



## Roads

Unlike the park's current roads, the condition of which has become a focal point of controversy and visitor annoyance, the first formally designed roads in Yellowstone were once a source of pride to the U.S. Army Corps of Engineers and considered visitor attractions in their own right. In the days before large mixing machines, the concrete for the 1903 construction of Chittenden Bridge over the Yellowstone River at Grand Canyon was mixed by 150 men working in three eight-hour shifts and poured in a period of 48 hours. The bridge lasted for 59 years, until it was replaced in 1962, and is still regarded by some as the greatest engineering achievement in the park's history.

The arrival of the first private automobiles in 1915 led to significant changes in how Yellowstone was managed. Spurred by the resulting increase in visitation, the development of a road system was

an important part of making Yellowstone and other parks more accessible to the public. When the National Park Service was established in 1916, Stephen Mather, the agency's first director, recognized that cars would jeopardize "the old atmosphere of the Yellowstone." So the NPS sought to provide roads that would enhance the park experience and enable visitors to move through the landscape in such a way that car travel became a means for appreciating the park.

In keeping with this idea, national park roads were often called "auto trails" and intended for low speeds only. But this relaxed mode of travel was superseded by the demand for roads that met higher standards of safety and comfort, a form of progress that continues today as the park's roads are upgraded under the Federal Lands Highway Program.

Yellowstone's road inventory includes 466 miles of road, 310 of which are paved and considered primary roads, with most open to public use at least six months a year, and another 156 miles of secondary paved or gravel roads. About 184 miles are groomed for oversnow use during the winter. The primary roads include 20 miles of U.S. Highway 191 (the Gallatin Highway) along the park's northwest boundary, and 43 miles of

the Beartooth Highway leading from Red Lodge, Montana to the Northeast Entrance. Now a designated scenic highway, the Beartooth Highway was completed in 1936 to encourage travel from eastern Montana to Yellowstone, and the park continues to have responsibility for spring plowing and maintenance of the section from the top of Beartooth Pass to the park.



### A GRAND LOOP

According to Philetus W. Norris, who enthusiastically oversaw the construction of many facilities, roads and bridges during his 1877 to 1882 tenure as Yellowstone's second superintendent, "Yellowstone is...one of the largest, most elevated, and mountainous...densely timbered and difficult in which to construct or maintain roads or trails, of all our great mountain parks." In 1878, using \$1,000 to hire an assistant and most of his \$10,000

annual appropriated budget, he set out with "barometer, compass, field glasses, thermometer...and some 20 well-armed, mounted, equipped, resolute, and reliable mountaineer laborers" to build a road from Mammoth Hot Springs to Swan Lake Flats.

Ultimately Norris was credited with constructing more than two-thirds of the park's loop road system, an enormous figure eight in the heart of the park with 70 miles around the northern circle and 96 around the southern circle, including the 12 overlapping miles from Canyon to Norris junctions. This Grand Loop, which was completed in 1905, still serves visitors making the "grand tour" of Yellowstone, with stops at Tower Fall, the Yellowstone Canyon, Hayden Valley, Yellowstone Lake, Old Faithful and the hot springs of the Firehole Valley, and the geyser basin named in honor of Norris. But the prediction in his 1881 annual report, that the need for appropriations for the construction of roads, bridle paths, and trails "would not be perpetual," missed the mark. An estimated \$4+ million per year will be needed to maintain the park roads on a 30-year cycle after the major reconstruction project is complete.



## AN UPHILL BATTLE FOR BETTER ROADS

In Yellowstone's early automotive days, travel was hampered by the primitive condition of both the roads and the automobiles, which were often no match for the potholes and steep grades. Motors overheated, brakes burned out, and vehicles sank to their hubs in mud. Although that was an expected part of the adventure for America's pioneering motorists, today's shock-absorbed drivers complain more about the condition of the park's roads than any other aspect

of their visit. The safety of the public and the quality of the visitor experience, as well as the economic viability of gateway communities, still depend on a road network that has some very weak links. Repairs and reconstruction must be done exclusively during the summer, which means increased traffic delays and dust in the busiest tourist season. Except for about 25 percent of the main arteries that have been recently repaired or reconstructed, the park's roads are structurally deficient.

- **Age.** Many of the roads were built decades ago over old horse trails and wagon roads. They lack a road base designed for the weight, speed, and volume of modern traffic or for early spring clearing, when the poorly draining subgrade contributes to pavement failure and heaving.
- **Design.** The unreconstructed roads, which vary in width and have narrow or no shoulders, are unsafe for cyclists and pedestrians, who often must travel in general traffic lanes at the mercy of the heavy trucks used to supply visitor facilities, and RVs and buses that may have mirrors extending out 18 inches on each side.
- **Topography.** Curves in the road and heavy vegetation result in short sight distances, making passing difficult and wildlife crossings hazardous. Some pullouts are available for slower traffic, but many have abrupt pavement edges with sharp dropoffs.
- **Terrain.** Many road segments cross or are adjacent to wetlands, geothermal areas, or land slumps and slides where the subgrade and surface deteriorate rapidly.
- **Bridges.** Many of the park's 61 highway bridges have chipped concrete, structural deterioration, and excessive layers of asphalt left from previous repair efforts.
- **Drainage structures.** These must be cleaned and repaired to meet acceptable standards. Some impede trout spawning runs or impair flows from or to wetlands.

### A PATCH IN TIMES SAVES LIVES

To prevent small holes from getting larger and to eliminate road hazards, funding for road maintenance is needed in order to keep to a 30-year cyclic schedule:



- Crack sealing as needed ..... \$1,500/mile
- Surface patching treatment by chip sealing on a 4- to 8-year cycle (50 miles/year) ..... \$15,000/mile
- Asphalt pavement overlay on a 20-year cycle (average 15 miles/year) .... \$155,000/year
- Rehabilitation and repair of bridges and retaining walls ..... \$192,000/year
- Striping (175 miles a year) ..... \$100,000/year
- Ditch and culvert maintenance (average 200 miles/year) ..... \$1,000/mile

### YOUR HIGHWAY TAX DOLLARS AT WORK

A major reconstruction project was launched in 1986 under the Federal Lands Highway Program (FLHP), which is funded by the federal gas tax. When the work is completed, most of the park's major roadways will be 30 feet wide, including paved shoulders. Consideration was given to constructing a bicycle path that would parallel the road, but the added value for visitors could not be justified in terms of the large additional expense and impact on the landscape. While the removal of natural biota as a result of road widening is unavoidable, the park has gone to considerable effort to minimize the impact by improving drainage and restoring completed road corridors with native seeds and plants collected in advance from sites that will be disrupted.

**The life cycle of a park road.** The asphalt pavement structure of a park road should last 30 years or more if properly maintained. This includes sealing, in which a layer of oil and often a layer of chips or aggregate are rolled onto the surface. Sealing is necessary once a new road has cured for two to three years and then every four to eight years. A road also requires shouldering and drainage work every three years and repaving with an asphalt overlay at 15 to 20 years. The cost of properly maintaining a one-mile stretch of road over its expected life is about \$1.2 million—after which it is time to replace the road's pavement and base.

### GOOD NEWS FOR TRAVELERS

Despite the backlog in road maintenance, improvements are being made in Yellowstone and other parks across the United States. Since the onset of the Federal Lands Highway Improvement Program, the roads from the West and South Entrances have been rebuilt and, as of 1999, work is underway to rebuild the East Entrance road and overlay the Northeast Entrance road. These internal park roads link major state highways and gateway communities with the Grand Loop Road, the destination of most park visitors.

On the loop itself, segments have been repaired across the center of the park from Norris to Canyon, along the west shore of Yellowstone Lake, and across Craig Pass from West Thumb to Old Faithful and north to Madison Junction. Reconstruction and repaving are planned for all the park's remaining roads.



**Paving the way.** Unfortunately, insufficient funding resulted in deferred maintenance and a protracted reconstruction schedule that only increased the difficulty and cost of the work. When the total amount allocated to Yellowstone under the Federal Lands Highway Program (FHLP) for 1997 was only \$9 million, it was estimated that at that rate reconstruction would take up to 30 years to complete. Meanwhile, the park's roads were continuing to deteriorate more quickly than they could be repaired or rebuilt, and an unreconstructed road is more expensive to maintain than a new one.

In 1998, Congress reauthorized the FHLP and provided a large increase in road building funds for the NPS. Yellowstone was granted \$280 million for an 18-year program to repair its roads in a methodical and economic way.

### WHEN THE GATES OPEN

Although roads in the park's interior close to the public in November and cease to be plowed, that allows snow to build up for travel by snowmobile and snowcoach during the park's winter season. Then as the weather permits in March and April, the Grand Loop is plowed open for wheeled traffic again.

Despite years of practice, spring opening in Yellowstone is neither easy to predict nor simultaneous throughout the park; each road is opened when it is ready and not a day before. The goal is to have the South and East entrances open by early May each year, but spring travelers receive extra warnings; Yellowstone's "April showers" are likely to drop snow, not rain, and extend well into months that might be thought of as summer in lower regions of the country. Sylvan Pass and the Lewis River

Canyon are notorious for spring and fall storms, and on the loop, Craig and Dunraven passes open later, by mid- to late-May. The Beartooth Highway, which approaches 11,000 feet in elevation at its highest point, is not targeted until Memorial Day weekend, and some years even that is impossible.

Depending on snow conditions, Yellowstone spends between \$285,000 and \$700,000 clearing its roads for spring opening and maintaining the 24 necessary vehicles—rotary plows, bulldozers, graders, pickup trucks and one V-plow. About two-thirds of this equipment should be replaced, including six of the rotary plows at an estimated cost of \$375,00 to \$400,000 each.



In addition to the road openings, about \$65,000 is spent each winter to plow snow on the roads that are kept open to wheeled vehicles, and an average of \$91,000 just to install and remove the snow stakes that mark the road edge for the plow crews and winter drivers, and purchase new ones as needed.

### *Program Needs*

- **COMPLETE ROAD RECONSTRUCTION.** With gas tax revenues providing badly needed funds, the park must proceed with rebuilding well-designed roads that provide safe travel, scenic vistas, and minimal impact on park resources.

- **CONTINUED MAINTENANCE.** The cyclic maintenance program needs sufficient funding, staff, and road maintenance equipment to ensure upkeep of newly rebuilt roadways.

### AS THE WHEEL TURNS

Although difficult to imagine today, Yellowstone existed as a national park for more than 40 years before the privately owned car became part of its landscape. During that early period, most visitors arrived by train and traveled through the park on horseback or by horsedrawn wagon. Even when cars became available to middle-class Americans, their role in the park's future was by no means obvious. "The popular sentiment of those touring the park is against the admittance of automobiles," Yellowstone's Acting Superintendent warned in his 1914 report. Maybe so, but it was a sentiment that was soon to go the way of the buggy whip. The newly formed automobile clubs lobbied Congress to open national parks to their vehicles, and in 1915 Yellowstone joined Yosemite in permitting private autos. During the next 15 years, as annual visitation rose from 52,000 to 228,000, the proportion of Yellowstone visitors arriving by train dropped from 80 percent to 10 percent.

Attitudes toward the role of private vehicles in national parks have begun to make a U-turn, as once again some people are questioning their impact on the quality of both the environment and the visitor's experience. Zion, Yosemite and Grand Canyon national parks have all developed transportation systems to reduce the negative consequences of too many cars.





## ROADS

### STEWARDSHIP GOALS



Visitors enjoy safe travel on roads that meet federal highway standards for construction and maintenance of scenic routes.



Design, construction and maintenance of roadways is completed in a cost-effective manner with minimal disturbance to visitor experiences, vistas, and cultural and natural resources.

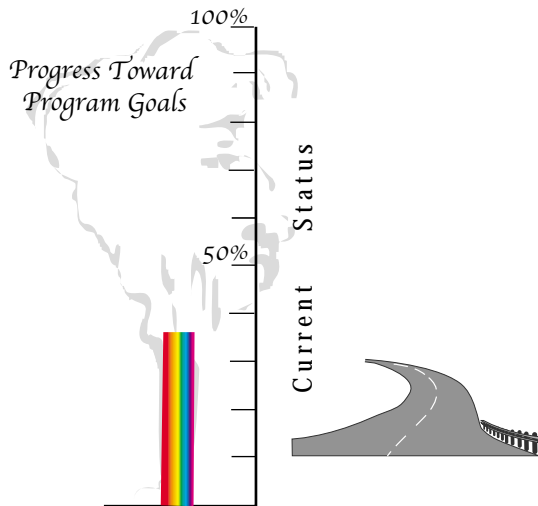
### CURRENT STATE OF RESOURCES/PROGRAMS



In the past decade, several park road segments have been rebuilt or repaved, but many have yet to be repaired, resulting in frequent visitor complaints about the roads and the damage to their vehicles. New construction funds have been promised to address this problem.



Geology, climate, and traffic load make road maintenance costly and time-consuming; traffic delays for road repair frustrate visitors. Road deterioration proceeds more quickly than reconstruction and cyclic maintenance.



### 1998 FUNDING AND STAFF

|                              |              |
|------------------------------|--------------|
| <b>Recurring Funds</b>       |              |
| Yellowstone N.P. Base Budget | \$ 2,298,000 |
| <b>Non Recurring Funds</b>   |              |
| Fee Demonstration Program    | \$ 519,200   |
| One-time Projects            | \$ 807,000   |
| Capital Improvements         | \$ 9,000,000 |
| Staff                        | 52.57 FTE    |

The human resources and funding necessary to professionally and effectively manage the park to stewardship levels will be identified in the park business plan.