Historic Roads in the National Park System
Special History Study
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IN MEMORY OF MY DAD
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WHO TAUGHT US TO
“LISTEN TO THE WILD”
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 all five of us rowdy children into the air force blue Chevy station wagon and whisked us off to Manassas, Shenandoah, Blue Ridge, Great Smoky Mountains, Harpers Ferry, Antietam, and many other national park areas. Even then I could perceive something special about national parks. The scenery changed even though it was just a couple of miles down the road from the outside world. The air was cleaner, 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 the Virginia piedmont through the eyes of Thomas Jefferson; I imagined I was a young rebel soldier looking down from my crow's nest in the mountains watching troop movements in the Shenandoah Valley below. We took photographs that documented our travels—with all of us kids sitting on a stone retaining wall at an overlook in Shenandoah, 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. Looking at these photographs years later I was not always able to pick out the exact locations where the pictures were taken, but I invariably knew the parks.

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 it all 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 carries us to some of the park's prime resources, and through a variety of scenery that gives us a feeling for the territory that the park encompasses. The gentle, rounded slopes along its edges and the way the road lies so delicately on the land enhance the subtleties of the natural landscape. The road also carries us to the trailhead, the campground, the restaurant, or our bed 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 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.
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INTRODUCTION

The development of road systems in national parks involved interrelated political and economic issues. Although based in the idealism of the Organic Act that established the National Park Service, park development relied on appropriations that were linked to visitation. During the late 'teens and 'twenties the National Park Service pushed for funding for the construction of park roads, 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 chief geographer of the U.S. Geological Survey to the 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. Later annual reports of the director of the National Park Service and other documents for that time period showed clear motivation. Although many records chronicled the scenic and inspirational qualities of national parks, a recurrent theme throughout the literature involved increasing the economic strength of the nation through tourism, thereby providing a practical justification for parks. Allowing 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 increased dramatically — from 8,000 in 1900 to 23 million in 1930. This prompted a major change in how parks operated. Initially most visitors had arrived at parks via train. The railroads made most of their park-related money from the sale of passenger tickets, and they made very little if any from concessions operations with which they were connected within park boundaries. Thus, their greatest profits came from outside the parks. Following the dramatic increase in autotourism by the 1930s, as environmental historian Alfred Runte pointed out, the profit-taking from visitors' pockets shifted from outside park boundaries to inside the boundaries as visitors spent money on hotel accommodations, meals, and souvenirs.

Coincident with the early physical development of national parks was the evolution of a design ethic that emphasized an organic approach to architecture and landscape. This evolution, the roots of which lay in the 19th century work of horticulturist Andrew Jackson Downing and Landscape Architect Frederick Law Olmsted, stressed design in harmony with nature. Following this ethic, nature was the most important element of design, and all design decisions subordinated the built environment to the natural environment. National Park Service (NPS) designers during the 1920s tended to perceive roads and buildings as necessary evils, and they incorporated a variety of means in their designs to achieve harmony with the surrounding environment. The use of onsite, natural materials, sensitive siting that responded to nature, and curvilinear road alignments that hugged the topography were characteristic of this type of rustic design. Because this ethic permeated all aspects of park design, national parks began to develop a distinctive, identifiable look and feeling.

The creation of a formal partnership between the National Park Service and the Bureau of Public Roads in 1926 clarified an ongoing alliance. Since 1914 the two agencies had been working hand-in-hand to construct new roads and rehabilitate existing roads in national parks. The interbureau agreement signed by the two agencies in 1926 specified that the

2. Foresta, America's National Parks and Their Keepers, 27.
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Bureau of Public Roads was responsible for surveying, engineering, and overseeing construction of park roads while the Park Service maintained absolute control over the aesthetic and management issues of road design and construction. The roads constructed through this working arrangement included some of the best examples of road engineering and the most scenic roads in the United States.

Thus the Park Service in conjunction with the Bureau of Public Roads built park roads, and the states, often in concert with the Bureau of Public Roads built access and connecting roads. A problem, however, arose. Park roads were so well-designed that the experience of driving a park road became an integral part of the park experience. Sometimes the road became a destination in itself. Driving park roads evolved into one of the recreational experiences that visitors relished in parks. 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 Road, or to Rocky Mountain National Park without driving Trail Ridge Road. Sometimes specific features on the park road also became signatures of the park experience. The carved entrance sign of the profile of the Cherokee leader Sequoyah along the road at the entrance to Sequoia National Park was one of those identifiable marks. The rustic log entrance station at the northeast entrance to Yellowstone was another. Distinctive landscapes or specific vistas developed into indelible images that became part of the collective scenic and cultural heritage of the nation. The view of the mountains and the river from the Snake River overlook at Grand Teton National Park was one of these. All of these elements were part of the park experience that visitors mentally collected and took home with them.

The application of the rustic aesthetic to road design enhanced the park experience so much that more and more visitors came pouring in. The well-designed roads made access easy and something else to write home about. They introduced the American public to the wonders of nature. Yet as early as the 1930s a few faint voices complained of the impacts of road construction on national parks and the number of automobiles and people that the new roads encouraged. Despite these early warnings, NPS administrations continued to foster park development to stimulate tourism for one principal reason — congressional appropriations for parks were directly correlated with park visitation figures.

Visitation steadily increased in national parks through the 1930s, and more automobiles passed over park roads. A depressed domestic economy during and after World War II and the Korean War reduced funding for park maintenance, so the roads fell into disrepair. Compounding that situation was the rugged terrain over which some park roads passed. Despite the best engineering available at the time, the forces of nature sometimes overtook the forces of development. Portions of roads collapsed or slumped due solely to the natural conditions under which they were constructed. An influx of funding for road projects during Mission 66 — a 10-year development program to upgrade park facilities for the 50th anniversary of the agency — altered the manner in which the National Park Service constructed roads. Rather than emphasizing the aesthetics of nature in the design, the matter of greatest concern most often became one of engineering the road to accommodate greater numbers of larger vehicles at higher speeds. Also, highway safety standards changed tremendously, and most old park roads did not meet those requirements.

During the 1960s a change in the tenor of the perception and management of the country's natural resources occurred. The passage of the Wilderness Act was a sign of the times. Consistent with the thinking of environmentalists such as Rachel Carson and Aldo Leopold, understanding the fragility the world's natural resources became a higher priority to land-managing agencies. Appropriate treatment of resources was an issue of high visibility, and a stronger emphasis on environmental concerns spilled over into park road design. When the
first official *Park Road Standards* was printed in 1967, the authors noted that park roads were different than other highways, and because of their locations in highly sensitive ecosystems road width and numbers should be kept to a minimum and treated with the utmost care. The standards also commented on the subtle aesthetics of park roads, their graceful curvilinear alignment, and their gently rounded slopes. The standards put greater emphasis on the natural environment in which the roads were constructed than the National Park Service had previously. Although the aesthetics of park roads remained a strong concern, they often slipped in the priorities of road design.

In the past two decades the evolution of priorities in road design issues continued. During the 1970s and early 1980s, for instance, safety tended to be of paramount importance in design, and all other issues became subordinate to that. The significance of park road design in engineering, architecture, and as part of the cultural landscape emerged during the 1980s. In the past decade controversy often arose on park road projects when issues concerning modifications for the sake of highway safety conflicted with preservation of scenic, cultural, and historical values. In addition, a lack of consistency in dealing with road projects appeared between Federal Highway Administration and National Park Service offices. Part of the problem was the lack of understanding about what features constituted a historic road, why those features were significant, and how they should be managed. Although most managers, designers, and cultural resource specialists could understand the significance of specific architectonic features on a road such as a bridge or tunnel, the other components that contributed to the road's sense of place — the character-defining features in the road prism, in the gradient, or in the vistas — often remained elusive. Also, the importance of the road in its broader context — to the overall pattern of the cultural landscape of the park and region, and its contributions to the history and development of the area — sometimes passed unrecognized. In recent years this situation has improved dramatically as more park roads have been evaluated and included in the National Register of Historic Places, and as the Historic American Engineering Record continues its research and documentation work throughout the national park system.

This study was funded to answer some of the questions about the historic development of park roads and their aesthetics nationwide, to provide information on context, and to provide guidance in understanding what features constitute a historic road. Part I of the document includes a narrative history of the development of park roads through Mission 66. Part II includes information on the significant features that make up historic roads. Part III includes appendixes and a bibliography. In the appendixes 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 and construction to ameliorate impact on the landscape and resources of national parks.

Managing historic park roads is a complex task. Recently NPS Landscape Architect Charles Birnbaum summarized five essential points for dealing with historic landscapes, of which historic park roads are an essential element. These included (1) establishing a historical context, (2) adopting a comprehensive preservation planning process, (3) acknowledging that rehabilitation would probably be the most practical treatment, (4) networking with allied professionals, and (5) understanding the dynamic qualities of landscapes. All of these apply to the proper management of historic park roads. Yet the impacts that construction and rehabilitation have on historic park roads extend beyond matters of cultural resource management, beyond safety, and beyond aesthetics. Roads will continue to provide access to parks. For most visitors driving the park road is the entirety of the park experience, and that park experience can have a profound effect on people. Environmentalist Aldo Leopold wrote in *A Sand County Almanac*: 3
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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.  

The care with which most park roads were constructed did both.

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 parks for the scenic, inspirational, natural, and historical qualities, we now must consider the global impact of every undertaking we execute in and around the fragile, limited resources of the earth, including the relatively pristine ones within our artificial NPS boundaries. The political reality is such that national parks will always accommodate visitors. Our agency and our parks were authorized through legislation, and it would be foolhardy of us to believe that they could not be deauthorized in the same way. In the future the importance of parks may lie increasingly in their environmental significance as recharge zones, and as teaching tools for improving our understanding of the 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, asked again, and answered again as the population of the earth increases.

Thus understanding the management issues connected with historic roads in parks requires a broad vision: studying the history of the area and the importance of the road to the area's development; delineating the physical features that make a park road a significant work of engineering or landscape architecture; accommodating those features in rehabilitation work; and most importantly, comprehending the ramifications of the chosen course of action on the future of that park.

This study would not have been possible without the help of several key people with that broad vision — in particular, John Reynolds, Denis Galvin, and Leslie Starr Hart. Others who made significant contributions were James Stewart, Harlan Unrau, Howard Wagner, Terry Goodrich, Mo Miller, Dana Leavitt, Pat Sacks, Ethan Carr, Linda McClelland, Ken Raithel, Robin Gregory, Bob Page, Marcy Culpin, Mark Hartsoe, Eric Deloney, Richard Quin, Todd Croteau, Beth Savage, and Eliot Foulds. A great number of people from various parks and offices of the National Park Service and from the Federal Highway Administration assisted with this document. Thanks to all of you.

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

4. Aldo Leopold, A Sand County Almanac.
PART I: HISTORY
EARLY ROADS: EXPERIMENTS AND SUCCESSES

EARLY FEDERAL INVOLVEMENT IN ROAD CONSTRUCTION

Traveling down an early 19th century country road in frontier North America was a hazardous undertaking for the hardy travelers who ventured forth. Sometimes these routes 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 across the central lowlands, the Great Plains, the southern Rocky Mountains, and the high plains and deserts 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 of that expansion.

Federal involvement in the process of building roads for the nation was a slow evolution. During the early 19th century the economy of the new country was still struggling. In 1801 Secretary of the Treasury Albert Gallatin suggested that one-tenth of the net proceeds of public land sales be applied 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 state to do so. Three-fifths of the money gleaned from public land sales there was earmarked for roads to and through Ohio. This was the beginning of federal and state support for road construction.

In 1807 the United States Senate requested Albert Gallatin to conduct 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 navigational headwaters 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 would receive. So many wagons loaded with freight traveled the road that available funding could not cover the high costs of maintenance. Merely building the road, then, was not enough.

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, disapproved of the proposal and vetoed the bill. He reasoned that the collection of tolls implied that the federal government had


6. America’s Highways, 16–18.
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.\(^7\) 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 19th century included construction of 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, Tennessee 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 Native American trails. Between 1807 and 1880 the United States Army constructed more than 100 other military wagon roads throughout the United States and its territories, which amounted to 21,000 miles of roads.\(^8\) Thus federal involvement in road construction started in the early 19th century and contributed to the development of the nation through actual road building and federal aid.

**THE EMERGENCE OF ROAD DESIGN IDEAS**

During the middle of the 19th century a young horticulturalist 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 landscape issues on private estates, he included as part of his work sections on road construction within parks. He stressed laying out roads following the topography and the natural curves of the landscape. He emphasized planting copse of trees within 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.\(^9\) His approaches either worked with existing natural landscape features, or included construction or manipulation of landscape features to enhance the qualities of nature.

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 19th century. This picturesque, designed landscape was 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

\(^7\) The Federal Highway Administration operates in the same way today. *America's Highways*, 19–21.

\(^8\) *America's Highways*, 24.

thus by curves and grades avoiding unnecessary violence to nature."\(^\text{10}\) His gentle approach to landscape architecture stressed the process of sequentially experiencing 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.\(^\text{11}\)

**A FEDERAL ROADS AGENCY**

The need for better, more dependable road systems increased in the late 19th century. The Agricultural Appropriation Act of 1893 set aside $10,000 for the secretary of 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 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.\(^\text{12}\) 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.\(^\text{13}\)

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 progress in road construction 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 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. The Bureau of Chemistry analyzed all of that information and made recommendations about the appropriateness of

\(^{10}\) McClelland, *Presenting Nature*, 22, quoting from Olmsted's "Notes on the Plan of Franklin Park."

\(^{11}\) McClelland, *Presenting Nature*, 47.

\(^{12}\) America's Highways, 44, 47, 48.

the material for road construction or suggestions for possible improvements to it. Dodge readily understood the benefits of learning from successful operations and studying the applications of different materials.\textsuperscript{14}

In 1900 the Office of Public Road Inquiry experimented with a variety of road materials that included vitrified brick, oiled roads, and 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, the agency coated 4,650 feet 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 30 other railroads throughout the United States were using the process, and most claimed that the crude oil made 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.\textsuperscript{15} This experiment was typical of ones the bureau had underway.

The annual reports for the agency during the early 1900s concentrated on two concerns: technical aspects of road building; and building good roads for the nation to open it up and serve the people. The aesthetics of road design and construction were not discussed in those reports. Instead the agency's bent was a purely practical one concerned with materials and maintenance.\textsuperscript{16}

By 1903 the OPRI budget increased so it could start doing more. At the time, the office had a construction team that traveled around the country building demonstration roads. They constructed approximately eight or nine road segments each year in areas scattered all over the United States. The segments varied from .5 mile to 1.5 miles long. In 1900 they had even constructed an experimental brick road on the grounds of the Department of Agriculture in Washington, D.C.\textsuperscript{17} 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 Public Road Inquiry usually gave speeches about improvements in road design and often he had them printed up in local newspapers. His intent was to increase awareness and support for road construction. In one of the articles Harrison wrote:

\ldots 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 [Public] 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

\begin{footnotesize}
\begin{enumerate}
\item Martin Dodge, "Report of the Director of the Office of Public Road Inquiries for 1900," in \textit{Annual Reports of the Department of Agriculture}. Washington, D.C.: Government Printing Office, 1900. The experiment never did settle the question because of variety of gravel and stone used in different parts of the country, the amount of precipitation, and the climate varied so much.
\item National Archives and Records Administration, Record Group 30, passim.
\item America's Highways, 67.
\end{enumerate}
\end{footnotesize}
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. They consist of granite, trap, syenite, quartz, etc. This is much better than your soft limestone, or loose sandy, washed gravel.18

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

This small agency also assessed the broader needs of the country. In 1904 the agency conducted a survey to get an idea about the condition of roads throughout the United States. It mailed out a questionnaire that 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.19 This survey revealed how much work needed to be done.

At first the Office of Public Road Inquiry 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 the Office of Public Road Inquiry 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 the Office of Public Road Inquiry to create the Office of Public Roads (OPR). Also the legislation required that the head of the agency be a scientist. Logan Waller Page was appointed to the position.20

Page had a strong background in road engineering, and he was a proactive thinker. He began his career as 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 19th through the early 20th century France had the highest roads standards in the world, and Page took advantage of that knowledge by attending the French Laboratory of Bridges and Roads. He brought his additional skills back to his jobs in Massachusetts. He set up a laboratory for testing road materials with the Bureau of Chemistry in the Department of Agriculture, and he helped to establish testing labs in some of the states. When he received the appointment as director of OPR in 1905 he continued that agency's practice of constructing demonstration or object lesson roads. He expanded that program and shifted the emphasis in construction materials from macadam to locally available materials—most often earth, clay, and sand—that tended to respond better to the local environment. Even more importantly, however, Page wrote and disseminated additional information on road construction. In his writings he continually

19. Ibid., 50.
20. Ibid., 50-52.
emphasized that proper initial construction and systematic maintenance — things that were cheap and affordable to most communities — would keep roads in good condition for long periods of time. Following that course of action, he noted, provided a solid foundation for hard surfacing when funding allowed that to become a possibility.  

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 1,300 miles of dirt roads and 440 miles of sand-clay roads. Some were still experimental. In Mississippi, for instance, the agency tried burning fires on a clay road until the clay lost its plasticity and became a hardened surface. Under Page's direction, the OPR engineers drew up specifications for different types of road construction based on their 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 specifications for bituminous road binders became the industry standard, and they were adopted by many state highway commissions.

Page looked closely at the practical applications of his work, and his agency cooperated with the U.S. 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 assist solely with work in forest reserves, but Page allowed more of his people to work with the Forest Service as additional funds became available. 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 he assessed 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.

The need for qualified people increased as the funding did. 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. Also, the Post Office Appropriation Act of 1919 provided $3 million for road construction in fiscal years 1919-1921. This surge of federal money into road construction allowed Page to draw from that group of civil engineers trained under his direction.

Because of this large influx of federal money into road projects, officials from state highway departments across the country began discussions among themselves and noticed common problems and goals. In 1914 they formed an organization known as the American Association of State Highway Officials (AASHO) for "the purpose of providing mutual cooperation and assistance to the State highway departments ... and the Federal Government, as well as for

21. Ibid., 64-66.
22. Ibid., 67.
25. Ibid., 133-34.
Early Roads: Experiments and Successes

the discussion of legislative, economic and technical subjects pertaining to the administration of such departments.\textsuperscript{26}

The influence of AASHO was strong, particularly on the development of standards for road construction. Although the federal government had established a handful of standards in the federal-aid regulations of 1916, they were extremely minimal in content. Those federal standards stated that bridges, viaducts, and overpasses were to have roadways of not less than 16 feet, with clear head room of not less than 14 feet for a width of 8 feet at the center. This was one of the few occasions in which the federal government set standards for roads. Instead, the states worked together through AASHO to establish standards they all found acceptable, and they made adherence to the standards a provision of receiving federal aid.\textsuperscript{27}

Contemporary road construction practice of the time included several types of available technology. 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 penetration and mixing methods were both used. Even though the experiments were relatively successful, the emphasis in road construction by 1916 shifted away from dust prevention methods to road preservation methods. In the latter, wearing courses of tar or asphalt were built up over macadam, slag, or gravel bases. This method of construction followed along with Page's preferred way of working: creating a solid base and adding to the top of it when funding allowed. Under the Office of Public Roads the experiments were a good training ground for the engineers and physical scientists who later did soils engineering and pavement design for the agency.\textsuperscript{28}

"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 only 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 6 miles per hour. Automobiles, however, had started to push far beyond the boundaries of the cities at considerably higher speeds. 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{29}

As the numbers of vehicles increased, so did the interest in expanding their territory. The first time an automobile went entirely across the United States was in 1903 when Dr. H. Nelson Jackson and his chauffeur Sewell K. Crocker drove from San Francisco to New York. They were the first of millions to do the same.\textsuperscript{30} Although Dr. Jackson and his chauffeur

\textsuperscript{26} Quoted in America's Highways, 79.

\textsuperscript{27} Ibid., 88.

\textsuperscript{28} Ibid., 68–70.

\textsuperscript{29} Ibid., 52.

\textsuperscript{30} Ibid., 60.
shunned publicity, word of their exploit spread quickly. As more well-to-do people acquired automobiles, they quickly adopted the recreational aspects of driving, and they began constructing a political base to support their auto-touring and road-racing habits. The Automobile Club of America, for instance, started as a social club of people who enjoyed touring in their vehicles and participating in long-distance road races. They worked hard at protecting 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 and to improve road access.  

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 traveled cross-country had to carry individual licenses for each state through which they passed. Also automobile driving regulations could vary from county to county in the same state. Rural areas often were notorious for speed traps that provided a large percentage of support for small town or county treasuries.

By 1920 support continued to grow for touring the countryside by automobile, and the federal agency charged with providing technical support on roads projects — the Bureau of Public Roads — was starting to recognize the need for different types of roads. Often the early roads that had been upgraded from wagon roads to paved roads had rights-of-way that were too crooked and narrow to be upgraded to the modern highway standards of the time. As a result new construction of the period often adopted straighter lines (tangents) 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.

The use of tangents was typical of the design preferences of the Bureau of Public Roads: directness rather than aesthetics.

31. Ibid., 56-60.
32. Ibid., 57-60.
SUMMARY

Federal involvement in road construction started early in the 19th century, and part of money from 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 19th and early 20th 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; yet implementation of aesthetic concerns lagged behind. 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.
THE DEVELOPMENT OF PARK ROADS

AUTOMOBILES: YEA OR NAY

While interest in autotourism grew throughout the United States in the early 20th century, the official stance of the Department of the Interior was that no automobiles would be allowed in the national parks. That started to change in 1907. Hot Springs Reservation was the first federal reservation — set aside in 1832 for its natural resources.\(^{34}\) During the 1890s the reservation underwent considerable landscape development and improvement under the auspices of the War Department. Part of that development included the construction of carriage roads that wound up the mountainsides to overlooks and an observation tower.

In 1907 W. Scott Smith, the superintendent of Hot Springs Reservation, wrote to the secretary of the interior and 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 taking carriage or horseback rides on the mountain roads.\(^{35}\) A handwritten note on that piece of correspondence stated "7/11 Letter to Superintendent, denying." That small, penciled note from 1907 eventually changed the way in which most visitors experienced national parks. Hot Springs was the first federally protected area to officially allow automobiles.

In 1908 the chairman of a group called the California Promotion Committee officially requested that automobiles be allowed in the national parks. In response to that request the first assistant secretary replied that automobiles were only allowed in Mount Rainier National Park, and that their use 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."\(^{36}\) The exceptions at Hot Springs and Mount Rainier, however, had opened the floodgates.

Despite that official ruling, the public pressure for providing automobile access to the national parks was building. 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, Maj. Harry Benson, had 13 years of park duty under his belt, and he adamantly counseled against it. He replied: "The character of the

\(^{34}\) Hot Springs Federal Reservation became Hot Springs National Park in 1921. Thus, technically it was not the first national park area to allow automobiles.

\(^{35}\) National Archives, RG 79, Entry 6, Hot Springs, box 66, Letter, Superintendent W. Scott Smith to the Secretary of the Interior, 1 July 1907.

\(^{36}\) National Archives, RG 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, as shown in the earlier paragraph, allowed in Hot Springs Reservation in 1907.
The Development of Park Roads

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, 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-up teams might be overturned when the animals were spooked by an automobile. Benson also cited that the two army superintendents who commanded Yellowstone before he did — Col. Pitcher and Lt. Gen. Young — both recommended that automobiles be prohibited from entering the park.37

The push for automobiles in the national parks continued, however. 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 be allowed to enter 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."38 Then the secretary began hearing from senators who had been contacted by their constituents, and additional pressure was on. Sen. 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 Fred Whiteside, a constituent from 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.39

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 increasing visitation was one of the chief topics at a conference on national parks held in Yellowstone in 1911. Representatives from the railroads argued that train ticket prices were cheap enough to foster tourism in the parks, so they saw no


38. National Archives, RG 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.

additional need for the railroads to provide additional aid. In their view, the biggest obstacle to increased visitation was limited automobile access in national parks.  

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 (chief geographer 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 developed a road-use schedule which "governed self-propelled vehicles and muscle-drawn wagons, which practically kept the two forms of travel completely apart." The AAA also pushed for the construction of connecting highways between national parks through federal aid. Batchelder 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."  

Even though a few other national parks were open to the motoring public, the opening of Yellowstone to automobiles in 1915 signaled the beginning of a new era. The automobile clubs believed they had won a terrific victory over the 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 principal factor that opened the parks to automobiles.


43. National Archives, RG 79, entry 6, passim.
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 conflicts between horse-drawn vehicles and automobiles on the same narrow roads pointed to a need for regulation. Despite the problems that existed in with allowing automobiles into national parks, the department had become more flexible by 1910-11. The office of the secretary of the interior drew up regulations governing the admission of automobiles to 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.44

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 Hot Springs in 1907 and 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, Sulys Hill, and Casa Grande. Yellowstone National Park's concessioner phased out the horse-drawn stages and replaced them entirely with automobiles during the 1917 season, only two years after automobiles were allowed into the park.45

44. National Archives, RG 79, entry 6, PI 166, 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."

Fig 1. 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. Maj. Hiram Chittenden, who had been in charge of road construction in Yellowstone, supervised construction of this road. Horse-drawn carriages, bicycles, private automobiles, and concessioner touring cars were allowed access. *National Archives, Record Group 79.*
SEE AMERICA FIRST

In 1914 Europe was at war, and in August of that year John Wilson, 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." 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.46

EARLY INTERBUREAU 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 agreement to handle roadwork. Since 10% of forest revenues were allocated for roadwork, the Office of Public Roads had a good working budget for Forest Service lands.47

The Office of Public Roads also 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 the Office of Public Roads 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 10% Forest Service fund.48

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 National Park Service, Stephen Mather and Horace Albright cultivated powerful and often philanthropic support groups that included congressmen and senators, presidents, and businessmen and used them to benefit the agency. When Congress refused to approve an appropriation for the acquisition and


47. Ibid.


49. Ibid.
reconstruction of the Tioga Road that crossed the Sierra in Yosemite National Park, Mather believed so much in its acquisition that he dug into his own pockets and also loosened the purse strings of his cohorts to finance it.  

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 established a separate Division of National Park and Forest Roads within the Office of Public Roads to handle the projects, and he placed T. Warren Allen at the head of the new division. That same year Assistant Secretary of the Interior 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. These projects laid the groundwork for the decades of cooperation between the two bureaus.

"THERE ARE ROADS TO BE BUILT . . . ."

Between 1913 and 1915, T. Warren Allen spent a large amount of time in Yosemite, Glacier, 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 an abundant number of roads should be constructed 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 all people. In his view, after the roads were constructed to the park entrances, they were then to continue on to the primary points of interest in the parks. In general, his ideas paralleled those adopted by Stephen Mather.

Allen stated that the construction of park roads was often similar to the construction of forest roads. Parks and forests were huge tracts of land that in his view warranted development for two reasons: these land areas often contained physical obstacles to connecting with larger road networks; 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 overtaxed bodies and brains may be obtained as in the woods, and it should be our endeavor to make them readily accessible to all."

50. Foresta, America's National Parks and Their Keepers, 22.

51. American Highways, 75.

52. National Archives, RG 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.
Fig. 2. 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.
Allen's philosophy of making the parks accessible to everyone was supported by the first director of the National Park Service. Stephen T. Mather 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.

**PARK ROAD DESIGN PHILOSOPHY, 1915**

T. Warren Allen 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 walked the route, because sometimes roads laid out on a map might not fit the ground. 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 studied 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.


Allen considered using natural features to best advantage, stressing aesthetics, and sometimes even improving on nature were the elements appropriate for park roads.

Then, Allen explained, the road construction was similar to the construction of a typical country highway: placing centerline 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 with a specific 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 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, to enrich the coffers of the country.

The supervisor of Yosemite National Park, Gabriel Sovulewski, echoed Allen's sentiments at the same meeting. 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." In his view it was mandatory to take 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 Yellowstone. Also, Sherfey and others tended to reject truss bridges as being inharmonious with the landscape; also many likened looking at the scenery through the

56. Ibid., 27–28.
57. Ibid., 32.
58. Ibid., 71, 72.
chords of a truss as equivalent to looking through the bars of a prison. 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, discussed how he favored roads constructed on higher ground. Most often, he reasoned, these routes were more scenic, and they often avoided land that was of greater value to commerce and agriculture. His ideas of park road construction thus considered aesthetics and economics.

Ralston discussed studying soil conditions prior to construction, and paying particular attention to the road crown. According to his experience if the drainage were perfect, then the crown needed slightly less attention. Ralston also noted that:

> 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 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, the Office of Public Roads maintained 160 miles of roads, had constructed 170 miles, and had surveyed and planned for 477 additional miles of park roads. Some of the design ideas put forth by OPR officials paralleled the thinking expressed in the Department of the Interior.

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60. Ibid., 60-66.

61. American Highways, 76.
Fig. 3. The United States Army under the supervision of Capt. Hiram Chittenden constructed this road to the top of Mount Washburn in Yellowstone National Park. 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.
PART I: HISTORY

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. Another article described the experience 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." 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.

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." 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 the development of


64. Ibid., 595.

65. Ibid.
comprehensive plans for national parks and the construction of facilities such as roads, trails, and buildings only as needed and only then without harming the landscape.

As early as 1908 Dr. J. Horace McFarland of the American Civic Association—another professional organization instrumental in shaping the national parks—addressed a conference of governors called together by President Theodore Roosevelt to study the issue of conserving the nation's natural resources. McFarland told them:

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.\footnote{Kieley, \textit{A Brief History of the National Park Service}, 6.}

In 1915 Stephen T. Mather was an assistant to the secretary of the interior. 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.\footnote{Proceedings of the National Park Conference, 1915, 115-16.} He stressed that in 1915 between 400 hundred and 600 million dollars in coin was being spent by Americans overseas, and that so 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 than they could in California because of the large numbers of good, reasonably priced accommodations and the ease of access.

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 its 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. The clubs included nearly 2 million women in the United States and through them the membership hoped to "arouse public

\section*{The Development of Park Roads}
opinion to the value, both ethical and economical, of the natural scenery of our national parks.  

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." The concept of master plans for national parks was taking shape. 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 from 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 be seen and visited with the least amount of travel.

Also, Daniels stated that the department had put considerable thought into selecting the type of architecture for the greatest amount of "picturesqueness." Daniels' vision was great, and he frankly recognized the lack of financial support for 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 hope 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.

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:

68. Ibid., 140-42.
69. Ibid., 19.
70. Ibid., 20.
71. Ibid., 22.
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.\textsuperscript{72}

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{73}

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{74}

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 increased 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{75}

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{76} Mather's commitment to automobile access in national parks was so strong that he even supplied some of his own money to do so as shown in the instance of the Tioga Road acquisition.

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 the significant topics included in the four-page memorandum written by Horace Albright were


\textsuperscript{73} Ise, \textit{Our National Park Policy}, 203. These fees were reduced further in 1926.

\textsuperscript{74} Foresta, \textit{America's National Parks and Their Keepers}, 28.

\textsuperscript{75} Mather, \textit{Progress in the Development of National Parks}, 18.

\textsuperscript{76} Albright, \textit{The Birth of the National Park Service}, 195.
a number of items that characterized how the secretary and his department perceived national parks at the time, and in what ways he planned to deal with them. The memorandum described the development of the parks as the construction of “the national playground system.” It also contained 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 employment 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.77

In that statement the secretary of the interior showed his commitment to the scenic and aesthetic qualities of park landscapes, but he also looked toward regional planning efforts to ensure their future. The same policy statement 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 both the nature of the park experience and the national parks themselves. Some of the pressure for change came from the motoring public, which became enamored with the prospect of the freedom of the open road and clamored for access to the natural wonders of America. The pressure for road development to support auto travel became too great for the few voices who held out for no development in national parks. The parks, which were often perceived primarily as scenic and aesthetic resources, became destinations for the adventuresome and for those seeking spiritual replenishment from nature. The preservation of scenery, however, remained a key issue.

On the more practical side, decisions made within the Department of the 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. The "See America First" campaign encouraged Americans to spend their money at home. This accomplished two goals: the money that stayed in the United States 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 subsequent push for park road construction meant that areas that were once inaccessible other than by foot or horseback became readily accessible by automobile.

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
The Development of Park Roads

park by rail.\textsuperscript{78} This foreshadowed the evolution from the iron horse to the horseless carriage as the preferred method of getting to and around national parks.

Ideas about park road design also had started to evolve. Certain structures or methods of construction were being perceived as either appropriate or inappropriate. Even in the eyes of the Office of Public Roads, park road construction was already developing as a discipline separate and distinct from other types of road construction. Although the two bureaus had extremely different missions, some parallels existed in park road design philosophy.

\textsuperscript{78} Alfred Runte, \textit{Our National Parks and the American Experience}, 156.
TEAMWORK/COOPERATIVE EFFORTS

EARLY PARK ROAD DEVELOPMENT

The road systems in each of the national parks developed differently. Many were started before the establishment of the National Park Service in 1916. 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. Other park roads were built by states, counties, or private enterprises. As more parks were added, some of them came with existing road systems, and others came with no roads at all.

The saga of the start of road construction at Yellowstone National Park was an example of the evolution of park road development. Yellowstone, famous for its Grand Loop Road, received its first appropriation for road construction in the 1880s, and the responsibility for administering it rested with the Corps of Engineers. In 1883, Capt. D.C. Kingman was the first officer detailed as an engineer for road construction at the park. Most of the loop road's layout, however, came under the command of Gen. Hiram Chittenden, who came to Yellowstone at the end of the Spanish-American War. Between 1902 and 1905, Congress appropriated more than $1 million to reconstruct roads in Yellowstone. Besides repairing the earlier roads, the army also constructed a new stage road for Canyon to Mammoth Hot Springs by way of Dunraven Pass and Tower Falls. This work completed the loop road around the park. Stephen Mather led the auto tour that officially opened the Grand Loop Road.

Roads constructed under the aegis of the army included the road over Mount Washburn, the Golden Gate viaduct (11 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 (from 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 than left in an incomplete or rough state. He concluded that "The true policy of government in dealing with this problem should therefore be to make the roads limited in extent as will meet actual necessities, but to make such as are found necessary perfect examples of their class."

Some of the problems encountered at Yellowstone were typical of challenges facing park road construction. During the 1915 National Park Conference, Major Fries, who was in charge of road construction at Yellowstone at the time stated that the army was building some "high-class roads" of broken stone with an oil finish. For cheaper roads, the army usually spent about $100 per mile. In one stretch of that type of cheaper road, they had to construct 55 wooden bridges to span creeks. At Yellowstone, frequently 300 miles of roads were under repair or being constructed at one time. Because there was such a short working season —

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80. Foresta, America's National Parks and Their Keepers, 27.
usually only three months — 400 to 500 men often were working at the same time. Roads built at Yellowstone in 1915 still required the use of horse-and-mule teams, and the teams required forage. His goals included constructing steel bridges with concrete decks and reducing all road grades to 6%.  

While Yellowstone's road construction problems tended to be more physically oriented, Mount Rainier also faced political scrutiny. In 1915 only 20 miles of road had been constructed within the park, and repairing and maintaining those roads proved an arduous task. The park 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 to go 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 that the 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!"

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. Stephen Mater 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 National Park:..." 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 effort 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 the Rainier National Park Advisory Board submitted fliers to Congress and the National Park Service pushing for additional road development and 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 complete, and the company demanded that congress now satisfy its part of the bargain. This type of outside pressure often had a strong influence on the development of park roads.

82. 1915 Proceedings of the National Park Conference, 73–75.
83. Ibid., 161.
84. Mather, Progress in the Development of National Parks, 22.
85. Ibid.
86. National Archives, RG 79, entry 17, box 6, Undated Clipping "Is This Important," printed by the Rainier National Park Company.
Fig 4. 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 around the park. Dunraven Peak rose above the road in the background. *National Archives, Record Group 79.*
Fig. 5. 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 70, n.d.
Fig. 6. 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 70*, n.d.
Fig. 7. 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 70.
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NEW EMPHASIS ON PARK ROADS

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 agency was progressing into its second decade its annual appropriations remained tied to visitation numbers. The NPS 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.87

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 of Public Roads Chief Tom MacDonald noted that a growing demand for roads existed — farmers wanted roads from shipping points and agricultural centers to produce areas, and manufacturers wanted roads that facilitated the transportation of raw materials and commodities. In addition, he wrote that tourists were also 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.88 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 with religious fervor about access to park areas and the need to meet 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.'89

His view of one of the national parks as having an inspirational purpose was similar to many others of the period — including NPS Director Stephen Mather and his assistant Horace Albright. Even congressmen echoed that sentiment. Rep. Nicholas Sinnott of Oregon was a

87. Foresta, Our National Parks and Their Keepers, 27.


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.90

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 as little as possible the vegetation, forests, and rocky hillside 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.91

The reasons for park development, however, were both idealistic and practical. On one hand the NPS 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.92

ROAD NETWORKS

The NPS directorate in the 'teens and 'twenties had recognized the importance of tourism to the economy 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 promoted by the National Park Service. In that way autotourists crossing the continent had additional encouragement to see the parks.93

91. USDI, Annual Report of the Director of the National Park Service to the Secretary of the Interior for Fiscal Year Ended June 30, 1924, 14.
93. Foresta, America's National Parks and Their Keepers, 27.
Fig. 8. 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 park. *National Archives, Record Group 70*, Haynes Collection.
The National Park Service joined the informal consortium that encouraged the construction of a network of roads that connected highways and national park roads. NPS Assistant Director Horace Albright and Chief Civil Engineer George Goodwin worked closely with the Western Association of State Highway Officials. At a meeting with that organization 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 entering the parks concentrated in them. Albright expressed interest in building park roads to carry even higher concentrations of traffic inside parks than the less dense concentrations carried 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.

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 had 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 Fops on roads in National Parks, report of the forester for 1922, and the Interior Department bill approved on January 23, 1923, and he based some of his findings on information presented in those documents.

By February 1925, Goodwin had prepared some standard road sections that covered four classes of roadways, and he submitted them to the director for approval. Goodwin's standards included road surfaces of 20 feet, 16 feet, 10 feet, and 8 feet. Mather refused to approve the drawings, and sent them back to Goodwin with instructions to prepare instead "standard cross-sections similar to those approved by the Bureau of Public Roads for forest development roads covering 18-foot, 16-foot, 10-foot, and 8-foot roadways." Mather saw no need for a 20-foot road section unless the service widened a road at some time in the future. He also noted that the Bureau of Public Roads standards approved for forest highway and forest

94. National Archives, RG 70, entry 22, box 4, Letter from George W. Borden, President, Western Association of State Highway Officials, to George Goodwin, 13 August 1924. This concept of having a higher-volume road constructed inside park boundaries was quite contrary to the way parks were developed.

95. The concept does, however, bring to light the issue of high-volume highways funneling visitors into the congested roads in parks.

96. National Archives, RG 79, entry 22, box 4, Letter from 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.

97. National Archives, RG 79, entry 7, file 630, box 154, letter from A.E. Demaray to Mr. Hites, 7 March 1923; and letter from Editor In Charge of Travel and Education to George Goodwin, 7 March 1923.
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development resulted from a number of years of experience in road construction, and that the Park Service had no reason to adopt a higher standard. Contractors, he argued, were familiar with the standards.\textsuperscript{98}

Goodwin overhauled his standard road sections following the standards and resubmitted them a week later. They were nearly identical to the standards adopted by the Bureau of Public Roads. Mather also wrote that although he approved the sections that Goodwin submitted, some variation would be allowed. Widening on curves, for instance, would be approved where conditions required, and a wider width of road might be allowed where conditions warranted and where there would be no disfigurement of the landscape. In the same letter, Mather approved paving the El Portal Road in Yosemite to a full 20-foot width and paving the valley floor roads there — approved as class I roads — to the full 18-foot width. The Middle Fork Road At Sequoia was approved as a class II road, but the director was allowing it to be constructed at less than standard width in some places based on the recommendations of the landscape engineer to prevent scarring the landscape.\textsuperscript{99}

PARK ROAD FUNDING: 1924

Congress responded by approving $2.5 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 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."\textsuperscript{100} 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.\textsuperscript{101} 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 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

\textsuperscript{98} National Archives, RG 79, entry 22, box 1, Director Stephen T. Mather to George Goodwin, 11 February, 1925.

\textsuperscript{99} Only copies of his original submittal disapproved by Mather appeared in the National Archives. National Archives, RG 79, entry 22, Stephen T. Mather to George Goodwin, March 25, 1925.

\textsuperscript{100} 1924 Annual Report of the Director, 13.

\textsuperscript{101} Ibid.
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.102

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. Fifteen years after its inception, NPS Landscape Architect William Carnes recalled how the agreement developed behind the scenes:

The Service had little previous experience in making a location survey and commencing construction on new projects of this magnitude [Glacier's Trans-Mountain Highway] through rugged, mountain terrain. Dissatisfied with the location selected and progress made by the NPS engineer, a Mr. Goodwin,...Director Mather requested the Public Roads Administration to "kibitz" on this project in an attempt to develop a location less destructive to the park's natural features. The resulting location suggestions of the Bureau of Public Roads were so gratifying to Director Mather that he conceived the idea of utilizing this large, well-established engineering and highway building organization for all major park road projects. He requested the Superintendent of Glacier National Park (Charles Krabel), the Service's Landscape Architect (Tom Vint), and the Public Roads Engineer to draft up an agreement which might be entered into by the National Park Service and the Bureau of Public Roads which would set forth the duties and responsibilities which would be performed by the two bureaus should other road projects of this type be undertaken as a joint task.103

In the interbureau agreement (see appendix C ), 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 NPS 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, ran the survey, and 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. The National Park Service programmed funds for the projects and constructed minor roads and service roads. The Bureau of Public Roads supervised contractors on major road projects and drew up the engineer plans. NPS landscape architects inspected and supervised the construction of bridges and guardrails and ensured the preservation of natural features.


103. WASO central files, copies in the Office of Associate Director, NPS, WASO, Memorandum William G. Carnes to Mr. Hearon, 22 August 1941.
Fig. 9. 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, n.d.*
By the time the agreement was signed, certain elements had become standard practice in park road design. Director Mather, for instance, stressed that roads should be constructed in national parks with as little injury to a park’s chief scientific features as possible, but also he emphasized “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.”

The landscape engineers also had made significant contributions to the enhancement of road design in the national parks, and these contributions also had evolved into standard practice. 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. The designers built the road to incorporate specific vistas and natural features such as bedrock outcrops, rivers, and waterfalls.

The signing of the agreement between the Bureau of Public Roads and the National Park Service formalized the way in which the two bureaus cooperated. The National Park Service retained its upper hand in aesthetics, while the bureau controlled the physical activities of construction. 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.

DEVELOPMENT OF THE BRANCHES OF ENGINEERING AND PLANS AND DESIGN

In the early years of the National Park Service, 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., where 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 those needing attention in the future. Punchard wrote an 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 in a national park, and the person responsible for choosing the location of roads, overseeing vista clearing, ensuring preservation of timber along the roads, as well as the person who defined a park’s architectural character. In his eyes, the landscape engineer was the key member of a park’s village planning commission, who oversaw the development of concessioner and NPService improvements.

Punchard wanted to achieve the balance between preserving natural scenery and developing facilities by adopting careful planning methods. 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 urged that new ones be located out of visitors’ sight. He stressed the importance of scenic details to the aesthetics

105. Ibid., 108–114.
106. Ibid., 80–82.
part of the park. He pushed for roadside cleanup 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 first met Engineer George Goodwin when he was working on a road-building project at Crater Lake in 1915. Goodwin’s work impressed them so much that they hired him away from the Corps of Engineers, made him chief engineer of the National Park Service, and established his 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 agency in 1922 as chief of planning, headquartered in Yosemite. The following year his office moved to Los Angeles, and in 1927 the 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. When the Emergency Conservation Work projects came into being in 1933, the branch took over responsibility for state park work in 1936, the number swelled to 220 men. The branch was responsible for preparing master plans governing development in the parks and monuments and providing advice to the director and 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.

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 broader-scoped park planning function 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 reuse of design with nature.

The Branch of Engineering had it 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 of the National Park Service, the bureau put all major road-building

107. Ibid., 82-84.
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. Kittredge had worked as a special assistant to L.I Hewes of the Bureau of Public Roads, and he had extensive experience in road construction. After 1930 a shift in the geographic emphasis 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.110

THE DEVELOPMENT OF ROAD STANDARDS

Some ideas about park roads had been readily adopted by the professional design staff of the National Park Service. Frederick Law Olmsted, Sr., for instance, 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, and 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 Trail, 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 ensured design in harmony with the landscape of the park. So these were all parts of larger systems.

Other issues that the NPS 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 had suggested decades earlier that a road laying gently on the land disturbed the natural topography as little as possible, while at the same time it simulated the natural surface of the landscape to the greatest extent possible.

Actually incorporating those thoughts into road construction standards was a very gradual process. When the army was constructing roads in Yellowstone National Park in 1883, the standards were simple and practical:

18 feet width road, well rounded up in the center, and provided with suitable side ditches and cross culverts; that all trees be removed for a width of 30 feet; that on

side hill cuttings the fill be retained by a dry stone wall, and that an ample ditch be placed on the up hill side at least a rod from the road to catch the snow water and convey it to the natural water courses, and that where there are meadows or marshes that cannot be drained and must be crossed, the corduroy be replaced by a good plankroad. That all culverts be of stone or 3 inch plank, and that all bridges be well constructed of good sawed lumber. This early standards stressed cutting the road through the woods and building it in such a way to keep it dry.

The first standards written specifically for the development of national park roads were written by landscape engineer Daniel Hull in 1925. His treatise, entitled "Landscape Protection for Road Development in National Parks," concentrated on aesthetics. Hull said that most road building of the time was an engineering science that did not take into account what he called the "Landscape Effect."

Hull wrote that new road construction should gain the maximum scenic beauty with the least scarring of the countryside. He stated that some places in national parks should never have roads to them, such as Vernal Falls and Nevada Falls at Yosemite, or the upper portion of Zion Canyon approaching the narrows. In his view the topography of the land would determine road location, and in some instances he believed that one-way roads might solve some complex road design issues around national parks. His treatise stressed that the design of roads should aim for maximum scenic vantage points, and that they should be brought in close proximity to natural features while not endangering their native beauty. He believed that adding a view of a spring, waterfall, or rock cliff provided additional interest for the traveler. To him good road design avoided monotony by traversing through combinations of forest and open country, thus using the variety afforded by light and shade and avoiding miles of sameness. Hull also stressed the use of native materials in road construction and the construction of associated landscape features. In short, he proposed exposing park visitors to specific park experiences through sensitive road design.

In 1926 Mather directed Engineer 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 had his staff work with Hewes to develop road standards and 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. 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 finding ways to eliminate 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. NPS 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 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% grade, although some rough park topography dictated 8% grades in a few areas.\(^{114}\)

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."\(^{115}\) 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.

Next, the National Park Service adopted "General Specifications for Forest and Park Projects," *Federal Register* 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 by 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:

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115. WASO files, 630, Roads General, January 26, 1934.
Fig. 10. 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, n.d.*
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 1.116

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.117

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 resodding slopes, installing wooden cribbing, or using 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 setbacks which gave a gentle, undulating line to the edge. All of these contributed to improved aesthetics of the park road.


117. Ibid, 9.
During the 1920s and 1930s several types of edging materials were developed for park roads. Log and stone were the primary building 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; and blending stonework with the surrounding outcrops. Variations from the simple wall included the guard wall with the crenelated top, used in some parks such as Bandelier. Sometimes individual variations occurred in parks, such as the guardrail at the overlook on the Yakima Park Road (Sunrise) at Mount Rainier, which included large pyramidal shapes mimicking a mountain every 14 feet, or the blocky coping stones that edged the road at Acadia National Park. The walls normally varied from 18 to 24 inches in height, which allowed visitors to look across them and observe the view while they were driving. The masonry specifications called for using different types of stone in different ways. 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.

In most instances the structural aspects of bridges were left to NPS 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 NPS 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.

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, both following construction and on a regular maintenance basis. John D. Rockefeller, Jr., visited Yellowstone National Park in 1924, and he 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 concessioner and the National 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 National 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.¹²⁰

A final item dogging road development was the question of a centerline. NPS Director Arno Cammerer was concerned about a 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 the inconsistency, and his preference for more rustic stone work along roads.¹²¹ 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 NPS 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 city-like appearance."¹²² Cammerer's idea of keeping the roads pristine was not practical, however, in light of the levels of traffic in most park areas. Eventually, all major paved roads in national parks received striping.


Fig. 11. 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.*
Fig. 12. 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.*
Fig. 13. 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.*
Fig. 14. 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.*
Fig. 15. 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, n.d.*
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 of Public Roads was that the NPS landscape engineer worked with the Bureau of Public Roads survey crews in the initial layout of the road. In all matters regarding aesthetics and scenery, the National 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 pullouts and picnic areas. They supervised the selection of borrow pits, selected stone to be used in construction, and ensured the preservation of scenery and the parks natural resources. The National 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.123

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 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.124 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.125 Albright summarized his philosophy on road development as follows:

123. McClelland, Presenting Nature, 120.


125. Albright, The Birth of the National Park Service, 265.
PART I: HISTORY

... in each park the outstanding natural feature, which probably ... was the reason for the creation of the park, has been or is being made available to everybody, and I think this exception is absolutely necessary. The Grand Canyon of the Yellowstone, for instance, should be seen by all whether they be well and strong and capable of taking long walks afoot and making long rides on horseback, whether they be very old or very young, whether they be sick. The same thing can be said of Old Faithful Geyser, the Big Trees of California, the Yosemite Valley, the Grand Canyon of the Colorado. The outstanding natural features, not duplicated anywhere else in the world, all are entitled to see and any policy that contemplates the exclusion of the public from these places could never long be maintained.\(^{126}\)

During 1932 Louis Crampon, 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 on the landscape or conflict with it only to the absolute minimum.\(^{127}\)

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 they 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.\(^{128}\)

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127. Kieley, A Brief History of the National Park Service, 10–12.

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."129

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 two bureaus. 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.

Road construction in Yellowstone during the 1880s was a crude process that showed little concern with aesthetics or resources. By the 1920s, the design vocabulary for park roads had developed to a point that a big effort was put into naturalizing the landscape. Switchbacks were replaced by radial curves where possible. Stone-faced bridges with rampant arches curved gracefully over their spans and incorporated the superelevation of the road. Stone headwalls on culverts and stone guardwalls became commonplace. By the early 1930s standardized plans with standard slopes and guard walls were readily incorporated into park road design. This standardization of road construction features were developed by the National Park Service and reviewed by the Bureau of Public Roads. At the same time, new road construction included the review and comment from a variety of disciplines within the Park Service, including geologists, wildlife biologists, botanists, and interpreters. Prior to World War II, the Park Service began taking a more holistic approach to road development.

Fig. 16. 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 skimmed along the edge of the mountains in a gradual lift up and over Logan Pass. *Rocky Mountain Regional Office, n.d.*
Fig. 17. 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 crenellations added texture and relieved the monotony of the wall surface in the rugged mountain environment. Rocky Mountain Regional Office, n.d.
Fig. 18. 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.
Fig. 19. 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.
EVOLUTION OF PARKWAYS

A DIFFERENT KIND OF ROAD

Parkways evolved in a very different manner than park roads, but as NPS Historian Jere Krakow has pointed out, the meaning of the term "parkway" has evolved considerably since it was coined. As a result there is some confusion about its meanings. This chapter explores some of those.

The idea of parkways grew out of 19th century efforts to create beautify cities by creating grand, landscaped boulevards for the purpose of recreational pleasure afforded by walking, riding, driving carriages, and the social interaction that went along with it. Characteristics of these roads included limited rights-of-way, careful plantings and landscape articulation, exclusion of commercial vehicles, and limited access. Often these boulevards were the approach roads to city parks, or connecting roads between them. By the end of the 19th century the concept of parkway had evolved to include the concepts of the spiritual, restful character that these green strips of nature created in the urban landscape, and the conservation of nature was key to parkway development. The use of the curvilinear roads that flowed along with the topography to expose nature to best advantage was a concept introduced in the work of Andrew Jackson Downing and Frederick Law Olmsted, also during the 19th century.

The introduction of the automobile and subsequent rise in recreational driving substantially altered the concept of parkway. By 1925 Frederick Law Olmsted described the four types of roads that in his view fit the definition of parkway. They were the "elongated park" or linear park that possessed the landscape features of two parks it might connect; the "ornamental street" designed to enhance property values; any thoroughfare with a more aesthetically pleasing appearance, in a landscape sense, than an ordinary street; and finally a combination of an elongated park and landscaped thoroughfare. Thus the use of the term even by one of its originators was somewhat confusing.

The Bronx River Parkway, completed in 1923, was constructed specifically for pleasure and recreational driving, and it was the first of the modern parkways. The exclusion of commercial vehicles, the use of overpasses at crossings, the use of curvilinear alignment reflecting the design speed in relation to topography, the use of planting to screen adjacent buildings, and the prohibition of billboards all contributed to its significance. Also the varying width of the entire parkway corridor created additional visual interest. The 13-mile-long road was part of a larger effort to save the Bronx River from further degradation through land reclamation, provide a park-like connector between Westchester County and New York City, and create a park on both sides of the river. A parkway could turn an abandoned wasteland into an area of scenic beauty.

While the early focus of parkway design had been in urban landscapes, some of the same concepts applied in the development of more rural parkways. In January 1936, 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 it he gave a brief history of federal parkway legislation. Demaray discussed the first federal legislation on

Evolution of Parkways

Parkways, from the Act of May 23, 1928 which provided for the Mount Vernon Memorial Highway. The Act called for a highway connecting Washington’s Mount Vernon home and the nation’s capital. The legislation 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.

Following that, Congress passed 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 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 actual parkway construction started after the President approved building a parkway connecting Shenandoah and Great Smoky Mountains National Park; he requested that work begin as soon as possible on the Blue Ridge Parkway. This series of roads possessed some similar legislative and design characteristics.

Demaray discussed 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 even if it meant making the route longer. Also, grade crossings were eliminated, and parkways had minimal exits and entrances. Instead of acquiring land outright, parkways often used scenic easements to protect the land but not acquire it fee simple. The scenic easements prohibited the construction of buildings, pole lines, or structures other than farm buildings. Private road construction, dumping, and billboards were prohibited.  

PARKWAYS VS. HIGHWAYS

Because some confusion arose even during the 1930s about the differences between parkways and highways, the National Park Service distributed a document that provided the distinction between the two types of roads. In general, the points were the same ones that Demaray had presented. The document stated that a parkway was different than the usual highway because:

- 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.

- 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.

- It was preferably located through undeveloped areas of scenic beauty and interest, and avoided built-up communities and intensively farmed lands.

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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.

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

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.

Scenic easements were introduced in order to secure a maximum of protection without increasing the amount of land to be acquired in fee simple.\(^{132}\)

These became the standards that were applied in the development of the Blue Ridge Parkway.

### BLUE RIDGE PARKWAY

The Blue Ridge Parkway refined the parkway concept to the utmost. Begun in 1935 and not completed until 1984, its construction started for two principle reasons: to alleviate unemployment during the Depression; and to provide the physical connection between Shenandoah and Great Smoky Mountains National Parks. To minimize political involvement in the development of its route and to provide a framework for the parkway, designer Stanley Abbott and his team identified certain principles to guide its development.

First of these was the acquisition of a protected right-of-way through which the road would travel, which would allow for preservation and restoration of the surrounding roadside landscape. Next, the parkway and its structures were to possess a simplicity of character and informality that encouraged harmony with the natural environment. Design elements were to relate to each other so that driving the parkway would provide an unified kinetic experience, although some variety would be encouraged to alleviate monotony. The road would accommodate "ease and safety of travel" while revealing the character of the countryside through which it passed. The man-made roadside landscape was to be preserved and protected. Finally, the parkway was to provide the traveler with ample opportunities to experience the scenic qualities of the country through waysides, overlooks, picnic areas, and lodging.\(^{133}\)

The combination of those elements in that masterful work of landscape architecture contributed to its significance, but the alignment of the road within the landscape and the way in which it reveals the surrounding landscape may be its greatest character-defining features.

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Fig. 20. In 1938 the basic 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.*
Fig. 21. 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 advanced ongoing construction work and the primitive local conditions was sharp. National Archives, Record Group 79, Rhinehart Photo.
BROADER APPLICATIONS TO HIGHWAY DESIGN

Many of the elements developed under parkway construction were later incorporated in highway and interstate design under emphasis from President Franklin Delano Roosevelt. First among these was placement of the road distinct one-way roads that conformed individually to their sites rather than a divided highway with a fixed cross-section. Bridge design was to fit the alignment and gradient of the highway and be subordinate to the surrounding environment. Additional land area on the edges provided space for easier vehicular maneuvering, roadside businesses, and screening. Natural landscape features were to be protected and preserved for use as waysides and in a manner that conformed as much as possible to the existing topography to have the road appear to lie gently on the land. With separated highways both sections should be overlooks. Borrow pits were to remain out of sight or naturalized following construction. Any construction scars were to be naturalized or minimized and revegetation of slopes completed following construction. The highway design and landscape treatment was to require minimal maintenance and possess a natural appearance.\textsuperscript{134}

Even today, the large commuter-type parkways that up until recently came under the jurisdiction of the National Park Service received rave reviews from their users.\textsuperscript{135} An article in the \textit{Washington Post} in December, 1993, stated:

> Among local road-builders, 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.\textsuperscript{136}

Perhaps the best definition of a parkway comes from Landscape Historian Norman Newton. He stated that a parkway was:

> "... a strip of land dedicated to recreation and the movement of pleasure vehicles. The parkway was not itself a road, it contains a roadway. The strip of land was not just a highway with uniform grassy borders; it was of significantly varying width, depending on immediate topographic and cultural conditions. The roadway itself differed markedly from that of an ordinary highway in that it was meant for"

\textsuperscript{134} "Public Roads, Limited Access Highways, Parkways," \textit{Landscape Architecture}, XXXV (October, 1944), 55.

\textsuperscript{135} As of this writing the National Park Service remains responsible for the plantings and landscape adjacent to a parkway, but it is no longer responsible for the actual roadbeds.

comfortable driving in pleasant surrounding, not merely getting from one place to another as fast as possible.\textsuperscript{137}

\textbf{SUMMARY}

Considerable confusion has surrounded the term "parkway" because of the complex evolution of the concept. Parkways evolved from two sources: boulevards with landscaped edges connecting urban parks combining with the curvilinear roads developed in nineteenth century parks that presented the landscape to best advantage. While linear in form, parkways expanded to include appropriate treatment of the natural areas through which they passed. Additional facets of parkway development is the use of the parkways for reclamation of wastelands, particularly when it is developed as an urban connection.

Federal involvement in parkway design honed some of the legal tools for acquisition, design, development, and management of parkways. Many of the design principles developed for parkways were later applied in highway and interstate development.

\textsuperscript{137} Norman Newton, \textit{Design on the Land}. 74
WORLD WAR II AND BEYOND

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 way in which the agency managed its resources. All of these combined forces influenced the way in which roads were constructed in national parks.

In 1941 the deputy chief of planning for the National Park Service was Tom Carpenter. After being involved in the development of national parks since the 1930s, he became concerned about overcrowding in parks and the effect that the construction, management and use of roads had on the visitor experience. Consequently, Carpenter wrote a position paper about road design and speed limits in national parks. In it he explored the influence of speed and people's perception of parks.

In his view there was a limit at which people could travel a road and still perceive the scenery clearly enough to enjoy it. He believed that park roads should reveal representative examples of the types of scenery included within their park boundaries and he saw a need for use limitations. Carpenter reasoned that most of a visitor's park experience was a view from the road, and because of that reason roads took on an increased importance. Carpenter warned that unless the National Park Service accepted some average speed as a criterion for experiencing a park's terrain and scenery, then the agency would have to acknowledge that it was designing roads without consideration for the primary reason for setting aside park areas. Carpenter wrote about the scenic and inspirational values of parks, and notes that park roads and the slowed tempo went hand-in-hand.

But he also noted a differentiation between types of park roads. He believed that the upper portion of the General's Highway at Sequoia should be driven at a maximum speed of 35, while roads built in open, rolling terrain, such as the North Rim approach road to the Grand Canyon, could accommodate a faster speed. He stated that a human limitation factor existed which set a limit to the speed at which a visitor could travel a road and still perceive enough of the scenery to enjoy it. He wanted the National Park Service to establish a criterion of design speed for park roads. He cautioned:

Unless we accept some average speed as a criterion, for the given conditions of terrain and scenery, then we have to acknowledge that we are designing roads without consideration of the primary reason for setting aside park areas and are, on the other hand, concerned only with building roads without any definite limit as to how high the standard may become in the future, and that limit controlled probably only by cost.  

Thus, on the eve of World War II, the idea that restrictions should be placed on park road development and management through design speed had been planted.

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. In 1942 the

Public Roads Administration put out a report stating: "Efforts of the Public Roads Administration during fiscal year 1942 were centered on meeting needs of highway transport for war purposes." The Bureau of Public Roads annual report for that year included no information on park or forest roads, which was unusual. By 1945 the situation had improved somewhat. While most road construction in park and forest areas was suspended during the war, a few projects had been 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 a considerable amount 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 but 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.

The suspension in park road construction was about to pick up again.

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. The vehicle of choice for getting to and around national parks was the car. Park facilities continued to deteriorate, but visitation increased. The outbreak of the Korean War in 1950 further compounded the situation when congress reduced appropriations to the parks even further to cover the cost of the war effort. Yet the agency still faced the philosophical dilemma of providing safe, adequate roads to accommodate the cars without marring the landscape and harming the resources it was charged to protect.

MISSION 66

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 National Park Service. This 10-year restoration and development plan covered every type of park facility from employee housing to visitor centers to roads. Mission 66 included a proposal for construction, repair, and rehabilitation of 2,000 miles of park roads. Yellowstone National Park received special emphasis in preparation for its 100th anniversary in 1972. Appropriations for the entire Mission 66 program amounted to more than a billion dollars over a 10-year period.


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 members of 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. 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."

Wirth explained to his audience the guidelines and justification for Mission 66. 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. The program's emphasis on development was apparent.

In his memoirs, Wirth summarized the Park Service's relationship with the Bureau of Public Roads in light of the Mission 66 program:

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 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 as 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.

Wirth recognized a series of indicators that pointed toward an increase in park use that, in his mind, justified development: per capita income was on the rise; more cars were on the highways; and the average length of vacation time was increasing. The national park system had to accommodate more than 50 million visits by 1955, when the parks were designed to carry less than half that number. Wirth used Mission 66 to meet that demand by improving access to national parks. The bottom line of Mission 66 was to develop parks to accommodate visitors. This included widening some roads, changing some to one-way roads to abate traffic congestion, and constructing additional parking space.

143. Ibid, 261-62.
144. Ibid, 547.
After Mission 66 got underway, disenchantment with road development had set in. The Sierra Club, which had often supported the construction of roads in national parks, saw the upgraded roads of Mission 66 as threats to the parks and the resources they contained. One of the projects that the Sierra Club criticized was the Tioga Road rehabilitation in Yosemite. Between 1932 and 1937, the National Park Service had 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 and paving it from Crane Flat to the White Wolf intersection. This older road was noted for the way in which it “tiptoed” across the landscape. The careful work completed during the 1930s had included upgrading alignments, grades, cuts, and fills, and blending all structures along the road including bridges and culvert headwalls with the landscape.

Under the auspices of Mission 66, the 21-mile-long section between White Wolf and Cathedral Creek was scheduled to be realigned and replaced. When the final section of road was under construction during the 1950s, engineers with the Bureau of Public Roads and politically active conservationists went head-to-head. 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 Francisco Engineer and conservationist Walter Huber, Landscape Architect Frederick Law Olmsted, Jr., and William Colby of the Sierra Club.

Safety standards had changed since the 1930s, and the new design offered by Bureau of Public Roads included 4-foot shoulders on either side of the 20-foot road. The Park Service was fighting for 2-foot shoulders with turnouts where terrain allowed. The Park Service contacted Huber, a past president of the American Society of Civil Engineers and a man who had built a number of roads in Yosemite and the Sierra, to settle the dispute. Huber sided with the Park Service on the 2-foot shoulders, and the bureau accepted that decision. Despite that less intrusive course of action, one report stated that the new road “elbows and shoulders its way through the park — it blasts and gouges the landscape.” In addition critics of Mission 66 castigated the program for what it failed to do: make advances in resource management and ecological maintenance of the parks.

PARK ROADS DEFINED

By the time that Mission 66 came into being park roads had developed an identifiable character of their own. The lessons and standards that started in the west in Yellowstone, Glacier, Yosemite, Mount Rainier, and the other large western parks had spread east and evolved even further at Acadia, Shenandoah, and eventually the Blue Ridge Parkway. Dudley Bayliss, the Chief of Parkways for the National Park Service in 1957, wrote an article in the July, 1957 edition of Traffic Quarterly that the Park Service reprinted and distributed widely throughout the agency. In it Bayliss summarized the differences between park roads and high-speed highways. He noted that they had specialized access and circulation, and that

145. Foresta, America’s National Parks and Their Keepers, 54, 61.
147. Ibid.
World War II and Beyond

1. Park roads were planned to reach the principal features of the park rather than be the most direct route between two points.

2. Park roads were designed to fit the topography of a park rather than to conform to the standards of gradient, curvature, and alignment used in statewide or nationwide applications. The roads lay gently on the land rather than cut through it.

3. Park roads were designed to be low speed roads so that visitors could see and enjoy the park. Their design as low speed roads allowed easier fit into the landscape and reduced the amount of construction scars.

4. Whenever possible, the roads were designed to present the park in the best chronological or interpretive order.

5. In the location of new park roads or in relocation of old roads, NPS landscape architects incorporated points of scenic, historic, or scientific interest even at the expense of additional length or nondirectional alignment.

6. The Park Service employed various methods to protect roadside slopes, to heal cut and fills, and to secure against erosion. These included flattening and rounding slopes, fertilizing, mulching and seeding, restoring native vegetation, protecting natural features from blasting operations, and locating and screening borrow pits from public view.

7. An integral part of park roads were the views and vistas. The agency conducted selective cutting and thinning operations to open and maintain views and vistas. In some instances the designers strived for "canopy views" in which the understory or lower branches of a tree were removed, and the larger trees and their shade remained. Mowing, too, was included as part of that vista maintenance.

8. Master plans prepared by the National Park Service guided all park development. The road system plan was a section of each master plan. Each master plan, including road system portion, was developed with the expertise of a variety of disciplines such as landscape architects, engineers, biologists, and administrative representatives who took into account their respective disciplines in developing the plan. Master plans provided a direction to park development that was relatively removed from the effect that changes in personnel might bring to a park.

The summary clarified for many the differences between park roads and other roads.

CHANGES DURING THE 1960S

A key piece of legislation indicative of the changes in tenor of this time period was the Wilderness Act, signed into law in 1964. In general, the country had started placing a greater emphasis on natural resources — 1964 was the same year that NPS Director George Hartzog established the three-part classification system for national parks to better identify and manage the resources in terms of their inherent values and appropriate uses. Hartzog firmly believed that the key purpose of national parks was to bring humans and their environment
PART I: HISTORY

into closer harmony. Thus, he believed that the quality of the park experience was of greater importance than the quantity of people who experienced it.

Hartzog expanded his ideas to cover park access and development. He stated:

The automobile as a recreational experience is obsolete, we cannot accommodate automobiles in such numbers and still provide a quality environment for a recreational experience. . . . No more roads will be built or widened until alternatives are explored. We want to give a park experience not a parkway experience. . . . The National Park Service must not be obligated to construct roads, or to manage traffic, in order that new kinds of mobile camping vehicles be accommodated. The development of parking areas for trailers at park-entrances, and the exclusion of vehicles from park roads not capable of handling them, are appropriate solution.¹⁴⁸

Hartzog continued by reinforcing his stance on road construction. In his view if the agency were faced with a choice of creating a severe road scar to bring visitors to a point of interest, or requiring visitors to walk, or provide an alternative transportation system, the decision should be against the road.¹⁴⁹

PARK ROAD STANDARDS

In 1966 the functions of the Bureau of Public Roads were transferred to the Department of Transportation and assigned to the Federal Highway Administration. At about the same time the National Park Service had pulled together a team to write the first formal edition of park road standards. The committee who wrote them included: photographer Angel Adams; John Penfold from the Izaak Walton League; Ira Gabrielson of the Wildlife Management Institute; and from the National Park Service Charles Kreuger, assistant director, design and construction; Robert Linn, deputy chief scientist; and as its chairman William C. Everhart, assistant director, interpretation. The composition of the group — three from outside the Service and three from inside — and the disciplines represented (design and construction, the arts and sciences, aesthetics, and interpretation) proved an interesting mix. Missing was any representation from the Federal Highway Administration.

The new standards the group wrote concentrated on establishing an ethic for road design. The standards pointed out that the increase in the numbers of park users was threatening not only park values but the "extraordinary opportunity to make those values a more meaningful part of this nation's cultural inheritance." They were looking at National Parks in a new light.

The standards readily admitted that visitors needed to be manipulated. It stated:

In this era of enormously increasing vacation traffic, it must be assumed that those who visit the National Parks do so for the purpose of enjoying a unique experience, and are therefore willing to accept necessary restrictions, including those regulating

¹⁴⁹. Ibid., 108.
numbers of people and their means of travel. Such regulations, as necessary, may deepen the awareness of visitors that they are truly in places of special importance. 

The document recognized that higher speed on park roads diminished the perceived size of parks, as conversely a slower speed could expand the size. The example it gave proved effective. If a visitor were traveling in canoe at 3 miles per hour, the visitor would perceive that lake as 10 times as long and 10 times as broad as the person zipping across the lake in a speedboat at 30 miles per hour. It concluded that "every road that replaces a footpath, every outboard motor that replaces a canoe paddle, shrinks the area of a park."

The 1967 Park Road Standards looked at broad park road issues and came to some conclusions. The document stated that new roads should be considered only as a last resort in seeking solutions to park access. In park areas that already had established roads the document suggested that the National Park Service consider reducing speed limits, converting a one-way road systems, and limiting automobile use in certain areas of the park. To deal with larger vehicles the document suggesting excluding them from parks instead of constructing roads to those standards, and it recommended that all park roads should be designed for slow speed.

The standards also proposed a formal process for approval of road design and construction. The first consideration dealt with a professional ecological determination to ensure that the effect on park resources would be minimal, and the second was a determination about which means of transportation would provide the maximum opportunity for visitor enjoyment and appreciation of park resources.

The key to the ethic summarized in the 1967 Park Road Standards was included in the document. NPS Director George Hartzog wrote a short piece that park visitors received at some entrance stations:

If the National Parks were like the rest of the countryside, you probably wouldn't be visiting one new. The National Parks are different, though, and one reason for this is that roadways, where they exist, are planned for leisurely sightseeing. Park Roads are designed with extreme care and located with a sensitive concern for the environment. They are often narrow, winding, and hilly. At times they are little more than trails. But therein lies their appeal. These roads can take you close to America's most breathtaking places of beauty and history. To experience a park at its best, try getting away from your car. Walk or, if conditions permit, go by horse or canoe to the more remote reaches. It is almost a truism that the slower you got the more you will see. The next best thing, for those who have neither the time nor zest for roughing it, is a judicious use of park roads. Along these roads, you will find a world as varied as it is unhurried. But park roads are for leisurely driving only. If you are in a hurry, you might do well to take another route now, and come back when you have more time.

150. Park Road Standards, 1967.

151. Ibid.
Although the design ethic proposed in the document came through brilliantly, the practical application of the principles to road design, rehabilitation, and construction, was lacking. The exclusion of the involvement of the Federal Highway Administration in preparation of the document was evident.

ROAD STANDARDS REVISED

Almost 20 years later the Park 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 of road prisms and the design of structures appurtenant to park roads and parkways." Also, Federal Highways was committed under the agreement to accommodate the aesthetic, environmental, and cultural resource protection concerns 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 noticed to discrepancies in the application of the 1967 park roads standards, and the fact that the standards did not address the actual types of vehicular and pedestrian use occurring in many park areas. As a result, the NPS director 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; and 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, and 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." The document cited the Senate report that accompanied the Federal-Aid Highway Improvement Act of 1982, which stated that roads through federal land-managing agencies

153. 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 Standards.
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 and federal 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 lacked an 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 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. 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. The height of guard walls and guardrails 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. The document came closer to addressing hard safety and design issues in conjunction with park philosophy than had the 1967 edition, but it held some room for improvement.

NPS 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 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. Like the earlier version, this group of standards had room for improvement.

154. Park Road Standards, I.

155. Ibid, 1.

156. Ibid, 32.

157. WASO files, Memorandum, Jay Bright, Assistant Manager, Denver Service Center, to Denis Galvin, Manager, Denver Service Center, 14 March 1983.
The aesthetics of park roads was only one issue of discussion. 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 park road rehabilitation projects. After considerable discussion James F. Zotter, assistant regional counsel for FHWA in Portland, Oregon, wrote an opinion on the tort liability of the new Park Road Standards. In it he cautioned:

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 circumstances. 158

This opinion provided cautionary guidance for park road designers. Yet statistics gathered in the mid-1980s indicated that driving the Blue Ridge Parkway was three times safer than driving on state roads in Virginia or North Carolina. 159

SUMMARY

Prior to World War II, NPS Landscape Architect Tom Carpenter recognized that the speed in which people experienced a landscape had an effect on their perception of it. He applied that to park roads design and pushed the concept of slower speed in national parks. 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. The development push of Mission 66 affected park roads, and that strong emphasis on "modern" development to accommodate visitors often had a detrimental effect on the character of the park roads of earlier decades through design based on safety standards rather than aesthetics and resource management concerns. This approach disenchanted environmentalists who often had supported road construction in the earlier years of the agency.

Dudley Bayliss defined what made park roads different than other roads with a listing that identified some of those features. The political strength of the environmental movement during the 1960s culminated in the passage of the Wilderness Act in 1964, and it was indicative of public efforts at the time. In 1968, the National Park Service published its Park Road 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 park aesthetics to park

158. 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.

159. WASO files, Memorandum, Resident Landscape Architect to Superintendent, Blue Ridge Parkway, 2 February 1983.
environmentalism, the identifiable character of park roads was evident even to the casual observer.

The Park Road Standards underwent a revision in 1984. That update stressed the engineering aspects of road design rather than aesthetics and environmental issues. Shortly thereafter a legal opinion on the potential liability of park roads recognized that applicable standards could be waived with adequate documentation, although the National Park Service would bear the burden of proving that decision was a reasonable one.

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. Then the entire road corridor came under study: the history, the engineering feats, the masterful landscape treatment.

Now designers are charged with rehabilitating historic roads that provide access to national parks in a way that ensures visitor safety while at the same time addresses the sense of place the roads provide. Part of that sense of place comes from the landscape itself, but also key to that is the sensitive design that occurred through the symbiotic relationship between the Bureau of Public Roads/Federal Highway Administration and the National Park Service. Today's challenge is to continue that partnering of good engineering and good design with a respect for the past while meeting the social and environmental needs of the future.
PART II: UNDERSTANDING AND MANAGING
HISTORIC PARK ROADS
UNDERSTANDING THE COMPLEXITIES OF PARK ROADS

Only in this decade have we started to comprehend 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. 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, with funding from 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 roads 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 their subsequent management 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 the National Park Service looked most often at only the historic building and paid little or no attention to the surrounding landscape. Now it has evolved to a point where it realizes the importance of the building’s environs and the cultural landscape of which it is a part and takes 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

160. This 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.
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.

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.

The Park Service is evolving out of a 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.

INVENTORY AND EVALUATION

To start the sorting process of working with historic park roads, the traditional methods still work: inventory and evaluate the resource and determine its significance and integrity, and then address the management direction. First it must be determined what the resource is and the best way to manage it. The management goals might include: preserving portions of the cultural landscape, improving safety, moving traffic more efficiently, improving aesthetics, repairing or rehabilitating existing roads, improving drainage, or enhancing wildlife habitat/crossings. In delineating those goals, however, the broader impacts must be visualized. A "better" road usually accommodates higher speeds, increased traffic, altered landscape or park scene, and greater visitation.

The first step in understanding park roads, as in understanding any other cultural resource, is to inventory the historic resources to meet federal requirements under section 110 of the National Historic Preservation Act, Executive Order 11593, section 8© of the DOT Order 5610.1. This task may seem cut-and-dried, but it is quite complex because of the interrelationship among the elements of park development.

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 within the additional context of the individual state comprehensive preservation plans.
Roads should not be considered in isolation. They are an integral part of a 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. They should be evaluated in terms of statewide and nationwide systems, such as the National Park-to-Park Highway and the connecting roads as well as within the context of the park. The overall context is the key.

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 difficult. 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 things were constructed for purposes that had nothing to do with the national park. Consider overall transportation systems and their evolution — from trails, railroads, and 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.

In some instances the existing road fabric may not be eligible for the national register, but the broad transportation corridor in which it is sited 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 NPS 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 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.

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 with minimal resource impact
- 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 and vista clearing
- 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
- use of standard-plan guardrails and guardwalls
- 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

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 working on documenting eastern national park areas now.

**INTEGRITY**

After consideration of all of the above factors, the integrity of the significant features needs to be evaluated. Changes that have occurred over time and the effects those may have had on the original design intent need to be carefully assessed. 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-lane 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. Compare the original construction and design intent with extant features.

**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, they should be grouped in priority order, which will help management in decision making.

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 guardwall. Most historic guardrails and guardwalls were constructed to only 18 inches 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 in the average automobile, and the views were one of the most significant features of Skyline Drive.\footnote{161}

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.

No easy design solutions exist for these problems, and as an agency all we can do is continue with these efforts to refine some solutions, and discard others in future efforts.

A FINAL WORD

In 1994, 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."\footnote{162} 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.\footnote{163}

\footnote{161. The 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.}

\footnote{162. "Babbit Urges Authenticity in U.S. Parks," Miami Herald, 24 May 1994.}

\footnote{163. Nash, The American Environment: Readings in the History of Conservation, xii.}
Fig. 22. Scenic overlooks like 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.*
Fig. 23. 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.
Fig. 24. 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.*
Fig. 25. 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.
Fig. 26. 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.*
Fig. 27. 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.
Fig. 28. 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 Laura E. Soullière.
Fig. 29. 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 Laura E. Soullière.
Fig. 30. 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.
Fig. 31. Natural features often received place names such as this one – Indian Head at Great Smoky Mountains National Park. Again, having the autotourist in such close contact with the park's features, contributed to a sense of awe with the scenic wonders. National Archives, Record Group 30.
Fig. 32. 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.
Fig. 33. 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 Laura E. Soulliére.*
Fig. 34. 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 Falls overlook at Yellowstone National Park. *NPS Photo by Laura Soullière.*
Fig. 35. 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 Laura Soulière.*
Fig. 36. 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.
Fig. 37. 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.*
Fig. 38. 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.
Fig. 39. 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.
Fig. 40. Certain road features that predate 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.
Fig. 41. 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.
Fig. 42. 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.
PART III: APPENDIXES / BIBLIOGRAPHY
APPENDIX A: CHRONOLOGY

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 shall provide for the preservation, from injury or spoliation, 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 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. Office of Public Roads was working with the Forest Service on road construction as early as this year.
1906 Office of Public Roads 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 Office of Public Roads and U.S. Forest Service. Congress set up the "10% Fund" in which 10 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.

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

1915 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. Page appointed director.

1915 The Santa Fe and Union Pacific spent $500,000 in exhibits on national parks.

1915 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.

1916 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 inches to 6 inches.

1918 The Office of Public Roads and Rural Engineering changed to the Bureau of Public Roads.

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

1919 Thomas H. MacDonald appointed to replace Page as Director of Bureau of Public Roads.

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 in 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.
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.

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.

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.

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

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

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

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

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

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

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

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

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

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.


Federal-Aid Highway Amendment of 1931 (46 Stat 1053).
1931 By this year only one-fifth of the Park Service's five-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 Bureau of Public Roads 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.

1982    Surface Transportation Assistance Act of 1982 established Federal Lands Highways Program to ensure that highways on federal lands treated under uniform standards.

1983    Interagency agreement signed between Federal Highway Administration and the National Park Service, superseding 1964 interagency agreement. The gist of the agreement was that the National Park Service would develop park road and parkway design, construction, maintenance, and safety standards, among other items. Following established tradition, the National Park Service was responsible for providing architectural and landscape architectural services to "ensure that the highest standards of aesthetics and resources protection are followed in the placement of road prisms and the design of structures appurtenant to park roads and parkways."
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 arc 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.
<table>
<thead>
<tr>
<th></th>
<th>Schedule A</th>
<th>Schedule B</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Miles</td>
<td>Not earlier than</td>
</tr>
<tr>
<td><strong>GARDINER TO NORRIS.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Gardiner Entrance</td>
<td>0</td>
<td>6.00 a.m.</td>
</tr>
<tr>
<td>Arrive Mammoth Hot Springs</td>
<td>5</td>
<td>6.30 a.m.</td>
</tr>
<tr>
<td>Leave Mammoth Hotel</td>
<td>0</td>
<td>6.45 a.m.</td>
</tr>
<tr>
<td>Leave 8-mile Post</td>
<td>8</td>
<td>8.00 a.m.</td>
</tr>
<tr>
<td>Arrive Norris</td>
<td>20</td>
<td>8.30 a.m.</td>
</tr>
<tr>
<td><strong>NORRIS TO WEST ENTRANCE.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Norris</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Arrive West Entrance</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>(For Gallatin Station Entrance see Note 1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NORRIS TO FOUNTAIN.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Norris</td>
<td>0</td>
<td>8.45 a.m.</td>
</tr>
<tr>
<td>(Via Mesa Road.)</td>
<td></td>
<td></td>
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<tr>
<td>Leave Firehole Cascades</td>
<td>11.7</td>
<td>10.30 a.m.</td>
</tr>
<tr>
<td>(For Gallatin Station Entrance see Note 1.)</td>
<td></td>
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</tr>
<tr>
<td><strong>WEST ENTRANCE TO FOUNTAIN HOTEL.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave West Entrance</td>
<td>0</td>
<td>6.45 a.m.</td>
</tr>
<tr>
<td>Arrive Fountain Hotel</td>
<td>21</td>
<td>8.30 a.m.</td>
</tr>
<tr>
<td><strong>FOUNTAIN HOTEL TO THUMB.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Fountain Hotel</td>
<td>0</td>
<td>10.30 a.m.</td>
</tr>
<tr>
<td>Arrive Upper Basin (Old Faithful Inn)</td>
<td>9</td>
<td>12.00 m.</td>
</tr>
<tr>
<td>Leave Upper Basin (Old Faithful Inn)</td>
<td>0</td>
<td>2.30 p.m.</td>
</tr>
<tr>
<td>Arrive Thumb Station</td>
<td>19</td>
<td>4.30 p.m.</td>
</tr>
<tr>
<td>(For South Entrance see Note 1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>THUMB TO LAKE HOTEL.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Thumb Station</td>
<td>0</td>
<td>4.30 p.m.</td>
</tr>
<tr>
<td>Arrive Lake Hotel</td>
<td>13</td>
<td>5.45 p.m.</td>
</tr>
<tr>
<td><strong>LAKE HOTEL TO EAST BOUNDARY.</strong></td>
<td></td>
<td></td>
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<tr>
<td>Leave Lake Hotel</td>
<td>0</td>
<td>7.00 a.m.</td>
</tr>
<tr>
<td>Arrive East Boundary</td>
<td>28</td>
<td>9.30 a.m.</td>
</tr>
<tr>
<td><strong>EAST BOUNDARY TO LAKE HOTEL.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave East Boundary</td>
<td>0</td>
<td>3.15 p.m.</td>
</tr>
<tr>
<td>Arrive Lake Hotel</td>
<td>28</td>
<td>5.45 p.m.</td>
</tr>
<tr>
<td><strong>LAKE HOTEL TO CANYON HOTEL.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Lake Hotel</td>
<td>0</td>
<td>7.00 a.m.</td>
</tr>
<tr>
<td>Leave Canyon Station</td>
<td>16</td>
<td>9.00 a.m.</td>
</tr>
<tr>
<td>(See Note 2.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrive Canyon Hotel</td>
<td>17</td>
<td>9.10 a.m.</td>
</tr>
<tr>
<td>Schedule A</td>
<td>Schedule B</td>
<td></td>
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<td></td>
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<tr>
<td>Miles</td>
<td>Not earlier than</td>
<td>Not later than</td>
</tr>
<tr>
<td>CANYON TO NORRIS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Canyon Hotel</td>
<td>0</td>
<td>2.15 p.m.</td>
</tr>
<tr>
<td>Arrive Norris</td>
<td>12</td>
<td>3.15 p.m.</td>
</tr>
<tr>
<td>(For schedules from Norris to Fountain, Upper Basin, and West Entrance, see page 8.)</td>
<td></td>
<td></td>
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<tr>
<td>CANYON HOTEL TO TOWER FALLS.</td>
<td></td>
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</tr>
<tr>
<td>Leave Canyon Hotel</td>
<td>0</td>
<td>1.30 p.m.</td>
</tr>
<tr>
<td>Arrive Tower Falls:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Via Dunraven Pass</td>
<td>16</td>
<td>3.15 p.m.</td>
</tr>
<tr>
<td>Via Mount Washburn</td>
<td>10</td>
<td>4.15 p.m.</td>
</tr>
<tr>
<td>(For Cooke City Entrance see Note 1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOWER FALLS TO GARDINER.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Tower Falls</td>
<td>0</td>
<td>3.15 p.m.</td>
</tr>
<tr>
<td>Arrive Mammoth Hot Springs</td>
<td>20</td>
<td>5.30 p.m.</td>
</tr>
<tr>
<td>Leave Mammoth Hot Springs (via Main Road)</td>
<td>0</td>
<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>
<td></td>
<td></td>
</tr>
<tr>
<td>Leave Mammoth Hot Springs (via Old Road)</td>
<td>0</td>
<td>8.48 a.m.</td>
</tr>
<tr>
<td>Arrive Gardiner Entrance</td>
<td>5</td>
<td>9.30 a.m.</td>
</tr>
</tbody>
</table>

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 Entrances. 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
1962 AGREEMENT BETWEEN THE NATIONAL PARK SERVICE
AND THE BUREAU OF PUBLIC ROADS

The interbureau 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.
COPY

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

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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.

© 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 investigations, surveys, and estimates will be made for major projects for which reimbursements will be made in the manner hereinbefore provided.

ACCEPTANCE OF PROJECTS

Article V.

(1) Before approving final settlement with the 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 recommendations, for final acceptance of the Secretary of the Interior and transmission of voucher to the general accounting office for final settlement.

Signed this 18th day of January 1926.

By 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 signature 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 is 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 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 proposal. 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 on 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 contract relative to experience, financial ability, etc.
Two copies of a financial statement of funds available for the work.
The originals 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 inches nor more than 18 inches and wall lengths of not less than 18 inches nor more than 48 inches. 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 inches in height. All arch ring stones to be shaped to the approximate face dimension shown.

JOINTS. Mortar joints to be generally 1 inch to 1-1/2 inches wide, well filled and pointed to a depth of 1 inch 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.
National Park Service Landscape Architect Tom Carpenter drew some simple sheets on slope flattening and rounding.
SLOPE FLATTENING

<table>
<thead>
<tr>
<th>ER</th>
<th>HEIGHT</th>
<th>SLOPE</th>
</tr>
</thead>
<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 ROUNDING

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

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'

OVER 50'

1:1

GROUND SLOPE

71

1/34 (MIN. 8)

3'3"
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.
REPORT TO THE CHIEF ARCHITECT

TO ACCOMPANY "PRELIMINARY STUDIES FOR ROAD DESIGN."
Drawing No. NP-PG-2015 (7 Sheets)

By

Thos. E. Carpenter
Deputy Chief Architect

Branch of Plans and Design
National Park Service
250 Federal Office Building
San Francisco, California
March 22, 1938

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
  2 - Rounding Bottom of Cut Slopes
  3 - Flattening Fill Slopes
  4 - Rounding Top of Cut Slopes on Horizontal to Plus Ground Slopes
  5 - Rounding Top of Cut Slopes on Horizontal to Negative Ground Slopes
  6 - Flattening and Rounding Cut and Fill Slopes
  7 - 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 bench 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 measure­
ment (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.P.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 there 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 metallic 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:

| 3′ | 24′ #16 gauge Corrugated Pipe | at | $1.50 | $4.50 |
| 2′ | 18′ #16 | at | $1.30 | 2.60 |
| Labor cutting and welding Tee | | | | 7.37 |

($7.37 is the estimated cost of cutting and welding in the shop. The contractor on the job would probably do it for very much less.)

Labor cutting 6′ x 18′ opening in drop inlet | | | | .75 |

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 "Warping 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.
(5) 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 slope 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 recognised 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 stabilisation 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
18

OPENING TO GUTTER

OPENING FOR ROAD CUTOUT CAN BE CUT IN FIELD

HEIGHT OF IRON COVER AS REQUIRED

HEIGHT OF CONCRETE BASE AS REQUIRED

84 IN. DIM. OR 2 FT. 8 IN. AS REQUIRED
SLOPE STABILIZATION IMPROVES APPEARANCE. RESTORING LOWER PART OF SLOPE ENABLES ENSURE ESTABLISHMENT OF VEGETATIVE COVERAGE. TREES GROWTH IMPROVES VIEW OF BASE CUT SLOPES.

DRIVER'S VIEW OF FLAT, FILL, SLOPE ELIMINATES MENTAL HAZARD AND REDUCES NEED FOR GUARD RAILS.

PERSPECTIVE SKETCH ROAD DESIGN
NATIONAL PARK SERVICE BRANCH OF PLANS AND DESIGN
FEB. 23, 1938 DWG. NO. RG. 2018
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.
FLATTENING OF FILL SLOPES

<table>
<thead>
<tr>
<th>SLOPE RATIO</th>
<th>POSITIVE GROUND SLOPES</th>
<th>NEGATIVE GROUND SLOPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:1</td>
<td>0'-2'</td>
<td>0'-3'</td>
</tr>
<tr>
<td>4:1</td>
<td>2'-4'</td>
<td>3'-6'</td>
</tr>
<tr>
<td>3:1</td>
<td>4'-6'</td>
<td>6'-8'</td>
</tr>
<tr>
<td>2:1</td>
<td>6'-10'</td>
<td>8'-12'</td>
</tr>
<tr>
<td>1½:1</td>
<td>10' AND OVER</td>
<td>12' AND OVER</td>
</tr>
</tbody>
</table>

*Use treatment shown in detail for filling pockets inside embankments when the width of the pocket does not exceed 30 feet measured horizontally from the road shoulder at subgrade.

DETAIL FOR FILLING POCKETS INSIDE EMBANKMENTS

Provide drain inlet or other suitable structure to drain the filled pocket unless conditions naturally provide longitudinal drainage.

ROUND THE TOP OF FILL SLOPES AS SHOWN, REGARDLESS OF THE SLOPE RATIO, WHEN THE CROSS SECTION WIDTH OF THE POCKET EXCEEDS 30 FEET MEASURED HORIZONTALLY FROM THE ROAD SHOULDER AT SUBGRADE.

TYPICAL CROSS SECTION
FLATTENING OF FILL SLOPES

<table>
<thead>
<tr>
<th>SLOPE RATIO</th>
<th>3/4&quot; HEIGHT OF FILL SLOPES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>POSITIVE GROUND SLOPES</td>
</tr>
<tr>
<td></td>
<td>NEGATIVE GROUND SLOPES</td>
</tr>
<tr>
<td>G:1</td>
<td>0'-3&quot;</td>
</tr>
<tr>
<td>4:1</td>
<td>2'-4&quot;</td>
</tr>
<tr>
<td>3:1</td>
<td>4'-6&quot;</td>
</tr>
<tr>
<td>2:1</td>
<td>6'-10&quot;</td>
</tr>
<tr>
<td>1/2:1</td>
<td>10' AND OVER</td>
</tr>
</tbody>
</table>

*USE TREATMENT SHOWN IN DETAIL FOR FILLINGPOCHETS INSIDE EMBANKMENTS WHEN THE WIDTH OF THE POCKET DOES NOT EXCEED 30 FEET MEASURED HORIZONTALLY FROM THE ROAD SHOULDER AT SUBGRADE.

DETAIL FOR FILLING POCKETS INSIDE EMBANKMENTS

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
BRANCH OF PLANS AND DESIGN

FLATTENING AND ROUNDING OF ROAD FILL SLOPES AND FILLING POCKETS INSIDE EMBANKMENTS

DR BY H.B.S. OCTOBER 27, 1941
CH. BY T.E.C.

TYPICAL CROSS SECTION

REDUCED SIZE REPRODUCTION
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*Park Road Standards*, 1984.


SPECIAL COLLECTIONS

Crater Lake National Park, Special Collections, "Army Engineers Scrapbook."
As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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