



Pavement Preservation in our National Parks

Access to and within the National Park System has been a defining experience for generations of visitors.

The National Park Service (NPS) coordinates the planning and implementation of transportation systems that improve the visitor experience and care for national parks by:

- Preserving natural and cultural resources.
- Enhancing visitor safety and security.
- Protecting plant and animal species.
- Reducing congestion.
- Decreasing pollution.

NPS is committed to being a leader in pursuing strategies that can help make park units more enjoyable, cleaner, quieter, and more sustainable for present and future generations.

For more information, visit nps.gov/transportation/

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**EXPERIENCE YOUR
AMERICA**

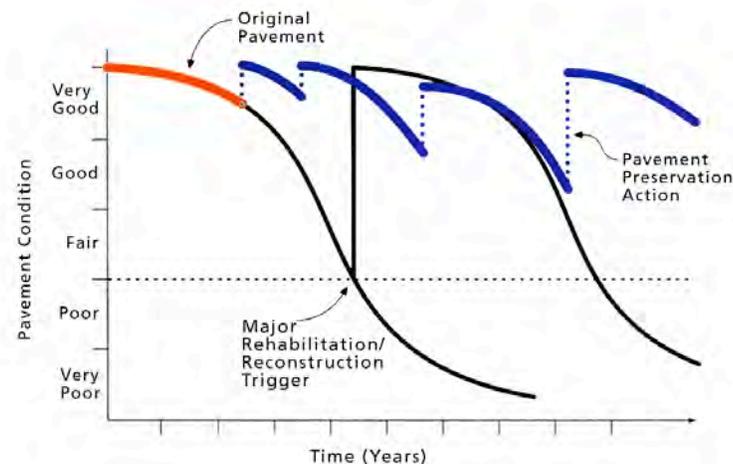
Pavement preservation: Applying the right treatment, to the right road, at the right time.

Demands on the road networks in our national park properties continue to rise with increased visitation. At the same time, funds available for road maintenance grow ever tighter. The transportation infrastructure of our national parks represents a huge asset investment of more than \$20 billion.

All roads begin deteriorating as soon as they are built; they are subjected to water, freeze-thaw cycles, solar radiation, as well as varying traffic loads. Typically, pavements perform well under loads until a particular point in their life spans, and then deteriorate precipitously and rapidly to failure. The road is then rehabilitated or totally reconstructed. A more cost-effective approach is needed to maintain park roads and meet the public's expectations for safety, ride quality, and optimum traffic flow, while protecting the capital investment in the park transportation networks.

The Pavement Preservation Process

Pavement preservation involves applying a series of low-cost treatments every few years to a road segment to halt further deterioration. It is important to note that pavement preservation works only on roads that are still in *good* condition. If the pavement surface and substrate have not significantly deteriorated, relatively inexpensive treatments can keep water out of the pavement, prevent oxidation of the asphalt, and maintain good skid resistance. The road surface can also be kept looking attractive, which is an important factor for national park roads.



Over time, roads deteriorate, and eventually fail. Using pavement preservation, successive small treatments (indicated in blue) maintain the road at “good” to “very good” levels, extending the road’s useful life.

(NCPD graphic)

Contrast this strategy with the typical “worst-first” approach, where precious maintenance funds are used to provide band-aid repairs to pavements that have deteriorated too far and are already failing. Soon after repairs are made, the base or pavement failures are reflected through to the surface, and the effort—and expense—has been wasted.

Reactive Pavement Maintenance

Traditionally, transportation agencies have allowed the structural condition of a road segment to deteriorate to a *fair* or *poor* condition before taking action to rehabilitate or totally reconstruct the road. The goal behind this process was to achieve the most useful life out of a road—typically 15 to 20 years for an asphalt segment—and thus maximize the required capital investment.

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There are three problems with this reactive approach to road maintenance:

- motorists experience progressively worse driving conditions as the road segment ages;
- the rehabilitation or total reconstruction process is expensive;
- major reconstruction is disruptive to traffic flow, a particularly bad situation in a national park setting.

Proactive Maintenance Approach

The NPS transportation program has adopted the proactive maintenance approach of *pavement preservation*. This approach calls for keeping good roads in *good* condition, rather than allowing them to fully deteriorate through their lifecycle. The focus is on strategies that preserve and maintain existing *good* roads, extending their lifespan.

Pavement preservation treatments include chip seals, slurry seals, hot mix asphalt (HMA) overlays, and crack seals, among others. These treatments can be applied to a road segment quickly, relative to major rehabilitation or reconstruction. A key to successful pavement preservation is choosing the right treatment for the right road, at the right time.

Pavement preservation strategies reduce or eliminate:

- the need for costly, time-consuming rehabilitation or reconstruction of roads that have reached or exceeded their useful lives;
- traffic disruptions, a major factor in national park properties, where there may be only one road available;
- work zone dangers, because the maintenance treatments can be applied more quickly than full reconstruction.

Transportation Asset Management and Pavement Preservation

This strategic approach to road maintenance fits well within the NPS' move to *transportation asset management*, a process of operating, maintaining, and upgrading physical assets in the most cost-effective way. Asset management combines engineering and data analysis with sound business practices, considering the trade-offs and long-term outcomes between possible investment profiles.

Pavement preservation has proven to be very cost-effective. Several studies have found that a dollar spent on pavement preservation can save between \$6 and \$10 in future pavement rehabilitation costs.

Summary

Pavement preservation is about maintaining and preserving our transportation investments. It introduces a more economical way of maintaining good roads in national parks properties by increasing the time between when a road is built and when it needs to be reconstructed. Some resources will always need to be devoted to building and reconstructing park roads. But with timely applications of carefully selected treatments to maintain and extend a pavement's service life, more resources can be devoted to other transportation infrastructure needs, while maintaining safe, efficient roads for park visitors.

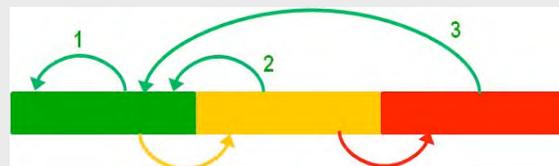
Pavement Preservation versus Worst-First

This sidebar will explain the effect on the paved road network of a pavement preservation strategy vs. a worst first strategy.

The 3-color bar below represents the entire paved NPS road network of 5,500 miles. Some of the miles are in good condition (green), in fair (yellow), and in poor (red). Every year, some good miles degrade to fair and some fair miles deteriorate to poor; poor roads simply stay poor. Also, each year the NPS spends money (or performs projects) fixing some of the miles and generally moving them to the left and returning them to good status.

Making poor miles good requires full rehabilitation, which is expensive. Fair condition miles require light rehabilitation to become good, which is more cost-effective. However, good miles only require pavement preservation, which is the most cost-effective of all, and simply insures that the preserved good mile stays good for several years, rather than deteriorating to fair condition.

Compare two scenarios: a pavement preservation strategy vs. a worst first strategy.



In the pavement preservation strategy, money is focused on keeping good roads good (1). The money is focused on fair miles, returning them to good (2). Only when the more cost-effective remedies for that funding period are performed is money spent on poor miles (3). Miles still degrade, but money is spent on the most cost-effective activities.



In the worst first strategy, pavements are allowed to deteriorate to poor condition, and only then are poor miles fully rehabilitated to good condition.

