



Adaptive Management Strategy for the Denali Park Road

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Adaptive management is a process that promotes an experimental approach to management and flexible decision making that can be adjusted as results of management actions are monitored and better understood (Fig. 1). We need adaptive management because the outcomes of most wildlife management actions are shrouded in uncertainty and unpredictability due to environmental variability or incomplete knowledge of system dynamics. This summary provides a brief outline of the adaptive management strategy that will be implemented should the park make any changes to the transportation system on the Denali park road.

Background

With the sustained growth in Alaska's tourism industry, trends indicate that the demand to visit Denali National Park will continue to increase; putting pressure on park managers to defend or change the current allocation of 10,512 vehicle trips on the park road during the summer.



Caribou on the Denali park road.

Evidence also suggests that there is a need to respond to changing demographics, interests, and needs of visitors. Addressing these issues will require a comprehensive review of the current transportation system and evaluation of alternatives for developing a system to better serve the needs of visitors while protecting park resources.

In 2006-2008, the park conducted a series of scientific studies to understand the relationship of traffic patterns on the park road to the physical, biological and social environment. The park initiated these studies, referred to collectively as the road capacity study, to understand the limits that need to be placed on park road traffic, and the potential effects changes in traffic patterns might have on visitor experience and other park resources. Results from the road capacity study were also used to identify

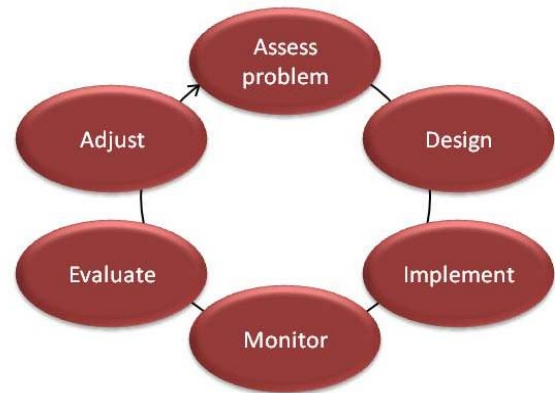


Figure 1. Diagram of the adaptive management process.

indicators of important resource values for use in this adaptive management strategy.

The park has begun preparing an Environmental Impact Statement (EIS) to evaluate alternatives for a Vehicle Management Plan that will determine the best method for moving the greatest number of visitors through the park while providing a high quality visitor experience, preserving park resources and values, and maintaining the character of the park road. Examples of visitor transportation system components that may be evaluated in the EIS include vehicle allocations, best available technology, schedule changes, alternative destinations along the road, and specialized tours. The park plans to complete the EIS by December 2010. Only if a change in traffic scheduling or volume is selected through the EIS process as the appropriate course of action will experimental traffic changes be implemented and monitoring studies conducted.

Adaptive management strategy

The strategy outlined here is designed to detect negative effects on important resource indicators that may be caused by changing the transportation system on the park road and to provide park managers with a method to adaptively manage traffic to address any impacts. The objectives are to: 1) determine the best indicators to monitor to detect impacts of changes in park road traffic management on important park resources, 2) monitor wildlife, physical and social indicators if any changes in the transportation system are implemented, 3) recommend adaptive management to address any significant changes in indicator variables.

A number of physical, social and wildlife indicators will be monitored. Table 1 lists possible indicators that have been identified from the road capacity study or other park research that may be monitored as part of this study. Indicators that will be used in this study will be

prioritized and finalized during the planning process with principal indicators of fundamental resources values given highest priority.

A Before-After, Control-Impact (BACI) study design will be employed to monitor indicator variables. This design is based on the principle that if two locations (control and impact) are monitored before a human-caused disturbance (in this case an experimental change in the transportation system), the impact location may show a different pattern after the disturbance than the control site (Fig. 2). BACI studies measure the change in the differences among sites between the two time periods (before and after impact) rather than measuring the overall magnitude of difference between the sites, thereby controlling for differences unrelated to the impact of interest. Consequently, park managers can attribute resource impacts to the management action if after the action, the magnitude of these difference values changes significantly from the observations before the action.

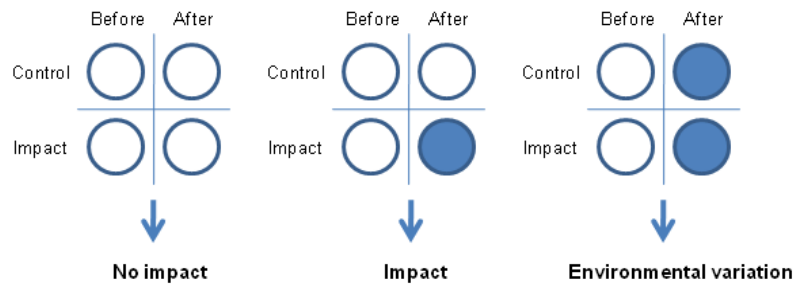


Figure 2. Diagram of potential BACI study results. Shading refers to an observed change.

Adaptive management may include a range of options from adjusting traffic schedules and vehicle numbers to a return to the previous traffic system. If monitoring detects impacts to the high priority indicators of fundamental park resources, managers will respond with a decrease in traffic levels.

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Table 1. Potential indicators and methods for monitoring. This list may be subject to change.

	Indicators	Method
Physical	Fugitive dust	Dust collection - mass
	Sound - backcountry users, wildlife stops	Sound stations – max decibel level; % time audible; sound model
Social	Visitor experience	Visitor survey – prioritize indicators within survey
Wildlife	% chance of seeing a grizzly bear on road trip	Touchscreen panels*
	% chance of seeing “big 5” (bear, moose, caribou, sheep, wolf) on road trip	Touchscreen panels
	Distribution of wildlife sightings (spatially and temporally)	Touchscreen panels, written bus driver observations, staff observations
	Timing and location of Dall’s sheep and grizzly bear road crossings	GPS collars, Touchscreen panels, road observations by staff
	Ratio and distribution of male (or unknown sex) bears vs. females with cubs along road	Observations by staff
	Movement rate of bears and sheep when crossing or “near” park road	GPS collars
	Distribution of bear inactive periods relative to road	GPS collars
	Probability and timing of sheep crossings	GPS collars
	Distribution of bears and sheep	GPS collars
	BIMS data	Wildlife – visitor incident records
Inventory & Monitoring program - Dall’s sheep, wolves, caribou		Population numbers and distribution
	BBS route – breeding bird survey	Species numbers and distribution

*Touchscreen panels are devices that have been installed on buses, allowing drivers to record wildlife observations and other details of bus movements and stops on the park road.