YOSEMITE ROADS & BRIDGES
YOSEMITE NATIONAL PARK, CALIFORNIA

For more than two decades following the discovery of the Yosemite Valley in 1851, the only access to the Valley was by rough pack and trail. In 1866, the Yosemite Valley and the Mariposa Grove of giant sequoias were set aside by Congress as a protective reserve, but it would be another ten years before the first road reached the area.

Hoping to capitalize on tourism, citizens of Mariposa and Tuolumne counties sought to entice Yosemite-bound visitors by building roads into the Valley. By the early 1870s, private toll roads were under construction from Coulterville, Big Oak Flat and Mariposa. A grand road-building race followed. Each community hoped to finish its road first and thereby capture the tourist trade. Dr. John Taylor Adair completed his Coulterville Road before the others on 17 June 1876. His hopes for a transportation monopoly were dashed only twenty-nine days later when the "Chinese Camp to Yosemite Turnpike," the forerunner of the Big Oak Flat Road, reached the Valley. From the south, a cart road headed by Albert Henry Washburn, opened another toll road from Mariposa to Big Oak Flat (now Wawona) and on to the Valley in 1875. North of Yosemite Valley, the "Sierra Western Road" was completed through the high country to reach gold and silver mines near Tioga Pass in 1883. Though not built for the broad vehicle, the route would evolve into the present Tioga Road, which at a height of nearly ten thousand feet, is the highest paved mountain highway in California.

Construction of the early roads was a major engineering feat of the period. All of these early roads were built through the rough, mountainous terrain using hand labor, aided by pick, shovel and "Grant" kerosene lanterns. The Valley Road was upgraded in 1903, the Board of Commissioners of the Yosemite Grant sporadically developed a system of carriage drives, connected by wood and iron truss bridges.

Yosemite was designated a national park in 1890. The United States Congress assumed command of the park administration and managed affairs until 1914. During this period, they oversaw the construction of three small roads: the road from the area to Yosemite in 1913.

In 1900, the first automobile struggled over steep, unpaved and inadequate roads to reach the Valley. Although they were banned by the park's acting military administration in 1901, the idea of the automobile had already arrived, and in 1913, Secretary of the Interior, Franklin K. Lane, opened park gates to the new and soon-to-be-dominant form of transportation.

The National Park Service was created in 1916 to protect the nation's most important scenic and cultural resources. Its first Director, Stephen T. Mather, was a native Californian deeply interested in the Yosemite Valley. In 1915, when he was still Assistant Secretary of the Interior, Mather and some business associates purchased the old Tioga Road and deeded it over to the park. As Director, he signed a Memorandum of Agreement with the Bureau of Public Roads (BPR) in 1925, under which the BPR would take charge of road construction in the national parks. Following the policies derived from the Highway Act of 1921, the BPR worked with the Public Roads Division to ensure that the new Yosemite road system was designed to blend with the natural setting. In the 1930s, the Wawona, Big Oak Flat and parts of the Tioga Road were constructed under BPR supervision. The park's landscape, architecture and the BPR collaborated to design a series of bridges and roadways made of concrete and steel, faced with granite or large redwood logs sawn to integrate with the natural setting.

After World War II, the Federal Highway Administration and the National Park Service decided to complete the reconstruction of the old Tioga Pass, a modern park highway, to the delight of motorists but to the dismay of some conservationists.

In 1950, the three major park roads and three million dollar project were near completion. The nine-lane road passes the three million dollar project. Park roads now are paving their way around the park's perimeter, ensuring the integrity of future construction endeavors.

This drawing was adapted from several historic photographs located in the Yosemite Research Library.

This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is an agency of the National Park Service, U.S. Department of the Interior. The Yosemite Roads and Bridges Project was sponsored by Yosemite National Park, Michael Finley, Superintendent; Kevin C. Blood, Chief Architect; and the Yosemite Roads and Bridges Program, John Grimes, Manager. The historic American Building Survey Historic American Engineering Record (HAER) was under the general direction of Robert J. Bevan, Chief of the Historic U.S. Department of the Interior, Yosemite National Park, Michael Finley, Superintendent; Kevin C. Blood, Chief Architect; and the Yosemite Roads and Bridges Program, John Grimes, Manager. The historic American Building Survey Historic American Engineering Record (HAER) was under the general direction of Robert J. Bevan, Chief of the Historic American Engineering Record (HAER).
Tourists began visiting Yosemite Valley in the 1850s to see its "scenes of wonder and curiosity." The journey was extremely difficult, as no roads yet existed. Early visitors endured miles of arduous travel over primitive horse trails. They often arrived too exhausted to fully enjoy the glorious landscape awaiting them.

Following the designation of the Yosemite Grant by the federal government in 1864, citizens in Tuolumne and Mariposa counties sought to entice Yosemite-bound visitors by constructing toll roads to the valley. In the early 1870s, companies constructing toll roads from the communities of Coulterville, Mariposa and Big Oak Flat raced to be the first to complete a wagon route and profit from the resulting traffic. The Coulterville & Yosemite Turnpike won, opening on 17 June 1874. The Chinese Camp & Yo Semite Turnpike reached the valley from Big Oak Flat less than a month later. A year later, Albert Henry Washburn and his partners pushed a road from Mariposa to Big Trees Station (Wawona) and on to Yosemite Valley. These roads were difficult to construct, as only hand tools and blasting powder were available. The three toll road companies completed for a limited number of visitors. The Big Oak Flat Road managed to break even, but the Coulterville Road was a financial disaster. Only the Washburn group realized any substantial return on their investment.

The construction of toll roads allowed stagecoaches to replace saddle horses as the primary means of transportation to Yosemite. With the extension of railway service to nearby communities, stagecoach companies began regular service to and from the valley. The trip remained difficult, as the primitive roads were steep, narrow, and dusty.

North of Yosemite Valley, The Great Sierra Consolidated Silver Mining Company constructed a wagon road to serve its mines on the Sierra Crest in 1882. The Great Sierra Wagon Road, commonly called the Tioga Road, remained in use for only a year before the mines played out and the road was abandoned in 1907. The Yosemite Valley Railroad completed a line to El Portal on the western edge of the park and built a connecting stage to the valley. Most visitors took this route and the longer stage roads declined. By the early twentieth century, the roads came under government control.

The first automobile entered Yosemite Valley in 1903. In response to increasing automobile traffic, park authorities banned their use in 1907. Outraged motorists aided by the California Automobile Association convinced the Secretary of the Interior to overturn the ban in 1913. The automobile road became the favored mode of transportation. The State of California built the improved "All-Year Highway" up the Merced River to El Portal, and motorists began using this route in conjunction with the former stage road to reach the valley in all seasons.

In the 1930s the federal government reconstructed the principal park roads to facilitate automobile travel. The National Park Service and the Bureau of Public Roads rebuilt the Wawona Road and relocated much of the Big Oak Flat Road to provide for a safer and faster approach to the Valley. Improvements included the construction of four tunnels to avoid massive scars to the valley walls and the provision of overpasses to allow motorists to take in the striking views. The long-neglected Tioga Road was repaired and put back into service. The State of California built a connecting road up to Tioga Pass, and the road became an important route across the mountains. Much of this road was rerouted in the 1950s during the National Park Service’s Mission 66 program. The newly widened and straightened roadway was reopened in 1961.

The Yosemite roads, both old and new, are significant for their engineering achievements, for the role they played in the development and enjoyment of Yosemite, and for the way in which they were constructed to harmonize with their natural setting. Natural materials were often used in the construction of road-related structures, and rustic-style amenities complemented the landscape. Travel on the park roads today is far easier than it was in the nineteenth century, but the experience remains a compelling adventure for visitors to one of America’s most popular national parks.
As interest in the wonders of Yosemite Valley increased, three rival companies sought to construct wagon roads to the Valley in order to capture toils from the visitors. The Coulterville & Yosemite Turnpike was completed in June 1874, and the rival Chinese Camp & Yosemite Turnpike (Big Oak Flat Road) less than a month later. From the south, the Mariposa Big Tree Grove and Yo Semite Turnpike (Wawona Road) reached the Valley the following year. With competition from the north and west divided, only the Wawona Road proved profitable. All of the roads were purchased by the government by the 1910s.

Descending the steep trails into Yosemite Valley from the Rim was a precarious nerve-taxing experience for visitors.
COULTERVILLE ROAD 1874

The first road to reach the Valley, the Coulterville and Yosemite Turnpike was begun by investors in the small mining town of Coulterville but completed in 1874 by Dr. John Taylor McClean. Running from Bower Cave on the Merced to the Valley floor at Cascade Creek, its monopoly was short-lived and the road never carried the expected loads of tourists. In 1913, it became the first road in the park over which automobiles could legally travel. Most of the road was closed in 1932 following the massive “Cookie” rockslide, it is now a hiking trail.

Hazel Green acted as the lunch stop on the Coulterville Road for many years. From Hazel Green the road headed south through the Merced Grove then southwest past Buntie Vista gap for the first views of Yosemite Valley. An early automobile heads down the steepest section of the Coulterville Road towards its junction with the Merced River.

The Coulterville Road passed directly through the Merced Grove of Big Trees, a primary attraction for early visitors to Yosemite.

The Coulterville Roads “Collision with the geological history of the park was inevitable” claimed Yosemite’s superintendent, after a rockslide closed it on April 5, 1932.
The proprietors of the Wawona Road engaged veteran roadbuilder John Conway to rebuild a saddle trail from Chinquapin Flat to Glacier Point, a promontory offering some of the most spectacular views of Yosemite Valley. Conway completed the road in 1882 at a cost of $48,000. Reconstructed by the government in the 1930s, it continues to delight visitors with its far-reaching vistas.
The "Chinese Camp & Yo Semite Turnpike" was constructed in the early 1870s as a toll route to the park from the northwest. After showcasing the Valley from Rainbow Point, it picked its way down the cliffs on a series of remarkable switchbacks called the "Zig Zag." To accommodate modern motorists, it was replaced by a new modern highway with easier grades in the 1930s. The New Big Oak Flat Road utilizes sweeping curves and three tunnels to eliminate the need for the earlier switchbacks.

The tunnel through the Dead Giant in the Tuolumne Grove was cut in 1878 to entice tourists to travel the Big Oak Flat Road.

Horse stages ascend the "Zig Zag" Switchback on the Old Big Oak Flat Road.

An early type motor bus descends the Old Big Oak Flat Road just above its junction with the Merced River.

Tunnel Construction on the Big Oak Flat road allowed the Park Service to provide a steady grade and minimize scaling.

The streamlined bridges on the Big Oak Flat Road eliminated the numerous switchbacks that were on the old road.
BIG OAK FLAT ROAD TUNNELS

In an effort to provide a steady grade and to minimize scarring of the granite cliffs, the reconstructed Big Oak Flat Road of the 1930s utilized three tunnels to carry the road through sheer cliffs. Traditional drilling and blasting methods were used for the two shorter tunnels. The 2,083' long tunnel was constructed using a "jumbo" with six separate drills, at the time, it was the longest tunnel built using this method. The tunnel portals by the Union Granite Company feature some of the finest stone work in the park.

Plan of Tunnels 1, 2, and 3

Tunnel 3 West Entrance

Reinforced Concrete

Section Axonometric Tunnel 3 East Entrance

Planting Pocket for Revegetation

Section Retaining Wall at Tunnel 2 West Entrance

Tunnel 1 East Entrance

Tunnel 1 West Entrance
The most successful of the early toll roads, the "Mariposa Big Trees and Yo Semite Tumpike" was started in the 1860s by Yosemite guardian Galen Clark but was taken over by Mariposa County investors in the 1870s. Reaching the Valley floor in 1875, it was the most popular route to the park for decades. Reconstructed by the National Park Service in the 1930s, it remains the principal approach to the park from the south. After passing through forests most of the way, travelers emerge through the Wawona Tunnel to one of the most exciting views of Yosemite Valley.
EL PORTAL ROAD
"The All-Year Highway"

Long thought impassible, the steep and flood-prone Merced River Valley was first conquered by the Yosemite Valley Rail Road, which built a line to El Portal and a connecting road to the Valley in 1908. In the 1930s, the State of California, looking to provide reliable year-round access to the park, built a modern highway to El Portal, and the National Park Service reconstructed the old wagon road into the Valley. Following disastrous floods of the Merced, the road has been realigned and heavily reconstructed.

Old Road Section circa 1930s

1927 ¼ mile below Arch Rock, traffic awaiting entry permits

New Road Section circa 1998
In 1878, the Yosemite Board of Commissioners authorized the proprietors of the Wawona Road to construct a spur road to the Mariposa Big Tree Grove containing the largest giant sequoias in the park. The two-mile road was completed the following year at a cost of $1,620. While the road once continued in amidst the giant trees, today it terminates in a parking area where visitors may continue on foot or gaze upward at the trees from motorized tram.

Mariposa Grove Map

Road

Restricted Road

Trail

Road Section showing relationship to Sequoia Root System. Bats use fly space over Roadway.

"Fallen Monarch California Big Tree"
175' long 12' wide

Tram People Mover
length 45' scale: 1' - 1/6"
TIoga ROAD 1883/1961

Great Sierra Mining Road

The "Great Sierra Wagon Road" was constructed in a matter of weeks by Chinese laborers to provide access to silver mines near Tioga Pass. Abandoned after the mines failed, the old road was purchased by NPS Director Stephen Multher and associates in 1915 and rebuilt as a low-speed motor road. During the Mission 66 program, the road was reconstructed as a high-speed modern highway over the objection of concerned environmentalists. It is the only road to cross the Sierra crest in the park.

Long before Tioga road the corridor was used for hunting gathering and trade

Before 1862

"The Great Sierra Mining Road" was constructed in less than one year

1862/83

Transportation on the Tioga Road in the 1890s

1890

First auto on Road

1910s

Paddons of the road realigned, retired and widened

1930s

1956-1961

"Mission 66" program announced and implemented to unimproved central sections of Tioga Road

1961-Present

Tioga Road Dedication

10%“
THE TRIANGLE ROUTE 1913

In 1913, A.B. Davis' "El Portal Big Tree Auto Stage Company" constructed a steep road from the El Portal terminus of the Yosemite Valley Rail Road up the steep cliffs to Crane Flat where a connection was made with the Old Big Oak Road. The new unpaved road offered railway visitors a chance to take a "Triangle Route" tour from El Portal to the Tuolumne Grove of giant sequoias before descending to Yosemite Valley to see its attractions. Never successful, the road is now closed at the park boundary but its route can still be followed.

Map

Not to scale

A rustic bridge took passengers beneath Crane Falls, An attraction only seen on The Foresta route.

Elevation Stone Culvert Bridge

Scale ¾" = 1’0"

Foresta Falls Bridge Detail

Scale 1" = 1’0"

The Curved bridge at Foresta Falls is One of two curved bridges unique to The Foresta Route
The first roads in Yosemite Valley were constructed in the 1860s, years before connecting roads made their way in from the park boundaries. In 1871, a wagon road was built leading to the Valley. In the early 1880s, a carriage road system was constructed by the U.S. Army, which then administered the park. Over the years, much of the system has been reconstructed. In 1970, the roads at the eastern end of the Valley were closed to automobiles, offering hikers and cyclists a refuge from the now heavily congested road system.

2001 Valley Roads Plan

Yosemite Falls
1930's Parking Traffic in the Valley
Old Roads Restricted now for walking or bicycles
21st Century Public Transit
North Dome
Half Dome
Vernal Falls
Glacier Point
Cathedral Rocks
Three Brothers
El Capitan
Big Oak Flat Road

VALLEY TRAFFIC FLOW

Road — Restricted
Road or Trail —

Alternative Fuel Shuttle Bus Project
ENTRANCE STATIONS

Tioga Pass Entrance Station was constructed in the 1930s with the "Rustic" style used by the National Park Service.

Even before automobiles were admitted to Yosemite, an entrance fee was charged for admission. With the opening of the park roads to motorists, entrance stations were established to collect the fees and to provide information for visitors. The earliest entrance stations were built of logs and boulders in the prevailing rustic style. Later fee booths sometimes incorporated native materials but were strictly functional structures of simpler and less expensive construction.

"Mission 66" sign located at Big Oak Flat Entrance

"Mission 66" South Entrance Station erected in the late 1950s

"Mission 66" sign located at Big Oak Flat Entrance

Wawona Entrance on the Chuchilla Mountain Road constructed in the 1920s

Aspen Valley Entrance in the 1910s

"Rustic" Arch Rock Entrance in the 1930s

Goulterville Entrance in 1913

Sign located at Big Oak Flat Entrance in 1941
ARCH ROCK ENTRANCE

The 1907 entrance road from El Portal to Yosemite Valley passes between two large boulders forming a naturalistic entrance to the park. In 1925, a bypass was constructed to carry large vehicles around the constricted tunnel; it is now the exit lane. The entrance station and ranger residence were constructed in 1926 to meet the needs of the new "All Year Highway" from Merced.

Plan Legend

Conifer trees
Deciduous trees

Shrubs and understory

Plant List

<table>
<thead>
<tr>
<th>Key</th>
<th>Botanical Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ar</td>
<td>Alnus rhombifolia</td>
<td>White Alder</td>
</tr>
<tr>
<td>Ld</td>
<td>Libocedrus decurrens</td>
<td>Incense Cedar</td>
</tr>
<tr>
<td>Pm</td>
<td>Pseudotsuga menziesii</td>
<td>Douglas Fir</td>
</tr>
<tr>
<td>Pp</td>
<td>Pinus ponderosa</td>
<td>Ponderosa Pine</td>
</tr>
<tr>
<td>Pt</td>
<td>Populus trichocarpa</td>
<td>Black Cottonwood</td>
</tr>
<tr>
<td>Qc</td>
<td>Quercus chrysolepis</td>
<td>Canyon Live Oak</td>
</tr>
<tr>
<td>Uc</td>
<td>Umbellularia californica</td>
<td>California Bay</td>
</tr>
<tr>
<td>Ts</td>
<td>Torreya californica</td>
<td>California Nutmeg</td>
</tr>
</tbody>
</table>

Shrubs and understory

| Cq  | Calyptanthus occidentalis | Spice Brush             |
| Pl  | Philadelphus lewissii    | Mock Orange             |
| Ru  | Rubus diversus           | Himalayan Blackberry    |
| Sc  | Sambucus cerulea         | Elderberry              |

SECTION AA

PLAN ENTRANCE STATION AREA
GUARD WALLS

A variety of stone guard walls or parapets was employed to prevent vehicles from plunging off the park roads. Most of the modern motor roads from the 1930s have their own unique styles. The early walls were constructed of native stone, cut and mortared to fit in varying patterns. Some of these guard walls are now being replaced with concrete core walls to meet increasingly stringent safety standards.
Yosemite's wide range of elevations, from its semi-arid foothills to its snow-capped crest, has produced zone type distribution of its 37 kinds of native trees and hundreds of wildflowers. The individual roads are often distinguished by characteristic trees representing various plant communities.
1 Log Bridges

The earliest bridges were built of large logs and primarily used as footbridges. Simple Queen post trusses were used for crossing short spans with heavier loads. This 3-panel bridge over Yosemite Creek was a modification of the King post truss with a horizontal chord for reinforcement.

2 Wawona Covered Bridge

A covered bridge protects the interior wooden truss system from decay. The 1888 open deck bridge at Wawona was covered in 1878 and remains the only covered bridge in Yosemite. Outside the park but close to the boundary there was another covered bridge across the South Fork Tuolumne River.

3 Timber Truss Bridges

As spans grew longer and vehicle weights increased, more complex truss systems were employed. Such bridges spanned across Yosemite Creek and the Merced River in Yosemite Valley. Also the old Cascade Creek Bridge built in 1907 was timber truss construction.

4 Steel Truss Bridges

More expensive than wooden trusses, steel bridges were much more durable and could carry heavier loads. The second Sentinel Bridge - an early representative of this group - was erected in 1879 as an iron truss. Built in 1919, the old El Capitan Bridge was a combined timber and steel truss structure.

5 Reinforced Concrete Bridges

By 1930, concrete bridges had made their appearance on the Valley floor. Over time, most of them were replaced, like the Old Sentinel Bridge & the Old Sentinel Bridge. One of the earliest concrete bridges was erected in 1921 at Happy Isles. The original concrete railing was later replaced by a Mission 66 railing.

6 Early Rustic Concrete Bridges

By facing three simple reinforced concrete bridges at Bridalveil Falls with stone, the military set the precedent for rustic bridge design in 1913.
BRIDGE EVOLUTION
1920s - Present

In the 1920s, the National Park Service embraced the rustic style, characterized by the use of native materials, but would employ more modern designs where rustic spans were inappropriate. Today's bridges reflect a revival of earlier rustic design.

7 Rustic Stone Arched Bridges
Most of the Valley bridges were graceful arches faced in native stone and with large ring stones defining the arch. The first one was Yosemite Creek Bridge built in 1921. It was followed by Pohono Bridge, Tenaya Creek Bridge, Ahwahnee Bridge and Sugar Pine Bridge, which were designed in a plan for five bridges in 1927.

8 Rustic Arches with Subways
Several of the Valley bridges incorporated tunnels or subways to accommodate passage of foot and bridle trails. The first of this style was Clark's Bridge, built in 1928 as one of the five bridges contract of 1927. It was followed by the erection of Happy Isles Bridge in 1929 and Stoneman Bridge in 1932.

9 Rustic Steel Girder Bridges
In an interesting rustic variant, massive logs were bolted to bridges to conceal their interior steel girder construction. Both Upper Bridal Veil Creek Bridge and El Capitan Bridge are still in use, while Upper Yosemite Creek Bridge and South Fork Merced River Bridge are condemned. Over time, all of them lost their original railing.

10 Concrete Girder Deck Bridges
Less expensive than arched bridges, concrete girder spans still employed native stone for abutments. There are only two bridges of this style in Yosemite, and both are found on Tioga Pass Road: Tuolumne River Bridge, built in 1934, and South Fork Tuolumne River Bridge, erected in 1937.

11 Reinforced Concrete Open Spandrel Arches
The three soaring open spandrel arch bridges on the Big Oak Flat Road reflect a streamlined modern style. They were built across Tamarack Creek, Wildcat Creek and Cascade Creek in 1938.

12 Contemporary Rustic Bridges
Recent bridges in the park reflect a return to the rustic style in their use of native stone facing. The Cascade Bridge on El Portal Road was built in 1955. The section shows the interior concrete construction. Another example is the new Sentinel Bridge in Yosemite Valley, built in 1994.