰ Although the road was opened, construction on it was not completed. Necessary were four bridges, a number of culverts and drainage ditches, some widening in spots, and final surfacing.

Stephen Mather suffered a stroke in November, 1928, that left him paralyzed. The only word he was able to say after the stroke was "cascades." When Albright went to visit him, he asked Mather about a series of projects that involved cascades. Finally, he struck upon it. "'Cascade Mountains in Washington?' His eyes crinkled in a smile. That was it! He wanted to know about the new highway across the northeaster corner of Mount Rainier that the state of Washington was planning to name after him. I told him the designation had gone through, and that signs were now going up along the highway, designating it 'Mather Parkway.' A relaxed, satisfied look came over his face, but he didn't try to do any

⁹NARG 79, Entry 17, Box 6, Undated Clipping "Is This Important," printed by the Rainier National Park Company.

¹⁰1924 Annual Report of the Director, 46.
Glacier. In 1916 Mather proposed the construction of additional roads into Glacier National Park. At the time there was no connecting road between the road systems on either side of the park. Mather proposed a road along the east side of Lake McDonald to provide access to Lake McDonald Lodge, and then a road across the continental divide. Eventually he hoped to develop a road up the McDonald River Valley, over Flattop, and into the Waterton Valley to Waterton Lake.  

Also the park service looked beyond the park boundaries in trying to protect the scenic qualities of the landscape. At the time of construction, the Belton-Lake McDonald Road was on patented lands. Mather pushed and succeeded in saving the dense forest of trees that grew along the road's edge in order to preserve the area's scenic quality.  

The passage of a sundry civil bill in 1916 contained an appropriation of $110,000 for the protection and improvement of Glacier Park. The park spent $45,000 of that money on road improvements on the east side in the Blackfeet Indian Reservation.

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11Albright, The Birth of the NPS, 222-223.

12Mather, Progress in the Development of the National Parks, 13.

13Mather, Progress in the Development of the National Parks, 14.
At Glacier National Park the construction of the Transmountain Road, better known as the Going-to-the-Sun Highway, was an accomplished feat of engineering in the roughest terrain ever encountered by the Bureau of Public Roads and the National Park Service. The road skidded along the edge of the mountains in a gradual lift up and over Logan Pass.

Rocky Mountain Regional Office, no date.
Edging the Going-to-the-Sun Highway and protecting autotourists from driving over the precipitous edge was a standard Type No. 2 guardrail developed by the National Park Service. The crenelations added texture and relieved the monotony of the wall surface in the rugged mountain environment.

Rocky Mountain Regional Office, no date.
between Glacier Park Station and Divide Creek.  

By 1924 work on the Transmountain Road was well underway, and the other park roads were maintained at a higher standard because the Flathead County Commissioners furnished two trucks and $300 for repairing the North Fork Road. That same year the approach roads leading to the park had undergone significant improvements.

Yosemite. The only road entering Yosemite from the east side was the Tioga Road, known originally as the Great Sierra Wagon Road. Chinese laborers working for the Great Sierra Consolidated Silver Mining Company constructed the 56-mile dirt road in 1882-83. When park service director Stephen T. Mather became convinced that the appropriation for its purchase would not be forthcoming from congress, he raised the money to purchase it from private sources that included the Sierra Club, and he contributed the remainder of the purchase price out of his own pocket.

In 1916 Mather stated that the roads in Yosemite were far inferior to the Yellowstone roads. That year he noted that the Tioga, Big Oak Flat, and El Portal roads needed extensive work, and he wanted them to be put into as good a condition as the state highways with which they connected. The Wawona and Chinquapin roads, however, were toll roads that were not under the control of the National

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14 Mather, Progress in the Development of the National Parks, 14.

15 1924 Report of the Director, 50.
Park Service, and Mather bemoaned that fact. Also the practice at Yosemite during that year was to tax automobiles that came into the park and use that money for road improvements and maintenance because the park had no congressional appropriation.\textsuperscript{16}

Two years later construction crews were in the process of completing reconstruction on four miles (out of eight) of the El Portal Road into the valley. The road width on that section had been increased to 20 feet and rock copings had been constructed where necessary. Also the park staff widened the valley roads to 20 feet and topped them with 3-6" of gravel. The problem that the staff kept running into, however, was that the gravel they used was a decomposed granite common throughout the foothills of the Sierra. The gravel was soft and disintegrated too quickly under heavy travel. The director noted: "... in the nature of things the overwhelming majority of visiting cars always will make the valley their headquarters, the absolute need of hard, durable valley roads is apparent; the alternative is increasingly great sums spent every year on repairs to the surface. I myself think that eventually we shall have to lay concrete roads in the valley as a measure of economy."\textsuperscript{17}

By 1918 the Tioga Road had justified its purchase and became a popular gateway into the park. Motorists often drove a loop from

\textsuperscript{16}Mather, \textit{Progress in the Development of the National Parks}, 18-19.

\textsuperscript{17}1918 Report of the Director of the National Park Service, 46.
San Francisco to Lake Tahoe, over the Tioga Road into Yosemite, and back to San Francisco through Modesto or Stockton. This spread park visitors out over a larger area. But even at that time the number of tourists in the valley was so great that the director commented: "The concentration in the valley has limits beyond which something vital is lost."\(^{18}\)

Between 1932 and 1937, the national park service realigned the eastern section of the road from Cathedral Creek near Fairview Dome to the eastern boundary of the park at Tioga Pass. Between 1935 and 1939 the park service worked on about 14.5 miles of the western section of the road, realigning parts of it at paving it from Crane Flat to the White Wolf intersection. As part of Mission 66 the 21-mile-long central section between White Wolf and Cathedral Creek was realigned and repaved between 1957 and 1961.\(^{19}\)

This last section was one of the most controversial road projects. The careful work completed during the 1930s included upgrading alignments, grades, cuts, and fills, and blending all structures along the road including bridges and culvert headwalls with the landscape. Besides receiving in-house review and approval in the National Park Service and the Bureau of Public Roads, a group of citizens known as the Yosemite Advisory Board reviewed and approved each step of the project. Members of the board included San

\(^{18}\)1918 Annual Report of the Director, 48.

\(^{19}\)Harlan Unrau, Historian, Western Team, to Manager, Western Team, Trip Report, June 28-July 3, 1992, Yosemite National Park.
Francisco engineer and conservationist Walter Huber, landscape architect Frederick Law Olmsted, Jr., and William Colby of the Sierra Club. When that final section of road was under construction engineers with the Bureau of Public Roads and politically active conservationists went head-to-head.

Safety standards had improved since the road reconstruction had started during the 1930s, and the new design offered by the Bureau of Public Roads during the mid-1950s included four-foot shoulders on either side of the twenty-foot road. The park service wanted two-foot shoulders with turnouts where terrain allowed. The park service contact Walter Huber, who was past president of the Sierra Club and past president of the American Society of Civil Engineers. Huber, who had built a number of roads in the Sierra, sided with the park service on the two-foot shoulders, with the exception of one section of road where three-feet would be necessary. The Bureau of Public Roads accepted the decision of the park service.\(^{20}\)

In December, 1924, a convict camp was busy constructing the last section of the Yosemite's "all-year highway" along the Merced River. This project, under the aegis of the California State Highway Commission, was being built 30-feet wide with easy grades "in accordance with the best modern highway construction methods and specifications." While that road was being constructed, the director was concerned about the increased traffic that it would bring that would tax roads within the park that were in a

\(^{20}\)Wirth, Parks, Politics, and the People, 358-360.
deplorable state. The park spent thousands annually in a futile attempt to maintain roads that were hopelessly inadequate, and many of the roads needed complete reconstruction to safe widths and reasonable grades.

**Crater Lake.** In 1916 the War department was working with a $50,000 appropriation for constructing a scenic highway around the lake. This was being completed under the direction of the army engineers.

By 1924 the macadam approach roads to the park from Medford and Klamath were in good condition. The only problem was that Crater Lake's 57-mile-long road system had no surface and had a hard time standing up to 200 cars a day. Also, the pumice gravel rutted badly, and the snow loads in the winter combined with the desert dryness of the summer created additional problems that needed attention.

**Sequoia and General Grant (Kings Canyon) National Parks.** Funds were meager for the development of Sequoia at first, and access up through the Sierra foothills was difficult. But in 1916, Congress appropriated funds for the construction of a new bridge over the

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During the 1920s the road system at Crater Lake had no surface, and the pumice gravel caused maintenance problems, such as this pothole. This photograph was taken of the south entrance road.

National Archives, Record Group 79.
By 1918 Tulare County constructed a new concrete road from Visalia to Three Rivers, the gateway community to Sequoia National Park, which guaranteed an increase in visitation. Also, the park staff extended the road from Giant Forest to Marble Fork (Lodgepole) where they opened up a new automobile camp. This relieved some of the pressure on the numbers of people flocking to Giant Forest. The connecting road link between Marble Fork and Grant Grove was proposed but not yet under construction by this time.

By 1924 the General's Highway to Giant Forest was still not completed, but three miles of newly constructed road had been accomplished that year. A boasting note in the director's annual report to the secretary of the interior noted that "the work was so carefully done by General Foreman James B. Small that the preservation of landscape value has brought forth praise form all visitors, whether trained engineers or architects or casual observers." Although the park scheduled the road opening that year, all agreed that the quality of the work offset the delay.

Also by 1924 access to General Grant National Park (Grant Grove) was easy enough that motorists could drive up from Fresno and

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24Mather, Progress in the Development of the National Parks, 22.

251918 Annual Report of the Director, 53.

261924 Annual Report of the Director, 53.
Tulare Counties in high gear on the Sand Creek and Dunlap roads. At the time most of the travel into that park way by local people, but the park service intended to increase national visitation with the completion of the General's Highway.  

Rocky Mountain National Park. The Organic Act that established this park included a clause which stated that no more than $10,000 could be appropriated annually for the administration, protection, and improvement of the park. Although that amount was adequate at the time for the administration and the protection, the money did not even come close to meeting what was required for improvements, especially roads. During 1916 the state of Colorado had constructed part of the road across the continental divide from Estes Park to Grand Lake through Fall River and over Milner Pass, and the state continued to build a few miles each year.  

By 1924 the director reported that road improvement was the primary park need. Sharp turns needed widening, steep grades needed reduction, and the wooden bridges needed replacement with permanent masonry ones. Also four sections of retaining wall along the Fall River road collapsed, and the roads in those sections were widened, and the retaining walls were replaced with gravity slopes.

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271924 Annual Report of the Director, 54.
28Mather, Progress in the Development of the National Parks, 25.
291924 Annual Report of the Director, 43.
After a steep climb through the foothills above the San Joaquin Valley, the General's Highway that connected Sequoia National Park and General Grant (later Kings Canyon) National Parks skirted along the western slope of the Sierra at the 7,000-foot level. The road was still under construction in this photograph.

National Archives, Record Group 79.
The official ribbon-cutting ceremony to open the General’s Highway from Sequoia National Park to General Grant National Park took place at the Clover Creek Bridge on June 23, 1935. The bridge itself was a masterpiece of rustic design.

National Archives, Record Group 79.
Mesa Verde National Park. Because of the steep edges of the mesa and unstable soil conditions, the park historically had problems with access and secure road construction. In 1916 the original road into the monument was in unsatisfactory condition, but nevertheless 1,385 people made it to the top of the mesa.\(^{30}\)

In 1924 the director reported that the Knife Edge Road had been damaged by wet weather and high winds, so the shale below the road kept slipping off. The width of that main road into the park was reduced to 9 feet for a distance of more than one thousand feet because of the slumping.\(^{31}\)

Grand Canyon National Park. In 1924 the park was open all year, but only 7.5 miles of year-round road had been constructed. As a result many visitors who did not hike the trails shortened their stays. While again pushing for higher visitation, the director in his 1924 report to the secretary, stated that the park hoped to build east to Grand View and Desert View, and west to Havasu Canyon and the Havasupai Reservation from the railroad terminus near El Tovar on the south rim if the appropriation came through. In the same report, the director pointed out the abundance of road material on the south rim, and how the construction of an all-year road at the canyon was inexpensive compared to other locations. But most importantly, the director stressed that new road

\(^{30}\)Mather, Progress in the Development of the National Parks, 27.

\(^{31}\)1924 Annual Report of the Director, 55.
construction meant a longer stay for visitors in both the winter and the summer ($). 

Acadia (Lafayette) National Park. The construction of roads at Acadia was an issue of local controversy. Director Mather and the secretary of the interior reviewed the situation again in 1924 and approved the dual road construction program of carriage trails for horses and roads for motor cars. The director boasted about the construction of the first automobile road that was funded by donations. He wrote:

It is in every sense a park road and far from bringing any discordant element into the landscape will open its interest and wild charm to countless visitors. The road to the summit of Cadillac Mountain, which branches off from this motor road, is planned for construction when funds authorized for the park road program become available. In this connection I desire especially to commend the superintendent and his forces for the painstaking care that has been taken in this construction work not to mar the park landscape. I consider the work that has been done the finest I have observed in mountain road building and I have in mind having all the road engineers of the National Park Service personally inspect the work so that they may take back to their own desks a desire to emulate the fine work that has been
accomplished at Lafayette.\textsuperscript{32}

Hot Springs National Park.

Denali (Mount McKinley) National Park.

Shenandoah. All of the bureau chiefs from Interior had a meeting with President Hoover at Camp Hoover in 1931, and Albright went out on a trail ride with him. On that ride, Hoover recommended the construction of a road: "The President called for me to bring my horse up alongside his. We looked at the view for a moment. Then, pointing out the flat, even contours of the ridge, he said, "You know, Albright, this mountain top is just made by God Almighty for a highway. There's nothing like it in the country, really, where you can see such vistas." He paused for a few moments, gazing at the beautiful scene. Then he added, "I think we should get a survey made for a highway here, and I think it can be built at a reasonable cost." Albright went forth with a contract with the Bureau of Public Roads to run a survey line, and eventually funding came through to acquire the land, located within the authorized boundary of Shenandoah National Park, and build the road. One of the important issues connected with the road was Hoover's insistence on the employment of local farmers who were suffering from the effects of a long-term drought. They and their equipment built much of the road.\textsuperscript{33}

\textsuperscript{32}1924 Annual Report of the Director, 59.

\textsuperscript{33}Albright, The Birth of the NPS, 266-268.
Scenic overlooks such as this one at Stony Man were characteristic of Skyline Drive at Shenandoah. The stonework of the guardrail and curbing blended well with the boulders and native tree placed in a naturalistic fashion in the grassy island separating the road from the turnout. Of paramount importance along Skyline Drive were the vistas.

National Archives, Record Group 30.
Blue Ridge Parkway. John D. Rockefeller made donations of land along the parkway to the forest service and the park service, including the Linville Falls area in North Carolina.⁴

Construction started on Blue Ridge Parkways under the National Industrial Recovery Act of June 16, 1933, and specific authority for it came in 1936. Land acquisition and subsequent work on the parkway continued up until World War II, but by the time Mission 66 was initiated, only about one-third of the work had been completed. Although Conrad Wirth intended to finish the entire parkway during the Mission 66 program, he was unable to do so. Mission 66, however, did cover the cost of more than 75% of the parkway.⁵

Colonial Parkway/National Monument. In early 1930, Albright was part of a group who drove along the James River from Jamestown through Williamsburg to Yorktown. Rep Cramton was in the group, and he drew a map of the three areas and suggested connecting all three with a parkway.⁶ They designed the parkway to follow the shoreline--both the most economical and scenic route.⁷

Great Smoky Mountains.

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⁴Wirth, Parks, Politics, and the People, 54.
⁵Wirth, Parks, Politics, and the People, 274.
⁶Albright, The Birth of the National Park Service, 247.
⁷Albright, The Birth of the NPS, 250.
Big changes occurred in the development of roads after World War II. The first item affecting park roads was the change that had occurred in visitation, second was a development program known as Mission 66, and the third was an overriding change in the direction of how the agency managed its resources. All of these combined forces influenced the way in which roads were constructed in national parks.

After World War II the changes in transportation in national parks had become evident. By the 1950s only between 1% and 2% of visitors came to the national parks by transportation other than automobile. So most the vehicle of choice for getting to and around national parks was the car. Yet the agency still faced the philosophical dilemma of

Development and construction of park roads came to a near standstill during World War II, and appropriations following the war were insufficient to cover the cost of delayed maintenance of the park facilities that had been postponed until after the war. The Public Roads Administration put out a report in 1942 stating: "Efforts of the Public Roads Administration during fiscal year 1942

\[\text{Runte, National Parks, 159.}\]
were centered on meeting needs of highway transport for war purposes."² The Bureau of Public Roads annual report for that year included no information on park or forest roads. By 1945, the situation had improved somewhat. While most road construction in park and forest areas was suspended during the war, a few projects were completed where timber or mineral deposits were significant and necessary for the war effort. To pick up the slack the Public Roads Administration had completed lots of survey work, soils investigations, preparation of plans and specifications, and the development and approval of upcoming projects to be completed under the Federal Aid Highway Act of 1944. The report also noted:

The funds for park highway improvement are not apportioned by states by are assigned to projects by the National Park Service in accordance with its development program. The program for park roads and parkways was nearing completion at the end of the fiscal year. Plans and specifications are now prepared for projects that will absorb all park and forest highway funds and those for parkways for the first postwar fiscal year. Construction will begin whenever it is authorized and weather permits.³


The facilities continued to deteriorate yet the visitors kept coming. The outbreak of the Korean War in 1950 further compounded this situation when congress reduced appropriations to the parks even further to cover the cost of the war effort.

To ameliorate the problem Conrad Wirth, who had been appointed director of the national park service in 1951, devised a plan which he christened "Mission 66." He targeted the program for completion in 1966, the 50th anniversary of the park service. This 10-year restoration and development plan covered every type of park facility from housing to visitor centers to roads. Appropriations for the program amounted to more than a billion dollars over the ten-year period.4

To kick off this new program, Wirth put together an American Pioneer Dinner in the cafeteria of the Interior Department. In attendance were approximately sixty members of the senate and house of representatives, members of the American Planning and Civic Association, and conservation groups. Sponsoring the dinner were the secretary of the interior, the National Park Service, and the American Automobile Association. The South Dakota state park system provided the meat for the feast: elk and bison. And Walt Disney put together the movie for the event which he entitled "Adventures in the National Parks." Distributed at the meeting was the booklet "Our Heritage."5

5Wirth, Parks, Politics, and the People, 257-258.
The guidelines for Mission 66 did not include anything specifically directed toward road construction, but only discussed them tangentially. Although park preservation was the underlying thread throughout the guidelines, other trends appeared. The second guideline, for instance, stated: "Substantial and appropriate use of the National Park System is the best means by which its basic purpose is realized and is the best guarantee of perpetuating the System." The third guideline noted that adequate and appropriate developments were necessary for public use and appreciation of an area, as well as for the prevention of overuse. Another stated that all visitors desiring to enter a park area could do so.6

Former Director of the National Park Service Conrad Wirth summarized the park service's relationship with the Bureau of Public Roads:

Before Mission 66 the master plans were loaded with projects of this type that needed financing. Mission 66 provided the momentum and resulted in a long list of completed projects that improved protection and the preservation of park values. Many of these projects involved major road construction, the engineering aspects of which were handled by the Bureau of Public Roads under agreements dating back to the twenties. Over the years the Bureau of Public Roads worked closely with the landscape architects of the design office and was very

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6Wirth, Parks, Politics, and the People, 258-260.
sympathetic to the policies of the service. It followed the approved priorities and recommendations outlined in the master plans. Differences of view regarding road standards and safety requirements admittedly caused some disagreements. The questions of location and design as well a final approval have always been the Park Service's responsibility. In the overall performance of its responsibilities, however, the bureau rendered outstanding service. It provided park visitors with excellent roads that brought a minimum of complaints.\footnote{Wirth, Parks, Politics, and the People, 61-62.}

[1960s environmentalism

The key piece of legislation to understanding this time period was the Wilderness Act, signed into law in 1964.

1960s roads standards

and Edward Abbey, Desert Solitaire.

ask Robert Linn about this. and about the committee that put together the roads standards--who they were, how they worked together, etc.

At the same time a somewhat contradictory effort was taking place within the park service--the idea that parks were for the people.
Almost twenty years later the road standards were in need of revision again. The passage of the Surface Transportation Assistance Act of 1982 set up a coordinated Federal Lands Highways Program, which made Highway Trust Fund money available for the construction and rehabilitation of park roads and parkways, as well as any other federal agency roads. The Federal Highway Administration and the National Park Service signed a new interagency agreement in 1983. According to the terms of the agreement, the National Park Service developed park road and parkway design, construction, maintenance, and safety standards. Federal Highways responsibilities included performing planning assistance, research, engineering studies, traffic engineering service, project development and contract administration. The Park Service provided architectural and landscape architectural services to ensure that "the highest standards of esthetics and resources protection are followed in the placement or road prisms and the design of structures appurtenant to park roads and parkways."8

Also, FHWA was committed under the agreement to accommodate the aesthetic, environmental, and cultural resource protection concerns

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brought up by the Park Service.

The Park Service began work on the new road standards. Besides completing its task under the interagency agreement, NPS staff noticed additional items that needed to be addressed in new road standards. An internal memo pointed to discrepancies in the application of the 1968 park roads standards, and the fact that the standards did not address the actual types of vehicular and pedestrian use going on in many park areas. As a result, Park Service Director William Penn Mott established a task force to look at park road use and to revise the road standards. Members of the task force included: Jim Straughan, Denver Service Center; Donald Falvey, Rocky Mountain Region; John Gingles, Washington Office; Robert Jacobsen, Shenandoah National Park; Gerald Lorenz, Denver Service Center; Merrick Smith, Denver Service Center; George Walvoort, National Capital Region.

The task force wrote that its purpose was to develop a document with road standards that accommodated existing and future road use while continuing to preserve the natural and cultural values of park areas, while at the same time addressing the requirements of Standard 12 of the Federal Highway Safety Program Standards and 23 CFR 1230. The task force wrote the document as a "definitive guide for manager, planners, designers and others involved in the planning, design and construction of park roads."  

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\(^9\)WASO files, Memorandum, 16 May 1983 for Association Director, Park Operations, Stanley Albright to Directorate, Field Directorate, and Manager, Denver Service Center; and Park Road
The document cited that Senate report that accompanied the Federal-Aid Highway Improvement Act of 1982 stated that roads through federal land-managing agencies must be designed to protect the significant natural and cultural features, and that they must be designed to blend with the landscape. Also because of the type of use these areas received "THE ROADS IN CERTAIN INSTANCES DO NOT HAVE TO BE CONSTRUCTED TO NORMAL HIGHWAY STANDARDS." The supporting documentation for the bill, then, noted that park roads were different, and could be constructed with a type of flexibility not allotted to state highways.

The standards provided a great deal of flexibility wherein designers could take into account variations in types and intensities of park use, differences in terrain and climate, and protection of natural and cultural resources. The document left many of the basic decisions on the application of the standards to park management. The preface and statement of purpose in the road standards again stressed the quality of the park experience and the importance of the road to that experience.

Although all of that information was included, the standards could have benefitted by interpretation of the design elements to show in more depth how using them assisted in creating that traditional "feel" of a park road. The link between the two was weak. The

Standards.

10 Park Road Standards, i.

11 Park Road Standards, i, 1.
document stressed generous rounding at the tops of backslopes "to minimize erosion and ensure long term stability and revegetation of cut slopes," for instance. But it said nothing about how the Park Service and the Bureau of Public Roads developed this method in the 1920s to accommodate stability and revegetation, and to improve the visual quality of the road and contribute to the way in which it rested gently on the land.\textsuperscript{12} That was one of the physical features that made a park road distinct. In the section on guardwalls, the document discussed choosing materials sensitive to the surrounding environment, but it did not discuss the founding principles of the rustic design ethic that gave so many parks a distinctive design vocabulary--which is often extant. Also, the height of guardwalls was not discussed from the standpoint of considering their impact on vistas and the kinetic scenery--usually highly significant aspects of the park driving experience. The treatment of historic structures was terse and inaccurate: "Preservation or restoration may be the only option for such historic roadways or structures"--when rehabilitation/adaptive use is the most common and often the most practical treatment.\textsuperscript{13} The document came closer to addressing hard safety and design issues in conjunction with park philosophy than had the 1968 edition, but it held some room for improvement.

National Park Service landscape architect Jay Bright critiqued the standards saying that they did not discuss the relationship between horizontal and vertical geometry. In his eyes--and he had driven

\textsuperscript{12}Park Road Standards, 32.

\textsuperscript{13}Park Road Standards, 32-35.
thousands of miles of park roads before he wrote his comments—the single most distinctive features of a park road was its curvilinear design. Also, the document did not stress the importance of the landscape architect in the design of park roads.\textsuperscript{14}

The question of liability and safety on park roads, however, was a thorny one that kept cropping up. The historic roads in national parks, for instance, were constructed to lesser standards than those being built in the 1980s. Disagreements often ensued between the FHWA engineers and NPS landscape architects on rehabilitation projects, too. After considerable discussion James F. Zotter, Assistant Regional Counsel for FHWA in Portland, Oregon, wrote an opinion on the tort liability of the new \textit{Park Road Standards}. In it he cautioned:

\begin{quote}
While each case must be decided on its own facts and circumstances, it is imperative that in those instances where the decision is made to construct a park road to less than the applicable design standards the administrative record describe in detail the factors that were considered in making the decision to waive the standard. Such contemporaneous records are critical to the Government's case, but even with such records, the Government bears a heavy burden in proving that its decision to waive the standards was reasonable under the
\end{quote}

\textsuperscript{14}WASO files, Memorandum, Jay Bright, Assistant Manager, Denver Service Center, to Denis Galvin, Manager, Denver Service Center, 14 March, 1983.
circumstances.\textsuperscript{15}

Yet despite this caution, statistics gathered in the mid-1980s proved that driving the Blue Ridge Parkway was three times safer than driving on state roads in Virginia or North Carolina.\textsuperscript{16}

\textbf{Summary.} Road work slowed during World War II, when the nation focussed its attention on the war effort. After years of delayed maintenance, Mission 66 helped get rid of some of that backlog, and forged ahead in the construction of new roads, housing for park employees, and visitor centers. A handful of parks, such as Acadia, were little touched by Mission 66 and retained more of their earlier character.

The political strength of the environmental movement during the 1960s culminated in the passage of the Wilderness Act in 1964. In 1968, the National Park Service published its \textit{Park Roads Standards} that echoed the sentiments of environmentalism and questioned the validity of any roads at all in the national parks. Despite the philosophical issues raised in that document, the visitors kept coming and the agency continued to repair, rehabilitate, park roads. Although the emphasis had changed during the 1960s from

\textsuperscript{15}\textit{WASO files, Memorandum, Tort Liability--Design Standards for National Park Roads, Assistant Regional Counsel James F. Zotter to Project Design Engineer Richard G. Wasill, 4 December 1895.}

\textsuperscript{16}\textit{WASO files, Memorandum, Resident Landscape Architect to Superintendent, Blue Ridge Parkway, 2 February 1983.}
As park roads such as Going-to-the-Sun aged, their significance started to emerge. At first the agency began recognizing only specific features along the roads as historic--bridges, culverts, aqueducts.
PART II
UNDERSTANDING AND MANAGING
HISTORIC PARK ROADS
Considerations. Only in this decade have we started to understand the significance of historic park roads. In March 1992, the Transportation Research Board included in a series of research needs the preparation of a study on the identification, evaluation, and management of historic highways.¹ The National Register of Historic Places has been recognizing the importance of historic roads and highways and has been working on criteria for evaluation for those resources. The Historic American Engineering Record, funded out of the Federal Lands Highway Program, has been documenting historic roads in a number of national parks throughout the United States. Various regions of the National Park Service have been preparing national register nominations for historic roads. The Olmsted Center of the North Atlantic Regional Office has been working very closely with the Federal Highway Administration and the park staff to come to a meeting of the minds on the treatment of the highly sensitive road at Acadia. The Pacific Northwest Regional Office is studying the Rim Road at Crater Lake in terms of its importance as part of the park's cultural landscape. The Rocky Mountain Region has worked out a mitigation plan for rehabilitation of Going-to-the-Sun Road at Glacier. These are only a few examples of work underway nationwide on historic park roads. All of these studies show a growing level of concern about historic park roads and the subsequent management

¹This broad study has not yet been funded; some of the work proposed in it, but by no means all, has been accomplished in this study.
of them.

In addition to those studies, the National Trust for Historic Preservation has been studying potential conflicts between the AASHTO Green Book and the preservation of historic parkways. In 1993 a program associate of that organization presented a paper to the AASHTO Task Force on Geometric Design. In it, author Paul Daniel Marriott argued that providing a safe driving environment on parkways while preserving significant historic resources is an achievable goal. The National Trust is pushing for the development of a new functional classification for historic parkways in the AASHTO Green Book that would carry with it a distinct series of standards for that type of historic road. Park roads, too, are a road of a different type that deserve a separate classification warranting distinct standards.

Although the preservation community has been quick to grasp the idea of historic roads, the physical elements that make up that road can be confusing. Understanding the nature of historic roads and then managing them accordingly is far more complex than working with historic buildings. A look at the evolution of management of historic structures might provide a useful analogy. Twenty years ago this agency looked most often at only the historic building and paid little or no attention to the surrounding landscape. Now we have evolved to a point where we realize the importance of the

building's environs and the cultural landscape of which it is a part, and we take that into account in assessing the significance of and managing the resource.

Roads are even more difficult. In earlier years we understood the importance of the structures on historic roads—the bridges, guardwalls, and culverts—but only recently have we started understanding the importance of the entire road prism, horizontal and vertical alignment, slope design, and the path that the road takes. All those, again, are physical features. In addition roads can possess intangible features, and in a sense they become intellectual properties—where the physical features of the road may not be significant, but the road's history or the use of it as an artery can be significant.

We are evolving out of our myopic view of resources into a broader vision. The only problem with that evolution is that as we gain understanding of the complexity of our resources, the resources get harder to manage. They seem to become amorphous when we try to nail down the physical characteristics, significance, and integrity.

Further complicating the issue of historic roads is their continued use in today's world. Of prime concern is safety. Lives depend on it. Many of these historic park tour roads cover some of the roughest terrain in the United States. The geography of national parks can bring with it a host of natural occurrences that threaten
road safety, from rockslides and mudslides to fires and floods. Park roads tend to have minimal width and numerous features to cause traffic jams such as scenery and wildlife. Most national parks are overcrowded to the extreme, and the primary method of access to the parks is by automobile. In addition most visitors expect a quality visual environment in any national park. At the same time we have been part of a large trend in this country involving safer highway design for high-speed driving. Most drivers have become accustomed to the easy rhythm of driving interstates and two-lane roads with ample shoulders, and most park roads do not fit into those types. Also, the concept of sustainability can no longer be ignored in a polluted world with rapidly diminishing natural resources. As a result the construction, rehabilitation, and continued use of park roads must be considered in that broader vision in terms of potential impacts to the earth's resources. Trying to mesh all of those factors is a formidable task. All of those considerations must be taken into account in managing historic park roads.

To start the sorting process of working with historic park roads, the traditional methods still work: evaluate the resource by determining significance and integrity, and then address the management direction. What the process does is help us get an idea of what is there, what it means, and what it does, and then we figure out what to do with it. The management goals might include: improving safety, moving traffic faster or more efficiently, improving aesthetics, repairing or rehabilitating existing roads,
improving drainage, enhancing wildlife habitat/crossings. In
delineating those goals, however, the broader impacts must be
visualized. A better road can mean higher speeds, increased
traffic, altered landscape or park scene, and greater visitation.

Primary park tour roads in nearly all cases were constructed as
parts of larger systems that included trails, secondary roads, and
primary park roads. For the purposes of the national register,
these roads must be considered as integral parts of these larger
systems. Most historic park roads should be evaluated as part of
Multiple Property nominations for national parks. They should not
be considered in isolation. They are an integral part of the
park's cultural landscape. A prime example of the integration of
these systems is at Acadia National Park. There, the tour roads,
secondary roads, carriage roads, and trails, form a network of ways
to experience the park. Also, they should be evaluated in terms of
statewide and nationwide systems, such as the National Park-to-Park
Highway and the connecting roads.

However most construction and rehabilitation efforts under the
Federal Lands Highway Program involve only the primary park tour
road or a section of it. Thus it is the joint responsibility of
the park manager and cultural resource staff to consider the road
or road segment within the larger context of the park's cultural
resources when assessing the impact of any changes proposed by road
rehabilitation, repair, or construction.
Grappling with historic park roads is difficult. Understanding what makes a road historic and eligible for the National Register of Historic Places can be hard to discern. Following the process below will help gain in the understanding of the significance of the road and the relative significance of all of its features.

CHRONOLOGY AND ANALYSIS. Roads in national parks most often have complex histories, and tracking that history is imperative in understanding the road as a resource. The preparation of a chronology and the analysis of that information is the first step in understanding the nature of the resource. Include in the chronology not only the date that something happened, but what that meant. When doing the assessment, think in terms of "inherited" roads as well as NPS-built roads. Often we were left with things constructed for purposes that had nothing to do with the national park. Consider overall transportation systems and their evolution—from trails, railroads, international roads. Consider the historical perspective of park roads, how they came about, how road systems are not static but are constantly developing, and evaluate what the changes did to the park experience.

SIGNIFICANCE AS HISTORIC TRANSPORTATION CORRIDOR/ARTERY. In some instances the existing road fabric may not be eligible for the national register, but the broad transportation corridor in which it sits may be. An example of that is the Tioga Road at Yosemite National Park. Because the physical features of the road had changed so much over time, minimal fabric was left that met the
criteria. Yet at the same time the corridor possessed numerous archeological features that were eligible, and the road had a checkered history that typified the growth of western national parks and the environmental movement.

The Tioga Road developed out of a wagon track to an 1880s mining venture, and it evolved into one of the primary roads to cross the Sierra Nevada. The Tioga Road was included in the National Park-to-Park Highway, and park service director Stephen Mather believed so much in its importance that he contributed financially to its acquisition. The road also was the center of a huge controversy over appropriate development for national parks during the 1960s that involved the Ansel Adams, the Sierra Club, the National Park Service, and the Bureau of Public Roads. The controversy was perhaps the largest one ever on a park road. It questioned appropriate road development in national parks, and impacts on scenic and natural resources. Thus the artery possesses archeological and historical significance, but few physical features along its length meet the criteria. In a situation such as this, the road meets certain National Register criteria, but most of what is significant about it is not the physical fabric. Thus, the driving forces behind decisions on changes to the road should be based on priorities that would include impacts on natural and scenic resources, safety, and maintenance.

SIGNIFICANCE IN LANDSCAPE ARCHITECTURE/PARK PLANNING. The elements of a road that might be significant in terms of landscape
architecture can vary tremendously. Some of these elements appear in the photographs at the end of this chapter and in the drawings in the appendices. These can include:

- the overall layout of the road and the way in which it lays gently on the land;
- the manner in which the topography dictates the design;
- the use of cut-and-fill and flat-fill slope operations;
- the manner in which the slopes are finished and rounded at the top and bottom;
- the shape and width of the road prism;
- the gentle curvilinear shapes of the road and the ways in which turn-outs are incorporated;
- the presentation of specific vistas;
- the use over the course of the road of a variety of vistas that show the variety of natural features in the park landscape;
- the integration of natural features into the road corridor;
- the use of tunnels to avoid deep scars to the landscape;
- the design of bridges, culverts, tunnel portals, and other features in harmony with the surrounding natural landscape of the park and in harmony with the built environment of the park;
- standard-plan guardrails;
- entrance features such as historic gateways and signs that mark the boundary from the outside world;
- rustic road furnishings such as benches and water stations
designed in harmony with the park's natural and built environment;
-vegetation and treatment of it along the road;
-the effect of all of the above on the experience of driving the park road.

SIGNIFICANCE IN ENGINEERING. Because of the rough terrain encountered in many national parks, particularly those in the west, the construction of park roads included major advances in road engineering and the physical processes involved in building park roads. In reviewing this aspect of the potential significance of a road, the Historic American Engineering Record has prepared background documentation on roads of the major western national parks. The division is starting documentation on eastern parks this year.

INTEGRITY. After consideration of all of the above factors, the integrity of the significant features needs to be evaluated. Carefully assess the changes that have occurred over time and the effects those may have had on the original design intent. For instance vistas that were an important feature of the park road in its early years may no longer exist because the vegetation had grown up. Mowing patterns along road edges may have altered the historic feel of the road. Widening the road and altering the slopes might have changed the manner in which the driver perceives the park and its resources. Instead of feeling an intimate connection with nature, the road may feel like just another two-
land road through a scenic area. Some road sections may retain high levels of integrity. Others may have none. In considering this category, however, evaluate the road as a whole, rather than just individual segments.

PRIORITIES. Not all features of a historic park road are of the same level of relative significance. One specific vista might be the most significant aspect of a road. The built environment along a road, such as the bridges and tunnels or even the curbing may be more significant than the views from the road. In assessing all of the significant features of a road, try to group them in order of priority. That assists in management decisions.

MANAGEMENT. In these days of comparative fiscal austerity, most road projects will probably be limited to rehabilitation. Rehabilitation and adaptive use of historic roads go hand-in-hand. The roads are meant to be used. Problems arise when certain elements that contribute to the significance of a road are determined to be a safety hazard.

One feature that is causing some consternation in rehabilitation projects these days is the stone guardrail. Most historic guardrails were constructed to only 18" in height. That height was fine for allowing visitors good views of the park landscape from their vehicles. Speed limits were so slow that safety was not a pressing issue at the time the walls were constructed. In the interim some of the walls have lost any semblance of structural
stability. Layer after layer of new pavement laid adjacent to the walls has sometimes raised the height of the pavement so much that the wall height is no longer 18."

To counteract that problem several approaches have appeared in national parks in recent years to meet safety concerns. At Shenandoah a new wall of a concrete core and stone veneer is now lining Skyline Drive. The stone veneer is of high quality and appropriate for the park setting. Unfortunately the height of the wall is such that the driver feels more as if he is driving along a parkway than a park. The height has removed the middle-ground vistas from the view of person in the average automobile, and that was one of the most significant features of Skyline Drive: the views from it.³

At Glacier National Park the stone walls that are in repairable condition will be repaired, and sections that are too decrepit will be removed and replaced with simulated stone (toned concrete cast from forms made from walls extant in the park). The height of the historic stone wall will remain. The speed limit and the size of vehicles on the Going-to-the-Sun Road will be limited. Reaching those agreements took several years, but it preserved not only the road but the entire park experience of driving the road.

³The odd part about driving Skyline Drive was that Shenandoah felt more like a parkway. Driving into the north end of the Blue Ridge Parkway felt like entering a park. The vistas were broad and open. Shenandoah’s were tight and enclosed.
A Final Word. The year of this writing, Secretary of the Interior Bruce Babbitt called for no new road construction in national parks. In his words, roads are "the enemies of national parks...They disrupt, divide and fragment animal habitat and the natural systems that are the very reason for the park. Our task is to invite visitors out of their cars and away from the roads." Instead of seeing park roads in that vein, perhaps these roads are just a job too well done. In our quest for nirvana, we have made that place a little too easily accessible, and by doing so we have invited so many that we are threatening to destroy that place of beauty and light.

Environmental historian Roderick Nash pointed out that the controversy between the natural and the utilitarian has been a historic one. In other words, objects like trees can be seen as lumber or scenery. Park roads also can be viewed from two different angles: as parts of transportation systems that provide access into and through national parks, and as integral parts of the entire park experience--and for far too many people the only park experience. The bottom line is how the nation decides to deal with them.

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The overall layout of a road on the land, the way in which it followed the topography, the native stone guardrail, and the variations between bedrock, thick forest vegetation, and open meadow land provided a variety of natural features that contributed to the park experience along the road. This was Skyline Drive near Bacon Hollow in the early 1950s.

National Archives, Record Group 30.
The entrance road at Carlsbad Caverns gently wound up the edge of the desert mesa to the cavern entrances above.

National Archives, Record Group 79, photo by Boles.
Cut-and-fill and flat-fill slope operations were sometimes necessary to provide a more even path for the roadway along a slope or mountain edge. This was Skyline Drive at Shenandoah when it was under construction.

National Archives, Record Group 30.
Sometimes placing the road so it traversed a mountain slope required disturbing a large amount of land. The finished slopes, however, were naturalized with native vegetation to minimize the impact of construction. The photograph was taken at Great Smoky Mountains National Park.

National Archives, Record Group 30.
This turnout near Swift Run Gap at Shenandoah exhibited some of the classic elements of 1930s park road design: the easy curvilinear shapes of the road, planted island, and turnout; the palette of natural materials in the curbing and stone guardrail; and the manner in which the stonework blends with the onsite bedrock. The views from Skyline Drive were an integral part of the Shenandoah experience, and perhaps the most significant aspect of that road.

National Archives, Record Group 30.
Specific vistas in national parks have become part of the collective scenic heritage of Americans. Photographer Ansel Adams made famous this view of the Tetons from the Snake River overlook. The presentation of this type of feature from the road can be a significant characteristic of the road.

NPS photo by L.S. Harrison
Other vistas along historic park roads provide opportunities to view the characteristic landscape of national parks. Here a visitor photographs Wild Goose Island and Saint Mary's Lake at Glacier National Park. Early design philosophy in laying out park roads stressed allowing the visitor to perceive the variety of scenic and natural resources available in the park landscape.

NPS photo by L.S. Harrison
Integrating the roadway with natural features, such as this cliff face of columnar jointing along the Tower Fall roadway at Yellowstone, proved a challenge to the roadbuilders. At the same time the placement of the road at the base of the overhanging cliff brought visitors into close physical contact with some of Yellowstone’s geology.

National Archives, Record Group 79.
Natural features often received place names such as this one--Indian Head at Great Smoky Mountains National Park. Again having the autotourist is such close contact with the park's features contributed to a sense of awe with the scenic wonders.

National Archives, Record Group 30.
Tunnels allowed access through terrain that otherwise might be insurmountable. The expertise in tunnel construction had evolved out of the railroads. Portals on tunnels varied from the natural bedrock to the rustic stonework shown here on the South Portal, Great Smoky Mountains National Park.

National Archives, Record Group 30.
Bridges and culverts were designed to fit into the surrounding landscape. At Cub Creek in Yellowstone, the rubble stone masonry had characteristics that blended it with the surrounding environment. These included the shapes of the stones, width and depth of the mortar joints, weathered surfaces toward the outside, use of onsite materials, and larger stones toward the base.

NPS Photo by L.S. Harrison
This Type No. 3 guardrail with the corresponding stone curb provided a clear definition between vehicular, pedestrian, and forest space. This type of development protected some of the fragile natural resources while encouraging visitors to park, get out of their cars, and seek out the highlighted feature, in this instance Gibbon Fall overlook at Yellowstone National Park.

NPS Photo by L.S. Harrison
Historic stone guardrails along park roads are an easily identifiable significant element of the road, but the wall height, relative strength of its materials when crash-tested, and jagged edges do not meet modern safety requirements.

NPS Photo by L.S. Harrison
Historic roads into national parks usually had some type of architectural feature proclaiming "boundary." The army constructed the Gardiner Entrance Arch at Yellowstone's north entrance. Here President Roosevelt and his entourage entered the park on September 25, 1937.

National Archives, Record Group 79.
During the 1920s and 1930s, more subdued rustic structures marked park boundaries. At the south rim of the Grand Canyon the log and stone gateway into the park established the canyon's recurrent architectural theme in the motorist's mind.

National Archives, Record Group 30.
Feeder roads that were not primary routes into national parks received entrance treatments that were more subdued but still in keeping with the park's architectural theme.

National Archives, Record Group 30.
Bridges such as this Loop Bridge at Great Smoky Mountains National Park often had stone facings similar to the stonework in other areas of the park (compare with the stone facing on the south portal tunnel). This type of design continuity contributed to a park's sense of place in the mind of the visitor.

National Archives, Record Group 30.
Certain road features that pre-date the National Park Service, such as the viaduct in Golden Gate Canyon at Yellowstone National Park, can be noteworthy for several reasons. In this instance the construction of the viaduct and road contributed to the entire road system at Yellowstone, and the use of the viaduct to hold the road instead of cutting into the mountainside for a roadbed indicated a difference in perception of the land. The way in which the army incorporated the "thumb" (the bedrock outcropping) instead of removing it by blasting showed a concern for leaving some of the natural features as they were.

National Archives, Record Group 79.
Other individual features of significance along park roads may include retaining walls. The rustic stonework of this one in Great Smoky Mountains National Park, followed that park's design traditions, which were more rooted in the managed view of nature and landscape that was typical of the eastern national parks.

National Archives, Record Group 30.
Often park roads have small enclaves of ancillary structures that contribute to the park road-trip experience. This water fountain at Great Smoky Mountains National Park was typical of that type of element that reinforced a visitor’s connection with nature in a slightly artificial manner.

National Archives, Record Group 30.
1801 Secretary of the Treasury Albert Gallatin recommended that 1/10th of the net proceeds of public land sales go into road construction.

1807 At the request of the Senate, Gallatin conducted a national inventory of transportation resources. Gallatin also studied European transportation systems and proved that the most productive facilities in a country were so because of the large integrated transportation networks.

1872 Yellowstone Act signed setting aside the park area "as a public park or pleasuring-ground for the benefit and enjoyment of the people. . .regulations hall provide for the preservation, from injury or spoilation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition."

1874-75 Toll roads completed into the Yosemite Valley.

1877 Yellowstone National Park was allotted $15,000 for road construction. This was the first appropriation for roads in a national park.
1878 Congress appropriated $20,000 for protection and improvement in Yellowstone National Park. Superintendent used some of that money and parts of his appropriations for subsequent years in the construction of about 60 miles of rough roads from Mammoth Hot Springs through Norris Geyser Basin to the Upper Geyser Basin.

1883 The U.S. Army took over construction of roads in Yellowstone from this date until 1918. As the roads improved, visitors and transportation systems increased, as did litter.

1883 Sierra Mining Company built the Tioga Pass road.

1893 Agricultural Appropriation Act set aside $10,000 to establish the Office of Road Inquiry under the Secretary of Agriculture. The office investigated road-building techniques and assembled road construction information for public distribution.

1894 Office of Road Inquiry published a "Good Roads National Map" that included all of the macadamized the gravel roads in the United States. Counties asked to update their sections.

1899 "Office of Road Inquiry" name changed to "Office of Public Road Inquiry."
1901  New York was the first state to charge registration fees for motor vehicles.

1902  American Automobile Association founded.

1903  Dr. H. Nelson Jackson and his chauffeur Sewell K. Crocker drove the first automobile coast-to-coast, from San Francisco to New York.

1903  Road completed to Giant Forest in Sequoia National Park.

1905  Logan Waller Page appointed Director of the Office of Public Roads. OPR was working with the forest service on road construction as early as this year.

1906  OPR detailed one engineer to Yellowstone Reserve to make recommendations for improvement and maintenance of forest roads and trails.

1908  Automobiles allowed inside Mount Rainier National Park with written permission of the superintendent.

1910  Secretary of the Interior Ballinger enlisted the help of J. Horace McFarland in preparing a bill to establish a park bureau. McFarland tapped the skills of Frederick Law Olmsted, Jr. in working on it.
1910  At Mount Rainier a rough road was completed as far as Paradise Valley.

1911  The first National Park Conference held to address various issues affecting parks.

1912  Formal agreement to handle road work in national forests established between OPR and USFS. Congress set up the "10% Fund" in which ten percent of forest revenues set aside for roads.

1912  With a $50,000 grant for road building from the Army Corps of Engineers and small park appropriations, Crater Lake pushed to have its park roads passable by 1916.

1913  Knife Edge Road completed up the 2,000-foot mesa at Mesa Verde.

1914  Director Page established a Division of National Park and Forest Roads within OPR, and he appointed T. Warren Allen to head it. Page also sent one engineer and one survey party to Yosemite.

1914  Mark Daniels appointed general superintendent and landscape engineer for all national parks. His office was in San Francisco until it moved to Washington, D.C., in 1916.
After going through a gradual evolution, the American Association of State Highway Officials (AASHO) organized.

The work that the Department of Agriculture had been doing on farm drainage, irrigation, and farm architecture, was merged with work on roads. The new agency was called the Office of Public Roads and Rural Engineering (OPRRE). Page appointed director.

The Santa Fe and Union Pacific spent $500,000 in exhibits on national parks.

The national park conference of this year included a series of presentations on park roads, and covered topics from specifications for construction to regional planning.

National Park Service established to:

... promote and regulate the use of the Federal areas known as national parks, monuments and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservation, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the
same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

1916 Seventeen railroads contributed $43,000 to help finance the publication of the first edition of the National Parks Portfolio. Stephen Mather also contributed personal funds to the project.

1916 Congress appropriated $15,000 to repair and extend 15 miles of road into the canyon at Zion.

1916 Federal Aid Road Act of 1916 (39 Stat 355). The regulations for this bill established a few standards for road and bridge construction. Later the federal government let AASHO decide upon the standards and made adherence to those standards a condition for receiving federal aid. The Federal Aid Road Act of 1916 appropriated $10 million to be spent between 1917 and 1926.

Also by this year the emphasis in road building was shifting from dust prevention methods to road preservation methods. In the latter, layers or tar or asphalt were put down as wearing courses over bases of macadam, slag, or gravel.
1917 First centerline painted on a rural state highway, on a stretch between Marquette and Ishpeming, Michigan.

1917 Bronx River Parkway started. Project included fairly revolutionary ideas including following landforms, dressing slopes, reserving excavated topsoil for later use on finished slopes, preserving vegetation.

1918 As men and material were hauled around the country during the World War, highway officials quickly determined that the road bases were too thin to withstand the heavy loads on army trucks. Often the bases were only 4"-6".

1918 The Office of Public Roads and Rural Engineering (OPRRE) changed to the Bureau of Public Roads (BPR).

1918 December. Logan Waller Page died of a heart attack.

1919 Thomas H. MacDonald appointed to replace Page as Director of BPR.

1919 Army Appropriation Act of 1919 (41 Stat 105).

1920 In the 1920 Annual Report, the general inspector of the Bureau of Public Roads noted that during this year 20 roads projects under construction in 11 western states were among the most difficult pieces of construction i
their roads program. Most of them formed connecting links between state highways, and they all ran over mountain passes that varied from 3,000 to 10,000 feet in elevation.

1921 Federal Highway Act of 1921 (42 Stat 22).

1921 $100,000 granted for construction of the "road over the mountain" in Glacier National Park.

1922 Flash flood in Zion canyon washed out all of the bridges.

1924 First National Conference on Street and Highway Safety held in Washington, D.C. Topics covered included everything from lack of consistent traffic signage to recommendations on road widths.

1924 Congress gave the secretary of the interior authorization to build, reconstruct, or improve roads and trails in national parks, and set aside $2.5 million every year for fiscal years 1924-1927. The first year's money, however, was reduced to $1 million because of the passage of the adjusted soldiers compensation act, and also because so much of the year had passed that the entire amount could not be obligated for construction, but then even that amount was cut. The agency was, however, allowed to keep and even expand its engineering forces. Also congress...
had the secretary of agriculture turn over war surplus road equipment to interior for park road construction.

1924 In his annual report the Director Stephen Mather wrote that park roads would be built so that visitors could enjoy the parks, but he also stated that large areas of the parks would be accessible only by trails. He noted that the roads would disturb the land as little as possible.

1924 The Southern Appalachian National Park Commission, established by Secretary of the Interior Hubert Work, wrote a report that proposed the construction of a skyline drive along the ridge above the Shenandoah Valley.

1925 The National Park Service prepared a 5-year plan of road improvements.

1925 Federal-Aid Highway Amendment of 1925 (43 Stat 889).

1925 Mount Carmel Road at Zion begun as part of $1.5 million package for roads and trails in the parks.

1926 Federal-Aid Highway Amendment of 1926 (44 Stat 760).

1926 Agreement signed between the National Park Service and
the Bureau of Public Roads. Under the agreement, BPR did road engineering and construction for the National Park Service on a reimbursable basis.

1927 Federal-Aid Highway Amendment of 1927 (44 Stat 1398).

1928 Federal-Aid Highway Amendment of 1928 (45 Stat 683).

1930 Federal-Aid Highway Amendment of 1930 (46 Stat 261).

1930 George Washington Memorial Parkway Act of 1930 (46 Stat 482). First unit completed, and this was a commuter artery.

1930-31 By this time fewer people came to national parks by rail, and more brought their own automobiles. Railroad tourists had used hotels while automobile tourists usually camped.


1931 Federal-Aid Highway Amendment of 1931 (46 Stat 1053).

1931 By this year only one-fifth of the park service's 5-year program of road improvements (submitted in 1925) had been completed.
1931 46 Stat 1053 authorized the secretary of the interior to construct approach roads no longer than 60 miles from the entrance of isolated parks to the "nearest convenient 7 percentum road." The bill also required that $1.5 million of the annual park service authorization be spent on approach roads.

1932 Emergency Relief and Construction Act of 1932 (47 Stat 709)

1933 National Industrial Recovery Act (48 Stat 195) made grants available for roadside improvements and pointed out that 60-foot right-of-way inadequate for sloping and erosion control. States often used the money for purchasing slope easement or additional rights-of-way, so that the 100-foot right-of-way was the standard by 1940.


1934 BPR established its Eastern Parks and Forests District in Washington, D.C.


1935 Davis-Bacon Act (49 Stat 1011).

1935 Engineer Joseph Barnett of BPR proposed that roads be
designed for an "assumed design speed"--the speed at which most drivers would be driving the road. This became known as the "balanced design concept."

1936  First contract issued for Blue Ridge Parkway construction.

1937  Federal-Aid Highway Act Amendment (49 Stat 1519).


1941  Inter-American Highway Act (55 Stat 860).

1941  With the advent of World War II, road construction in national parks halted. By this time 1,781 miles of park roads and 255 miles of access roads had been completed. The total amount expended amounted to approximately $87 million.


1943  Federal-Aid Highway Amendment (57 Stat 560).

1944  Federal-Aid Highway Act (58 Stat 838) authorized $4.3 million for highways in national parks and $10 million
for parkways. Construction under this authorization began in 1946.

1945 Federal-Aid Highway Amendment (59 Stat 507).

1946 Federal-Aid Highway Amendment (60 Stat 709).


1950 Federal-Aid Highway Act (64 Stat 785).


1953 Federal-Aid Highway Act (68 Stat 70).

1955 Mission 66 started. The program included upgrading existing park roads and trails, construction of new park roads, and construction on eight national parkways. Yellowstone roads received additional emphasis in preparation for the park's centennial in 1972.

1966 Functions of the Bureau of Public Roads transferred to Department of Transportation by an act of congress, and they are assigned to the Federal Highway Administration.
APPENDIX B
HISTORIC REGULATIONS FOR PARK ROADS
Historic regulations such as these first governed the use of automobiles in national parks.
DEPARTMENT OF THE INTERIOR.

REGULATIONS GOVERNING THE ADMISSION OF AUTOMOBILES INTO THE YELLOWSTONE NATIONAL PARK FOR THE SEASON OF 1915.

(EFFECTIVE AUGUST 1, 1915.)

Pursuant to authority conferred by section 2475, Revised Statutes, United States, and the act of Congress approved May 7, 1894, the following regulations governing the admission of automobiles into the Yellowstone National Park are hereby established and made public:

1. **Automobiles.**—The park is open only to such automobiles as are operated for pleasure and not to those carrying passengers who are paying, either directly or indirectly, for the use of the machine.

2. **Motorcycles.**—Motorcycles are not permitted to enter the park.

3. **Tickets of Passage.**—Ticket of passage must be secured and paid for at the checking station where the automobile enters the park. This ticket must be conveniently kept, so that it can be exhibited to park guards on demand, and must be surrendered at the last checking station on leaving the park. Tickets of passage will show (a) name of owner, (b) license number of automobile, (c) name of State issuing license, (d) make of machine and manufacturer's number, (e) name of driver, (f) seating capacity of machine, and (g) number of passengers.

4. **Fees.**—Fees are payable in cash only, and will be as follows for each trip through the park:

   - For runabouts or single-seated cars. .................................................. $5.00
   - For five-passenger cars ................................................................. 7.50
   - For seven-passenger cars ................................................................. 10.00

5. **Muffler cut-outs.**—Muffler cut-outs must be closed while approaching or passing riding horses, horse-drawn vehicles, hotels, camps, or soldier stations.

6. **Distance Apart—Gears and Brakes.**—Automobiles while in motion must not be less than 100 yards apart, except for purpose of passing, which is only permissible on comparatively level or slight grades. All automobiles, except while shifting gears, must retain their gears constantly enmeshed. Persons desiring to enter the park in an automobile will be required to satisfy the guard issuing the ticket of passage that the machine in general, and particularly the brakes and tires, are in first-class working order and capable of making the trip, and that there is sufficient gasoline in the tank to reach the next place where it may be obtained, and carry two extra tires. For this purpose, all drivers will be required effectually to block and skid the rear wheels with either foot or hand brake, or such other brakes as may be a part of the equipment of the automobile. Gasoline can be purchased at regular supply stations as per posted notices.

7. **Speeds.**—Speeds must be limited to 12 miles per hour ascending and 10 miles per hour descending steep grades, and to 8 miles per hour when approaching sharp curves. On good roads with straight stretches, and when no team is nearer than 200 yards, the speed may be increased to 20 miles per hour. Horns must be sounded at all curves where the road can not be seen for at least 200 yards ahead, and when approaching teams or riding animals.

8. **Teams.**—When teams, saddle horses, or pack trains approach, automobiles will take the outer edge of the roadway, regardless of the direction in which they may be going, taking care that sufficient room is left on the inside for the passage of vehicles and animals. Teams have the right of way, and automobiles will be backed or otherwise handled as may be necessary so as to enable teams to pass with safety. In no case must automobiles pass animals on the road at a greater speed than 8 miles per hour.

9. **Fines.**—Fines or other penalties will be imposed for arrival of automobiles at any point before approved lapse of time, hereinafter given, at the following rates: $0.50 per minute for each of first five minutes; $1.00 per minute for each of the next 20 minutes; $25.00 fine or ejection from the park, or both, in the discretion of the Acting Superintendent of the park, for being more than 25 minutes early.
10. Penalties.—Violation of any of the foregoing rules or general regulations for government of the park will cause revocation of ticket of passage, and in addition to the penalties hereinbefore indicated will subject the owner of the automobile to any damage occasioned thereby; immediate ejectment from the reservation, and be cause for refusal to issue new ticket of passage to the owner without prior sanction in writing from the Secretary of the Interior.

11. Accidents.—When, due to breakdowns or accidents of any other nature, automobiles are unable to keep going or to reach the next stopping place on time, they must be immediately parked off the road, or where this is impossible, on the outer edge of the road, and wait until the next schedule for automobiles past that point, or until given special permission to proceed by park guards.

12. These regulations and schedules do not apply to automobiles passing over the county road in the northwest corner of the park, en route to the town of Yellowstone, Montana.

Stephen T. Mather,
Assistant to the Secretary of the Interior.

SCHEDULES AND GENERAL INSTRUCTIONS.

Automobiles may leave the park by any one of the authorized routes of entrance. Automobile drivers should compare their watches with the clocks at checking stations.

Automobiles stopping over at points other than the hotels and permanent camps will be allowed to resume travel only at such time as permits them to fall in with a subsequent regular automobile schedule past the point of stop-over. Such automobiles while stopping over must park out of sight of, or at least 100 yards from, the main road.

Automobiles stopping over at permanent camps must leave the same at the proper time to conform with the published schedules from the nearest hotels. Detailed times of departure to comply with this provision will be posted at the particular camps concerned.

When, due to breakdowns or accidents of any other nature, automobiles are unable to keep going, or to reach the next stopping place on time, they must be immediately parked off the road, or where this is impossible, on the outer edge of the road, and wait until the next schedule for automobiles past that point, or until given special permission to proceed by park guards.

Automobiles will not be permitted for use on local trips around hot springs formations or other points of interest off the main roads, except in the case specially noted at Artist Point, in the morning schedule from the Lake Hotel to Canyon Hotel.

Speeds.—Speeds must be limited to 12 miles per hour ascending and 10 miles per hour descending steep grades, and to 8 miles per hour when approaching sharp curves. On good roads with straight stretches, and when no team is nearer than 200 yards, the speed may be increased to 20 miles per hour. No automobile shall pass another while in motion going in the same direction.

Horns.—The horn will be sounded on approaching curves, stretches of road which cannot be seen for about 200 yards, and driving or riding animals; also on meeting other machines.

Teams.—When teams, saddle horses, or pack trains approach, automobiles will take the outer edge of the roadway, regardless of the direction in which they may be going, taking care that sufficient room is left on the inside for the passage of vehicles and animals. Teams have the right of way, and automobiles will be backed or otherwise handled as may be necessary so as to enable teams to pass with safety. In no case will automobiles pass animals on the road at a greater speed than 8 miles per hour.

In addition to the schedules herein given, automobiles must keep clear of any horse-drawn passenger vehicles running upon regular schedules which may be following them; and upon overtaking any horse-drawn passenger vehicles running upon regular schedules, automobiles must not attempt to pass or approach closer than within 150 yards of the same.

Reduced engine power—Gasoline, etc.—Due to the high altitude of the park roads, averaging nearly 7,650 feet for the belt line and east, north, and west entrances, the power of all automobiles is much reduced, so that about 50 per cent more gasoline will be required than for the same distance at lower altitudes. Likewise one lower gear will generally have to be used on grades than would have to be used in other places. A further effect that must be watched is the heating of the engine on long roads, which may become serious unless care is used. Gasoline can be purchased at regular supply stations as per posted notices.
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<thead>
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<td>8:30 a.m.</td>
<td>9:00 a.m.</td>
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**GARDINER TO NORRIS.**

- Leave Gardiner Entrance: 0
- Arrive Mammoth Hot Springs: 5
- Leave Mammoth Hotel: 0
- Leave 8-mile Post: 8
- Arrive Norris: 20

**NORRIS TO WEST ENTRANCE.**

- Leave Norris: 0
- Arrive West Entrance: 27

(For Gallatin Station Entrance see Note 1.)

**NORRIS TO FOUNTAIN.**

- Leave Norris: 0
- Arrive Firehole Cascades: 11.7
- Arrive Fountain Hotel: 20

(For Gallatin Station Entrance see Note 1.)

**WEST ENTRANCE TO FOUNTAIN HOTEL.**

- Leave West Entrance: 0
- Arrive Fountain Hotel: 21

**FOUNTAIN HOTEL TO THUMB.**

- Leave Fountain Hotel: 0
- Arrive Upper Basin (Old Faithful Inn): 9
- Leave Upper Basin (Old Faithful Inn): 0
- Arrive Thumb Station: 10

(For South Entrance see Note 1.)

**THUMB TO LAKE HOTEL.**

- Leave Thumb Station: 0
- Arrive Lake Hotel: 15

**LAKE HOTEL TO EAST BOUNDARY.**

- Leave Lake Hotel: 0
- Arrive East Boundary: 28

**EAST BOUNDARY TO LAKE HOTEL.**

- Leave East Boundary: 0
- Arrive Lake Hotel: 28

**LAKE HOTEL TO CANYON HOTEL.**

- Leave Lake Hotel: 0
- Leave Canyon Station: 16
- Arrive Canyon Hotel: 17
<table>
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<tr>
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<tr>
<td>CANYON TO NORRIS.</td>
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<td>Leave Canyon Hotel</td>
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<tr>
<td></td>
<td>12</td>
<td>3:15 p.m.</td>
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<tr>
<td>Arrive Norris</td>
<td>(For schedules from Norris to Fountain, Upper Basin, and West Entrance, see page 3.)</td>
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</tr>
<tr>
<td>CANYON HOTEL TO TOWER FALLS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Canyon Hotel</td>
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<tr>
<td>Arrive Tower Falls:</td>
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<td></td>
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<tr>
<td>Via Dunraven Pass</td>
<td>16</td>
<td>3:15 p.m.</td>
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<tr>
<td>Via Mount Washburn</td>
<td>10</td>
<td>4:15 p.m.</td>
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<tr>
<td>(For Cooke City Entrance see Note 1.)</td>
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<td></td>
</tr>
<tr>
<td>TOWER FALLS TO GARDINER.</td>
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<td></td>
</tr>
<tr>
<td>Leave Tower Falls</td>
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</tr>
<tr>
<td>Arrive Mammoth Hot Springs</td>
<td>20</td>
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</tr>
<tr>
<td>Leave Mammoth Hot Springs (via Main Road)</td>
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<td>7:00 a.m.</td>
</tr>
<tr>
<td>Arrive Gardiner Entrance</td>
<td>5</td>
<td>7:30 a.m.</td>
</tr>
<tr>
<td>MAMMOTH HOT SPRINGS TO GARDINER.</td>
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<tr>
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<td>8:45 a.m.</td>
</tr>
<tr>
<td>Arrive Gardiner Entrance</td>
<td>5</td>
<td>9:30 a.m.</td>
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The Acting Superintendent of the park has authority to change these schedules if necessary.

Note 1.—Owing to scarcity of travel on the roads named, automobiles will be permitted to travel without schedule on the roads between the South Entrance and the Thumb; between the Northeast or Cooke City Entrance and Tower Falls Station; and between the West Entrance (Yellowstone, Montana), and the Northwest or Gallatin Station Entrance. Upon entering the main roads at the Thumb, Tower Falls, and the West Entrance, however, automobiles must conform to the regular schedules.

Note 2.—Automobiles making the morning trip from the Lake to the Canyon will be permitted to make the side trip to Artist Point, provided they keep within the schedule upon passing Canyon Station.
APPENDIX C

1926 AGREEMENT
BETWEEN THE NATIONAL PARK SERVICE
AND
THE BUREAU OF PUBLIC ROADS
The Inter-Bureau Agreement between the National Park Service and the Bureau of Public Roads established the formal working relationship between the two agencies, and served as the basis under which the National Park Service and the Federal Highway Administration work today.
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  

RULINGS No. 1 - ADMINISTRATIVE GENERAL  
National Park Service - Procedure for Highway Cooperation by Bureau.  

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 1.  

(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 of the States within which 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 highway 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 will 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 recommendations with respect to the proposed project. Copies of the superintendent's report and recommendation shall be submitted to the Chief of 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 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 approved recommendations by the landscape engineer of the Park Service and the superintendent of the Park Service 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 so to do.

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 expense against existing appropriations or appropriations authorized to be made against which obligations may legally be incurred.
(3) Reimbursement 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 investi­
gations, 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 contractors
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 Engineer 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 recommenda­
tions, 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 Stephen T. Mather
Director, National Park Service.

Signed this 3rd day of February 1926.

By Thos. H. Macdonald,
Chief, Bureau of Public Roads.

Approved: January 22, 1926, by Hubert Work,
Secretary, Department of the Interior.

February 10, 1926, by W. M. Jardine,
Secretary, Department of Agriculture.
Outline of procedure to be followed under the interbureau agreement between the Bureau of Public Roads and the Park Service for the handling of Park Service Work

Plans, Specifications and Estimate. In the preparation of the preliminary plans the District Engineer of the Bureau shall cooperate with the Landscape Engineer of the Park Service in order that final drawings may embody satisfactory landscape features.

The title sheet of the plans should contain provision for the approval and signature of the following:

Chief Engineer of the Bureau of Public Roads
Director of the Park Service
District Engineer of the Bureau of Public Roads
Superintendent of the Park
Landscape Engineer of the Park Service

A copy of the plans, specifications and estimate should be forwarded to the Washington office of the Bureau of Public Roads, together with the title sheet bearing the signatures of the District Engineer of the Bureau of Public Roads, Superintendent of the Park and the Landscape Engineer of the Park Service. Blue print copies of this title sheet will not be necessary. The Bureau of Public Roads at Washington will obtain the signatures of the Chief Engineer of the Bureau of Public Roads and the Director of the Park Service on the title sheet. One blue print copy of this title sheet will be retained by the Bureau of Public Roads for their records; another copy will be attached to the plans and specifications transmitted by the District Engineer and the complete set of plans forwarded to the Park Service. The tracing will then be returned to the District Engineer of the Bureau of Public Roads. Copies of the plans, specifications and estimate should be furnished by the District Engineer to the Park Superintendent and Landscape Engineer of the Park Service if required. The District Engineer should cooperate with the Landscape Engineer of the Park Service relative to any changes in the plans that may be found necessary during construction.

Notice to Contractors and Advertisement. Two copies of the notice to contractors shall be forwarded by the District Engineer to the Bureau with the request for permission from the Secretary of the Interior to advertise. On approval, the Park Service will notify the Bureau that such permission has been granted. The work may then be advertised by the Park Superintendent or by the District Engineer of the Bureau, as may be decided upon between them.

Preliminary Recommendation of Award. The District Engineer shall telegraph results of the opening of bids to the Bureau showing the three low bidders and recommending award or rejection of the
The Park Superintendent shall telegraph the Park Service the results of opening of bids showing the three low bidders and recommending award or rejection of the proposal.

Award Papers. All award papers should be forwarded in duplicate, the original copy for the Park Service and one copy for the Bureau of Public Roads, which, after passing through channels, returns to the Bureau of Public Roads' files.

Regional Office Concurrence. Telegraphic concurrence shall be forwarded by the regional office of the Bureau of Public Roads at San Francisco. This concurrence will be the result of their review of the carbon copy of recommendation of award or rejection of the proposal which has been forwarded to the Washington office of the Bureau of Public Roads by the District Engineer of the Bureau.

Documents which should be Forwarded by the District Engineer to the Bureau of Public Roads at Washington:

Two copies of the letter recommending the award or rejection of the proposal, concurred in by the Park Superintendent.
Two copies of the tabulation of bids and the engineer's estimate.
Two copies of all telegrams setting forth the status of the contractor relative to experience, financial ability, etc.
Two copies of a financial statement of funds available for the work.
The original of all proposals received.
A statement of the standard specifications governing.

Secretary of the Interior's letter to the Contractor Accepting or Rejecting Proposal. A draft of a letter for the signature of the Secretary of the Interior to the contractor making the award or rejecting his proposal will be prepared by the Washington office of the Bureau of Public Roads and forwarded to the Park Service with the award papers. This draft, together with a letter from the Chief of the Bureau to the Director of the Park Service concurring in the recommendations of the District Engineer and the Park Superintendent will be forwarded by the Bureau to the Park Service. The Park Service will prepare the formal letter according to this draft and secure the Secretary of the Interior's signature to the award or the rejection, as the case may be. The following copies of the letter of the Secretary of the Interior to the contractor making an award or rejection shall be prepared by the Park Service:

One copy for the Secretary of the Interior's files.
One copy for the Park Service files.
One copy for the Bureau of Public Roads' files.
One copy for the Regional Office of the Bureau of Public Roads' files.
Two copies for the District Engineer, one for his files and one to be transmitted to the Park Superintendent for his files.

The following copies of the letter of the Chief of Bureau recommending the award or rejection of the proposal to the Park Service shall be prepared by the Bureau of Public Roads.

One copy for the Regional Office of the Bureau at San Francisco.
Two copies for the District Engineer of the Bureau, one to be transmitted to the Park Superintendent.
One copy for the Bureau of Public Roads' files.
The original letter will remain with the Park Service.

Notification to the Contractor of the Award or Rejection. The original letter to the contractor and four copies accepting or rejecting the proposal shall be returned to the Bureau of Public Roads for proper distribution.

Disposition of Award Letters to the Field. The Bureau of Public Roads at Washington will transmit to the Regional Office of the Bureau at San Francisco and to the District Engineers the following papers:

To the Regional Office: A copy of the Secretary of the Interior's letter to the contractor making award or rejecting the proposal and a copy of the Chief of Bureau's letter to the Director of the Park Service recommending the award or rejection of the proposal.

To the District Engineer: The original copy of the Secretary of the Interior's letter to the contractor for delivery to him, two copies of this letter, one to be retained by the District Engineer for his files and one to be delivered to the Park Superintendent; two copies of the Chief of Bureau's letter to the Director of the Park Service recommending the award or rejection of the proposal, one for the District Engineer's files and one to be transmitted to the Park Superintendent.

Preliminary Action by the Field. The District Engineer will anticipate an award and have the contract executed by the contractor, together with a bond and forwarded to the Washington office. The following copies should be prepared: Eight copies, two signed and six typed. The Bureau of Public Roads at Washington will retain the original proposal of the contractor which will be attached to the contract when received.
Review of Contracts. The contracts will be reviewed by the Bureau of Public Roads in Washington and compared with the proposal accepted by the Secretary of the Interior and forwarded to the Park Service for review and execution.

Distribution of Contracts.

One original for the auditor.
One original for the contractor through the Bureau of Public Roads.
One copy for the Bureau of Public Roads at Washington files.
One copy for the Regional Office through the Bureau of Public Roads.
One copy for the District Engineer through the Bureau of Public Roads.
One copy to the Park Superintendent through the District Engineer of the Bureau of Public Roads.
One copy for the Washington office of the Park Service.
One copy to Returns Office through the Park Service.

APPROVED:

/s/ Stephen T. Mather.

Director, National Park Service.

APPROVED:

Chief, Bureau of Public Roads.
APPENDIX D

STANDARD ARCHITECTURAL DETAILS
HEADWALLS FOR CULVERTS
Under the direction of Tom Vint, the Division of Landscape Architecture, later known as the Branch of Plans and Design, produced standardized details for certain features along roads. The specifications on the following sheets noted:

STONES. Weathered stones are preferable. No freshly broken stones shall be exposed. Round stones are not to be used. Stones shall have wall heights of not less than 6" nor more than 18" and wall lengths of not less than 18" nor more than 48". All stones to be laid with their larger dimension horizontal. Four joints should not come together.

ARCH RINGS. Key stone to be not less than 22" in height. All arch ring stones to be shaped to the approximate face dimension shown.

JOINTS. Mortar joints to be generally 1" to 1-1/2" wide, well filled and pointed to a depth of 1" to present a wavy plain surface.
APPENDIX E

STONE AND LOG GUARDRAIL TYPES, 1929
PG-20/PG-AP-3
Stone and log guardrails appeared along the edges of roads and turnouts. These designs were the standardized types developed by the National Park Service and commonly used during the late 1920s and early 1930s.
APPENDIX F

PRELIMINARY STUDY
FOR
WARPING CUTS AND FILL SLOPES, 1937
PG-2010
Perhaps the biggest contributions to the aesthetics of road design made by National Park Service landscape architects dealt with the design of the road prism, including the following sheet on warping cuts and fill slopes, produced in 1937.
APPENDIX G

SLOPE FLATTENING AND SLOPE Rounding DETAILS, 1939
PG-321-C
Park Service landscape architect Tom Carpenter drew out some simple sheets on slope flattening and rounding.
**SLOPE FLATTENING**

<table>
<thead>
<tr>
<th>EX</th>
<th>HEIGHT</th>
<th>SLOPE</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>0' TO 4'</td>
<td>2½:1</td>
</tr>
<tr>
<td>2</td>
<td>4' TO 12'</td>
<td>2:1</td>
</tr>
<tr>
<td>3</td>
<td>12' TO 20'</td>
<td>1½:1</td>
</tr>
<tr>
<td>4</td>
<td>20 TO 30'</td>
<td>1¼:1</td>
</tr>
<tr>
<td>5</td>
<td>OVER 30'</td>
<td>1:1</td>
</tr>
</tbody>
</table>

**SLOPE ROUNDELING**

7' BACK OF SLOPE STAKE AND 1/3L (LENGTH OF SLOPE) MAXIMUM 15'

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**CUT SLOPE**

**EXAMPLE #1**

Scale 1" = 10'

---

**CUT SLOPE**

**EXAMPLE #2**

Scale 1" = 10'
EXAMPLE #3

EXAMPLE #4

CUT SLOPES
Scale 1" = 10'

SHEET
CUT SLOPE

EXAMPLE #5
Scale 1" = 10'

GROUND SLOPE

1:1

OVER 30'

5.3'
APPENDIX H

REPORT TO THE CHIEF ARCHITECT
TO ACCOMPANY "PRELIMINARY STUDIES FOR ROAD DESIGN."
NP-PG-2015, 7 SHEETS, 1938
Carpenter formalized his designs for Tom Vint in the seven sheets of Drawing No. NP-PG-2015 and the report he wrote accompanying the drawings.
In our studies on road design, and working in collaboration with the Bureau engineers, we have pioneered a number of design features which the Bureau have adopted for National Park roads. These include spiral curvature, flattening and rounding of cut slopes and warping of fill slopes. Many other items are covered in our Special Provisions for road projects.

The accompanying set of prints of Drawing No. PG-2015, 7 sheets, represents our latest studies on road design. The plans are the following:

Sheet 1 - Perspective Sketch
  1 - Rounding Bottom of Cut Slopes
  2 - Flattening Fill Slopes
  3 - Rounding Top of Cut Slopes on Horizontal to Plus Ground Slopes
  4 - Rounding Top of Cut Slopes on Horizontal to Negative Ground Slopes
  5 - Flattening and Rounding Cut and Fill Slopes
  6 - Surfacing Cross Sections and Drain Inlets

The perspective sketch Sheet 1 illustrates a feature that we have considered for some time and I feel would be one of the most important steps that we could make in the advancement of road design. This is the introduction of a curve at the bottom of the cut slope in order to obtain a better transition from the lower part of the slope into the roadbed, and thereby do away with the sharp angle that is now obtained with ditch slopes such as 2:1 and 4:1 from the road shoulder to the straight line of the cut slope in cross section. This is accomplished through a "set back" of steep slopes which permits of flattening and thereby stabilizing the lower part of the slope. The flat gutter slope completes the transition from the slope to the road surface proper. This relatively flat gutter is shown contrasted with the deeper ditch slope, and a flatter fill slope is also shown for a low fill.
The perspective sketch illustrates what may be expected in stabilizing the lower part of steep slopes. Native vegetation will grow that otherwise can not become established on an unstable slope. As trees grow in height from the bottom part of the slope, they will also improve appearance of the upper part of the slope as seen in perspective by those driving on the road. For desert and semi-desert country, the main value would be stability and form of slopes, but even here it would enable low native vegetation such as sage brush to become established.

Sheet 2 shows the cross sections for proposed slopes in comparison with those used in present practice. Other sheets illustrate proposed revisions in the present standards of cross section design as pertains to flattening and rounding of cut slopes and also advancement in the handling of fill slopes to a degree beyond present standards, but primarily a better defined and simpler method for the field engineer to follow in the construction of fill slopes and in warping of fills. Sheets 2 to 5 are detailed to explain the design features. All of the data is summed up and shown on Sheet 6 in the two cross sections for cuts and fills with the slope tables. It is thought that this sheet, or modifications of it that may be worked out with the Bureau, will be included in the contract set of drawings to explain the proposed design for cut and fill slopes. Modifications would be those of road width and gutter details to fit specific road projects.

Sheet 2 - Rounding the Bottom of Cut Slopes.

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 perspective through the resultant feeling of stability expressed. Actual stability of the slope is created in the 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 an angle of repose. This is necessarily removed by maintenance, in keeping ditches open under the present standards of cut slope design and construction.

The cross sections on Sheet 2 show the proposed slopes in comparison with the as constructed cross sections of Yellowstone roads, Old Faithful-West Thumb 26 ft. shoulder to shoulder and Madison Junction-Old Faithful 28 ft. shoulder to shoulder, both with a ditch 4 ft. wide on a 4 : 1 slope. The proposed cross sections are 24 ft. wide shoulder to shoulder in cuts on benched section and 26 ft. wide in through fills. These widths are for finished grades. Even though a relatively wide gutter cross section results, part of it being the lower part of the transition slope, you will note that at the road elevation there is less width (or
not in excess) from the center line of the road to the cut slope, than for either of the two sections in comparison.

In comparison with the Old Faithful-West Thumb section the proposed 1 : 1 slope is "set back" 3 feet in horizontal measurement (less from the Madison Junction-Old Faithful section); the proposed 1-1/4 : 1 slope is set back 2 feet; on 1-1/2 : 1 and flatter slopes there is less excavation than on the two sections described. You will note that part of the stability is gained with a slope set back and part through the position of the toe of the slope, which is lifted in the use of a relatively flat gutter. The set back for a 1 : 1 slope may be called the criterion, because as the slope gets flatter — 1-1/4 : 1 and 1-1/2 : 1, it is not necessary to move the face of the cut back so far in order to have it in a position where the bottom of the slope can be flattened. There is a line at the toe of the slope or edge of the gutter that is common to all slopes. This would likewise be the "toe" line for rock cuts that are constructed on a 1/2 : 1 slope (District 2, B.F.R.).

There are exceptions to the "set back" of slopes in the case of extremely high cuts, especially where the ground slope above is very steep. In some such cases it may be more economical to construct a low retaining wall. This has been done under present standards.

Sheet 2 shows a certain amount of set back in the steep cut slopes. It does not purport to be the final answer to this subject, but is a big step in the right direction.

It should be explained that while comparison is made here with sections of Yellowstone roads or with standards used by the Denver District 3 Bureau Office, some modification in set backs would have to be made if this type of design were used for sections of road designed on the basis of the San Francisco District 2 Bureau Office, say for Yosemite, where the ditch is less in width and depth than for Yellowstone projects.

Increase in Excavation through use of the Proposed Cross Sections.

Through contact with engineers of the Bureau District 2 Office here, we have obtained estimates of cost of the net excavation increase on the basis of a 3 ft. set back throughout the cut slopes for two road projects. The proposed cross sections discussed herein are estimated to average about two-thirds of this cost per mile, because the sections average less in set back than those estimated by the Bureau. On a Forest Highway project in heavy type work, where road construction would cost as high as $50,000 a mile, it was estimated that the new type of cross section would increase the cost $800 (1,340 cu. yds.) for one mile, and $2,240 (3,730 cu. yds.) for another mile, an average of $1,520 per mile,
where the slopes are principally 1:1 and 1-1/4:1. This is about 3%. For the Overton-Lake Mead project at Boulder Dam Recreational Area, where the excavation was figured at 30¢ a cubic yard, it is estimated that there would be an average increase in cost of $4.50 a mile.

It is important to note that the increase in the net excavation quantities as given for these projects, is much less than the gross excavation quantities that would be obtained by simply taking an additional width of cut with the alignment and grade for the road as designed. The figure is obtained by adjusting the roadbed, for example raising a grade in a through cut, and shifting alignment right or left, in order to reduce excavation. In other words, if this type of design is adopted, the alignment and grade will be established on a given project to accommodate this change.

As near as can be estimated from data available now, increase in cost of excavation may be 3% or 4% on heavier type construction, but less on medium and low unit cost construction. Against the whole road project, including structures, etc., the figure of 2% should cover the increased cost over the average type of design now used. This is exclusive of gutter surfacing which is described later.

Regardless of gutter or ditch types the type of cut slopes shown in these plans is recommended. I feel that we are justified in some increase in first cost for several reasons. An economic one is the fact that maintenance will be reduced. There should be much less or little surface sloughing of banks into ditches. There is exception of course, for slides caused by certain ground water conditions in the cut banks. The paved gutter described in the following will likewise reduce erosion that takes place in dirt ditches and reduce maintenance cost.

With the present standards of flatter cut slopes, adopted several years ago, we have accomplished much stability in slopes. The proposed slope standards will add stability to the steepest slopes where it is needed, and likewise will permit of natural restoration of native plant growth on a considerable area of these slopes. This in itself should be sufficient justification for the design.

The Gutter and Cross Section - Sheets Nos. 2 and 7

In my opinion the use of a relatively flat gutter section will tend to promote driving closer to the shoulder than would be the case with a steeper ditch section because there will be less feeling that there is danger of running into a ditch. For this reason, and also in order to obtain a proper transition where the end of the cut section joins the fill, the fill is shown as 13 ft. width, in half section. The 3 ft. width of shoulder on the fill is the same slope.
as the same 3 ft. width in the cut section. This width is constant throughout cuts and fills.

With the old 18 ft. standard, 3 ft. shoulders were used either side of 9 ft. paved lanes. Likewise a 3 ft. width of shoulder is used in this design with the 10 ft. width of paved lanes, which are current practice in surfacing park roads.

A gutter of the type shown, will permit cars to turn off the traveled lane and park if desired, in order to change a tire or for other purposes and will supplement parking spaces made by turn-outs and daylighting of outside cuts. This will become more important as traffic increases in the parks, and I feel will offset the present desire to design wider roads such as 28 ft. shoulder to shoulder throughout, in order to have a 4 ft. shoulder for parking but with, in addition, a 4 ft. width of ditch which is now sloped too steeply to use for parking.

**Gutter Surfacing.**

In our studies of the subject and in discussion with Bureau engineers we have endeavored to have road cross sections designed with shallower ditches. The engineers have contended that it is necessary to have the ditch deep enough so that run-off water will be lower than the subsurfacing of the road in order not to disintegrate this material.

The detailed cross sections on sheets 2 and 7 show gutters of bituminous surfacing to seal out the water and protect the road surfacing proper. The gutter and shoulders are designed for a heavier or coarser aggregate than the 20 ft. wide seal coat, in order to obtain a texture that will define the limits of the through travel lanes. It is expected that there will also be a little difference in color which will add to the definition. The surfacing design is the function of the engineer. The sections shown in the plans are based on discussion with them, and are shown as an example of what may be required in order to obtain a shallow gutter and add to the safety of the road.

While the gutter is shown in the cross sections as 8 inches deep, the surfacing is indicated for a paved capacity of 4 inches depth and approximately 4 ft. wide, which should carry normal run-off. The reason for not paving for the full depth of 8 inches is to reduce the width of the gutter paving in order to avoid having a cross section too asymmetrical in the cuts in contrast to that in the fills. Ground cover vegetation should grow at the back of the gutter in the flat slope and there should be scarcely any more scour than there would be if the gutter paving were carried 4 inches higher, i.e., to the elevation of the road shoulder.
One question that has come up in regard to the use of paved bituminous gutters on roads has to do with how the material will stand up. It is stated that unless bituminous pavement has wearing use it may not stay resilient, but that this can be taken care of by an application of oil. We have an example of paved gutter (bituminous) at Zion, constructed by the B.P.R. District 12, that has stood up very well without any subsequent oil treatment.

The paved gutter will carry more drainage than one of the same cross section area constructed in dirt. This is obvious because there is less friction and the water is carried faster. With paved gutters the erosion of ditches is eliminated. From contact with District II of the Bureau we have data showing estimated capacities of road ditches and gutters. Without going into much detail on this, it can be said that the gutter cross sections shown on Sheet 2 would have, without surfacing, at least the same capacity as the road ditches in Yosemite and Sequoia. If the gutters are paved, they have a greater water carrying capacity.

Data is available on the annual precipitation and snowfall in Yosemite (and other Sierra Nevada parks), Yellowstone and Rocky Mountain National Parks. Rainfall and snow depth are much greater in Yosemite than in Yellowstone, and Yosemite has much more snow than Rocky Mountain. Outside of a deluge, causing flood conditions which are not provided for in normal gutter design because of excess cost, the spring run-off (rain with melting snow) is probably the greatest problem in surface water drainage. This problem is greater in Yosemite and the Sierras than in Yellowstone where the run-off is slower. Yet the road ditches for Yellowstone projects are designed for greater depth and width than those in Yosemite and other Sierra parks. The composition of the soil and how it drains may have something to do with this difference. It would appear that much of the difference in ditch standards may be due to a difference in engineering practice in different sections of the West.

Drain Inlets.

On Sheet 7 there is shown a type of drain inlet for use with paved gutters. Since cars will, on occasion, turn into these gutters, it will necessitate an inlet or catch basin of heavy construction to withstand the weight. In our study of road inlets we have endeavored to design a type that is both serviceable and as economical as possible. The enclosed print of a pipe drain inlet was prepared as a result of discussion on this subject with the Bureau and with representatives of a culvert pipe company.

We are informed that a number of pipe culverts of this type were installed on the Redwood Highway in the northern part of
the State by the maintenance division of the California Highway Commission and that these worked very satisfactorily in handling the drainage water during the heavy precipitation of the last two months.

As shown in the sketch, the pipe culvert is set in the bank with the front face at the edge of the gutter line. Since there is no weight to hold up, as in the case of an inlet under a paved gutter, a metal pipe is strong enough. The sketch shows an opening from the gutter 6 inches in height by 18 inches wide for a 2 foot pipe. In case it is not possible to predetermine the exact height of the drop inlet for vertical pipe, the opening in the drop inlet can be cut with a torch in the field and then slipped down over the road culvert. As an example of cost, with the requirements of a drop inlet 24 inches in diameter by 3 feet deep, connected to an 18 inch diameter road culvert, the following would be the approximate cost, exclusive of wood or cast iron cover, or bottom for inlet:

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 ft. — 24&quot; #16 gauge Corrugated Pipe</td>
<td>$1.50</td>
</tr>
<tr>
<td>2 ft. — 18&quot; #16 &quot; &quot;</td>
<td>$1.30</td>
</tr>
<tr>
<td>Labor cutting and welding Tee</td>
<td>7.37</td>
</tr>
<tr>
<td>Labor cutting 6&quot; x 18&quot; opening in drop inlet</td>
<td>0.75</td>
</tr>
</tbody>
</table>

We believe that this type of inlet has good possibilities for adoption in road drainage. We expect to receive some photographs and further information regarding the experimental installations that have been made on the Redwood Highway.

**Subsurface Drainage.**

When there is a flow or seepage of subsurface water from cut banks to an amount that is measurably harmful to the roadbed, it is necessary in most cases to remove this water by underground drainage, separate from gutter surface drainage.

As an example of subsurface drainage, on sections of a major road in Sequoia National Park and on the Sequoia-General Grant Approach Road in elevations between 6,000 and 7,500, on some 16.5 miles of road, the total cost for subdrainage was $21,900. A total of 8,000 lineal feet of 8 inch perforated pipe was laid. The cost includes trench excavation, back-fill and seal consisting of a bituminous treatment of thin oil mix. Of the above construction, the heaviest section for drainage was one of 81 stations or about 1-1/2 miles where a total of 3,600 linear feet of pipe was laid. Most of this construction was done with a surfacing project, a smaller amount during grading. Post construction showed the need for it. Most of the pipe was laid 4 feet deep. This was for ground
water that had to be taken away.

The point of this explanation is that to the larger extent, the handling of subsurface drainage is separate and distinct from the handling of surface water, the latter being the function of the ditch or gutter. Data would appear to indicate that many of the "deep" ditches are not deep enough to catch subdrainage, but are much deeper than necessary to handle ordinary surface water drainage.

By a set back of the cut slopes, an important advantage would be gained in subsurface water conditions as affecting the roadbed. Ground water under the slope would be carried to a lower elevation under the gutter and roadbed, and therefore there would be less danger of capillary action of the water affecting the subsurface of the road.

Engineers are now giving considerable study to the subject of road subsoils. Some soils hold more water than others and therefore affect differently the subsurface drainage problem as well as the road surfacing to be laid over them. For example, the Bureau have taken soil samples of the Old Faithful-West Thumb road and these are being tested. The result will show the possibilities of bituminous reinforcement and determine road surfacing design and cost.

**Flattening Fill Slopes - Sheet 3.**

The drawing is self-explanatory in that it shows proposed fill slopes based on two factors; one the height of the fill at the road shoulder and the other the percentage of the ground slope.

Present practice with the Bureau is to construct fill slopes on a 4:1 where the fill is 2'6" in height at the shoulder and sometimes up to a height of 5' or 6' where the ground is flat. All the data we have seen on this subject shows cross sections of fills superimposed upon practically level ground. The need for data shown on Sheet 3 is self-evident.

We have been using Special Provisions in contracts but with a plan as instruction to engineers, for "Warpping the End of Fill Slopes." Also, we have Special Provisions and plan for "Filling Inside Pockets." The proposed cross sections will eliminate both of these, because this data is incorporated. A review of those sections with the District II Bureau office shows that the sections do not depart very much from what has been done under one circumstance or another of fill construction. The cross sections are prepared to fill the need for definite instruction to contractors and engineers. Fill slopes based on this design will result in warping the ends of fills better than has been done heretofore. Flatter slopes on the lower fills will add safety to the road and in some cases eliminate necessity for guardrail, thereby economizing in construction.

The cross section and note for rounding the bottom of fill slopes where the positive ground slope is 3:1 and steeper is similar to the cross section shown in the plan for "Filling Inside Pockets."
Construction similar to this design was carried out on a Yosemite road project in 1937.

**Rounding Top of Cut Slopes on Horizontal to Plus Ground Slopes — Sheet 4.**

This sheet shows a moderate revision of the present standard of rounding. The proposed slope results in a parabola curve and makes a better transition than the present practice under which an equal distance either side of the top of slope stake is used for rounding. This is borne out by field construction and clay models. No change is made in the present standard of slope flattening on horizontal to plus ground slopes.

**Rounding and Flattening Cut Slopes on Horizontal to Negative Ground Slopes — Sheet 5.**

The present standards for rounding top of cut slopes have been inadequate when applied to most negative ground slopes. There has been too sharp an "angular" condition at the top. In many cases this has been taken care of by checking the individual cuts with the engineer. The proposed rounding will flatten the curve at the top of the cut.

It is also desirable to modify the sharp ridge effect that often obtains, as seen in cross section through the outside cut sections. It is proposed that the cut slopes be made flatter where the ground slopes are negative. The excavation quantities involved are not large.

**Flattening and Rounding Cut and Fill Slopes — Sheet 6.**

As explained earlier, all of the data shown on Sheets 2 to 5 inclusive (with the exception of the detailed gutter surfacing section on Sheet 2) is covered on Sheet 6 in the two cross sections and tables.

**SUMMARY**

(1) A setback of the steep cut slopes, enables rounding of the lower part of the slope. This adds stability to the slope and improves appearance through a design for transition from the cut slope to the roadbed. It is complementary to rounding the top of the cut slopes and this together with slope flattening serves to further the appearance of the road fitting the natural terrain.

(2) Stabilizing the slopes will increase vegetative cover on the steep cuts where it is needed so badly, and more plant growth that is lost through clearing, can thereby be restored. This is in the direction of making the least obtrusive development necessary to road construction in the parks.
(3) A relatively low percentage of increase in first cost is involved with transition cut slopes. This would be offset by a decrease in maintenance. Even less increase in excavation quantities is involved when the proposed cross sections are compared with sections of the highest road standard (28 ft. shoulder to shoulder) for an entire project, that has been constructed in the parks by the Bureau.

(4) The flat gutter section will improve appearance in connection with the transition cut slope. This type of gutter will give additional safety in the road through providing places where cars can turn off the through lanes either in case of emergency or in regular use for the purpose of stopping to admire natural features.

It is proposed that gutters and road shoulders be constructed of coarser aggregate than the center seal coat pavement of the road. The paved gutter will eliminate ditch erosion, and protect the road surfacing, through sealing out surface water, thus eliminating necessity for deep ditches designed to keep surface water at a lower elevation than the bottom of the road surfacing material. With paved gutters less cross section area of gutter is needed to carry surface water and hence a shallower gutter can be used.

(5) Two types of drain inlets are presented for use with paved gutter sections.

(6) To the larger extent the handling of subsurface drainage is distinct from the handling of surface water. This affects ditch design. The proposed cut slope cross sections are advantageous to subsurface water conditions as affecting the roadbed.

(7) Flattening fill slopes in relationship to the height of fill and percentage of ground slopes will improve appearance in fitting the road to the natural terrain. More safety is added to the road, and in the case of lower fills, flattening may permit of eliminating guard rail. Bottom of fill slopes are to be rounded with steeper positive ground slopes. The drawing will fill a need for definite instruction to contractors and engineers in fill slope construction.

(8) For improvement in appearance at moderate revision is proposed for rounding the top of cut slopes. Flatter cut slopes are proposed for construction in negative ground slopes.

(9) The design standards exclusive of surfacing cross sections are shown on one sheet. It is proposed that this sheet or its equivalent to fit a particular project, be included in the contract set of drawings to explain the proposed design for cut and fill slopes.
The new features of road design shown in the drawings and described in this report are an approach to the kind of design that landscape architects have done in private practice, and in public projects when opportunity was presented to do this. Advancement has been made in road design, and the engineering profession has a better appreciation and recognition of standards for better appearance. Likewise, we have learned from them.

Much of the design we have accomplished, has been educational. Not only has the Bureau adopted those features in National Park roads, but are also using many of them on Forest Highways. Some have been used by State Highway departments in the West as roadside development has gradually advanced to where it is now recognized as an integral part of highway planning.

Of the several features described, it is felt that the transition cut slope with its possibilities for further stabilization and for restoration of plant growth, and the flatter gutter section are most important. The other features are for the most part modifications for improvement in standards that are functioning at present, and can be more readily adapted.

These new design standards are submitted for your review, and it is recommended that they be used as the basis for improving design in the National Park roads.

Respectfully submitted

Thos. E. Carpenter
Deputy Chief Architect
WHERE SUBSURFACE WATER IS ENCOUNTERED INSTALL PERFORATED PIPE IN ROCK-FILLED TRENCH

OPENING FROM GUTTER

OPENING TO GUTTER

OPENING FOR ROAD CURB CAN BE CUT IN FIELD

HEIGHT, D.E.F. TO 4 FT.

AS REQUIRED

CONCRETE IN BOTTOM FOR BASE

24 D.I.D. ON 4" AS REQUIRED

18 DRAIN OR

SK.
APPENDIX I

1941 UPDATES, NP-PG-2015
The Branch of Plans and Design updated the flattening and rounding of road fill slopes and filling pockets inside embankments in these two sheets (one draft, one final) from 1941.
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264