National Park Service
U.S. Department of the Interior

Denali National Park and Preserve

An Integrated Study of Park Road Capacity

Spring/Summer 2006

Ongoing studies are assessing the Park Road's traffic capacity. What limit will ensure road traffic has no negative impacts on wildlife (such as grizzly bears) and on high quality visitor experiences?

...I would urge all planners to strive for quality in this Alaska wilderness. The people expect it.
— Adolph Murie

Maintaining a high quality wilderness experience for the greatest number of visitors while preserving park resources remains a primary challenge for park managers at Denali. Now underway are several studies about wildlife, visitor experiences, and vehicle logistics. Researchers will use data from these studies to build a computer model to assess the capacity of the Park Road. Park managers can use the model as a tool to evaluate road use in relation to park goals.

Park Road history and road limits

Denali is one of the most heavily visited subarctic national parks. Most visitation occurs from late May through mid-September and is concentrated along the 90-mile Park Road. Before 1972, visitors were few and they arrived by train or on the unimproved Denali Highway. In 1972, visitation to the park tripled with the opening of State Hwy 3, the George Parks Highway. Anticipating increased visitation, park management implemented a mandatory visitor transportation system (VTS) to minimize disturbances to wildlife and scenery.

The park's General Management Plan (GMP) was completed in 1986 after public hearings and other public input. The GMP authorized a limit of 10,512 vehicle trips annually on the Park Road past the Savage River. This limit was based on 1984 use levels, allowing up to a 20 percent increase in buses and reducing private vehicle traffic by 45 percent. The VTS has enabled Denali to keep vehicle use below the limit while providing most visitors with an opportunity to travel the Park Road. However, if increases in visitation continue and demand exceeds this capacity, there will be increased pressure to reevaluate this limit and provide a scientific rationale for it.

Previous Park Road studies

In response to increased visitation, the park supported several observational studies of wildlife abundance and behavior along the Park Road. Data from these studies indicate possible negative effects of visitation on movements and behavior of Dall sheep, grizzly bear, and moose. However, study results are inconclusive because of inadequate funding, intermittent effort, the nature of the studies (observational, focused only along the road corridor), and a non-integrated approach.

The primary factors that determine visitor satisfaction with the road experience have not been well-researched. Logistical constraints such as train arrivals or road travel time also influence how capacity levels are implemented and what the effects of road use are. Acknowledging these data gaps, park managers would like to move toward making more informed decisions about managing traffic levels on the road.

What to look for at Denali as the Road Capacity Study gets underway:

Photo credit: Kennan Ward

- **GPS receivers and data loggers in some buses (so drivers can document where and why buses stop, e.g., for wildlife viewing)**

Photo credit: Kennan Ward

- **Social scientists interviewing a sample of park visitors (to learn what affects the quality of their experience in Denali)**

Photo credit: Kennan Ward

- **Radio-collared Dall sheep, grizzlies, and wolves (to track their movements in relation to Park Road traffic)**

New Park Road research

To document the patterns of road traffic and the movements of selected wildlife (i.e., Dall sheep and grizzly bears), researchers will use state-of-the-art Global Positioning System (GPS) tags on a subset of vehicles and wildlife. Researchers will then establish "modeling rules" by combining current and past road research results with a literature review of the effects of road traffic on wildlife. For example, a modeling rule might be "unacceptable interference in Dall sheep migration is associated with a cluster of four or more vehicles within 20 meters (60 yards) of the sheep".

Concurrent studies of the factors associated with high quality visitor experiences and of the logistics of the park transportation system will establish social and logistical modeling rules.

Building a road capacity computer model

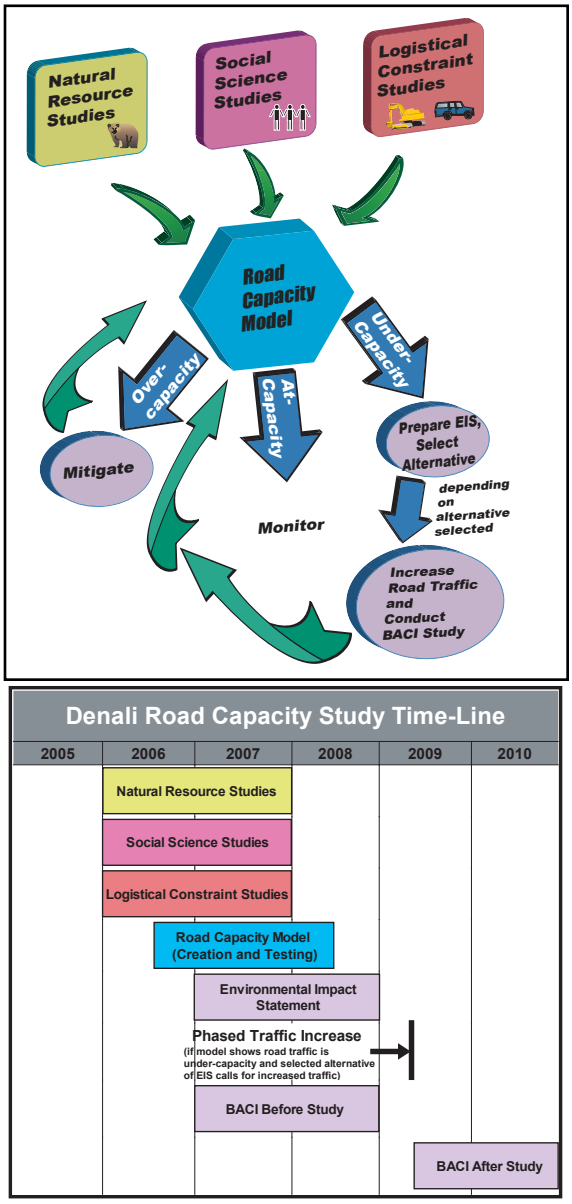
A dynamic road capacity computer model will be developed that integrates the modeling rules about the desired future condition for wildlife and other natural resources, the effects of traffic on wildlife, the retention of visitor experience for which Denali is famous, and the logistical constraints of the transportation system (see diagram at right above). The model will arrange information spatially with Geographic Information Systems (GIS), similar to the transportion or vehicle flow models used in non-park settings. The road capacity model will assess if the road is under-capacity, at-capacity, or over-capacity.

Using adaptive management

Park managers will use adaptive management in setting the Park Road traffic limit (i.e., adjust the traffic limit based on scientific findings). If the road traffic model shows the road to be at- or over-capacity, traffic limits would remain at the levels set in the 1986 GMP.

If the model shows the road to be under-capacity, an Environmental Impact Statement (EIS) would establish suitable alternatives for increased road use. Background sections for the EIS will be prepared in advance. Any increase in traffic chosen from alternatives would be phased in over multiple years and be implemented only on alternate time periods (e.g., days) and on certain sections of the road.

Because the model would not be able to predict all possible negative effects of a traffic increase, park managers would use a powerful Before-After-Control-Impact (BACI) study technique to evaluate these effects. Utilizing the experimental design of a BACI study, researchers will collect data about wildlife behavior, visitor experiences, traffic flow, and environmental variables over a two-year period *before* and *after* any traffic increase. Then they will compare data collected during time periods without an increase in traffic (*control*) to data collected when there is an increase (*impact*). Researchers will also compare data from sections of the road with and without an increase in traffic. Significant changes in these variables would be reason for rejecting any permanent increase in road traffic.



A flowchart (top) and a timeline (bottom) for the integrated road study. The model for road capacity (blue hexagon) is built from three types of studies (resource, social, and logistical). Park actions (purple ovals) depend on the outcome of the model (three dark blue arrows). Timeline bars are color-matched to the flowchart.

For more information

Philip N. Hooge, Ph.D.
Center for Resources, Science, and Learning
Denali National Park and Preserve
P. O. Box 9, Denali Park, AK 99755
philip_hooge@nps.gov
www.nps.gov/dena