National Park Service
U.S. Department of the Interior

Denali National Park
Healy, Alaska

Denali National Park:
Bus Shuttle System Analysis

Source: Volpe Center photograph (June 2012)

September 2013

John A. Volpe National Transportation Systems Center

U.S. Department of Transportation
Research and Innovative Technology Administration

Table of Contents

Table of Figures

Table of Tables

Report Notes

This report was prepared by the U.S. Department of Transportation John A. Volpe National Transportation Systems Center, in Cambridge, Massachusetts. The Project Team included Anna Biton and Michael Kay of the Transportation Planning Division.

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Acronyms

ANCSA	Alaska Native Claims Settlement Act
DENA	Denali National Park and Preserve
FTE	Full-time Equivalent
GPS	Global Positioning System
JV	Joint Venture
MDT	Message Display Terminal
NPS	National Park Service
VMP	Vehicle Management Plan
VTS	Visitor Transportation Service

Introduction

Denali National Park and Preserve (DENA) is located in south-central Alaska, with a broad expanse of mountains, valleys, plains and glaciers surrounding Mount McKinley, the tallest peak in North America. Denali is also known for free-ranging wildlife, including caribou moose, Dall sheep, black bears, and grizzly bears, and a variety of birds and small mammals.

There is only one road throughout the entire park. All but the first 15 miles of the 92-mile road are closed to most private vehicles; visitors must use organized tours or the Visitor Transportation Service (VTS) shuttles to explore further into the park. Over the past several years the park staff and the VTS provider have worked together to develop innovative approaches to continually improve the transit service.

This is the first in a series of briefs exploring best practices in the various ways to provide transit service in national parks. While Denali operates in a unique environment, the VTS experience offers many lessons related to managing natural resources, using performance measures, working effectively with concessioners, and operating shuttle systems.

This analysis identified several lessons learned, which are listed below and discussed in more detail at the end of the document:

- Strong park leadership and visionary thinking is essential to the success of a shuttle system.
- Flexibility to use franchise fees to fund comprehensive data gathering yields beneficial analysis.
- Limited access for private vehicles to the majority of the park raises the profile of the shuttle system.
- Flexibility of operating agreement leads to sustained improvement in service.
- Outcome-based approach fosters creativity in operational service planning.
- Prior experience of park staff having worked in concessions fosters better understanding of needs.
- Low driver turnover supports a successful transportation system.
- Communication between park and concessioner leads to frequent collaboration and both sharing and implementation of best practices.

Park Road History

The Denali Park Road (Park Road)[1] is a 92-mile primitive road that extends from the George Parks Highway in the northeastern corner of the park to Kantishna, a former mining community in the interior of the park. Completed in 1938, it is the only publicly accessible road in the six million-acre national park.

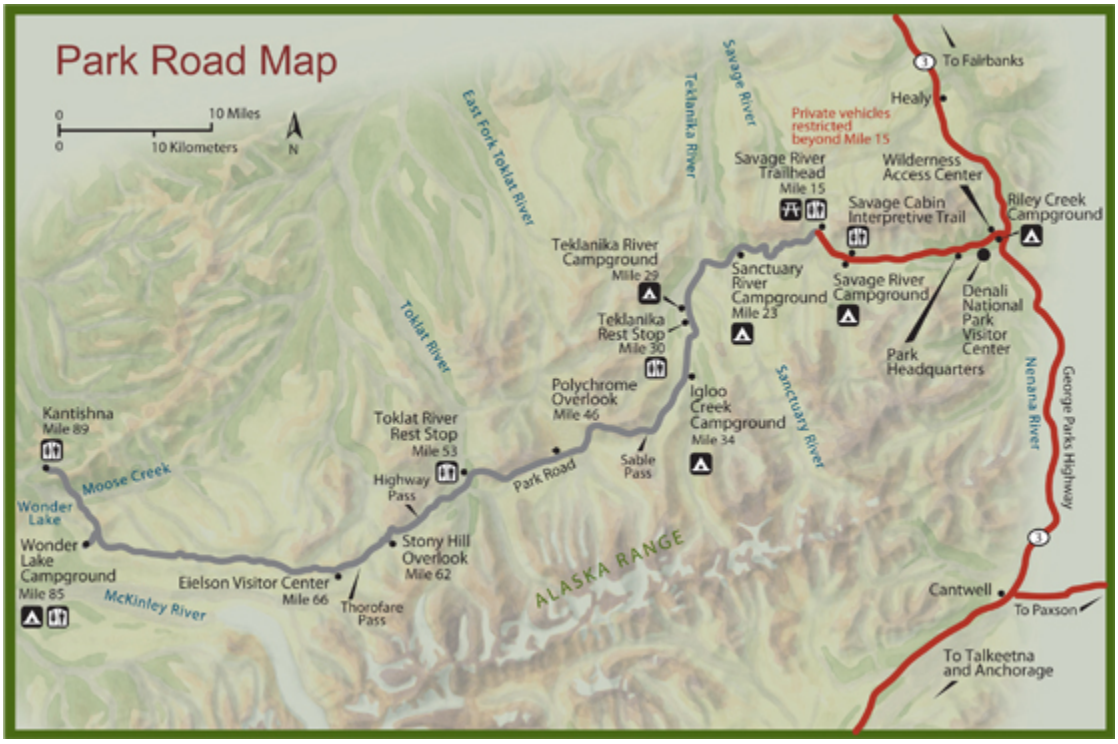
Visitation grew significantly in the 1960s and 1970s, as highway construction in Alaska made the park increasingly accessible from major population centers and allowed visitors to arrive in their own vehicles. Previously, visitors could arrive only by train or plane, and private concessioners provided transportation at the park. The NPS upgraded and widened the Park Road to accommodate more private vehicles in the 1960s, but park managers also recognized the need to actively manage the road in order to maintain the wilderness experience and character of the park.

[1] http://www.nps.gov/dena/index.htm

In 1972, in an effort to protect the natural resources from increased automobile traffic, NPS closed most of the Park Road to private vehicles and implemented a public transportation system to provide access beyond the Savage Check Station at mile 15. Buses transported visitors throughout the park, providing access to trailheads, and campgrounds.

The 1986 Denali General Management Plan continued the limited-access transportation system and set a limit of no more than 10,512 vehicle trips per summer season beyond mile 15. NPS made this decision through formal studies, general observations, and public input in order to minimize negative impacts on wildlife behavior while retaining an optimal visitor experience. The 10,512 value was based on 1984 traffic levels at the time, and allowed for a 20 percent increase in shuttle and tour bus traffic, while decreasing the number of private vehicles that were found to most negatively impact wildlife.[2]

Figure 1
Park Road Map
Source: NPS



Travel on the Park Road

There were 388,400 visitors to Denali National Park and Preserve in 2012, approximately two-thirds of whom rode on either a tour or shuttle bus in the park. The remaining third traveled on the unrestricted section of the park road and/or participated in a glacier landing on the south side of the park.

[2] Phillips, Laura M., Philip Hooge, and Thomas Meier. Park Science. Volume 27, Number 2. Fall 2010. P. 29.

The park manages a concession agreement with Doyon/ARAMARK Joint Venture (JV) to operate tour buses and hiker shuttle buses. The only other vehicles permitted on the Park Road are buses and vehicles operated by Kantishna inholders, holders of special use permits, and park adminstrative vehicles.

Tours

Approximately 71 percent of the park visitors traveling beyond mile 15 use one of the tours. All tours are conducted by driver-naturalists who provide interpretation throughout the trip. Tour bus trips begin and end at various locations around the entrance of the park.[3] Bus tours into the park include a 4.5-hour Natural History Tour, an 8-hour Tundra Wilderness Tour, and the Kantishna Experience, an 11-hour, 92-mile tour to the former Kantishna gold mining district.

Shuttle Buses

The shuttle buses are designed to move people around within the park. Like tour buses, shuttles make regular restroom stops and stop to view wildlife; however, unlike the tour buses, shuttles do not include formal interpretation. The shuttle system is designed to allow visitors flexibility to move within the park on their own schedule.

Visitors purchase tickets for one of four destinations: Toklat River, Eielson Visitor Center, Wonder Lake or Kantishna. There are over 30 shuttle buses each day in mid-summer, each of which goes to its destination along the road, at which point it turns around and travels back to the park entrance.

Figure 2
Park Shuttle Bus
Source: NPS[4]

Visitors may get off the bus at various points to hike or spend more time in a particular location, and then flag down another shuttle bus whether going further into the park or back toward the entrance, to re-board. Re-boarding is on a seat-available basis; visitors may have to wait for up to an hour for a bus with available seating.

There are also camper buses that are designed with space to accommodate backpacks and other camping gear; they bring visitors to the campgrounds and backcountry units in the park.

[3] http://www.nps.gov/dena/planyourvisit/bus-tours.htm

[4] http://www.nps.gov/dena/planyourvisit/courtesy-shuttle-buses.htm

Table 1
Shuttle Details
Source: NPS

Shuttle Name	Length	Time (Round Trip)	Adult (15 and older)	Season
Toklat River	53 miles	6.5 hours	$26.25	May 20 - Sept 12
Eielson Visitor Center	66 miles	8 hours	$33.50	June 1 - Sept 12
Wonder Lake	85 miles	11 hours	$46.00	June 8 - Sept 12
Kantishna	92 miles	13 hours	$50.00	June 8 - Sept 12
Camper Bus			$33.50	June 8 - Sept 11

Transit Provider

The unique relationship between the transit provider and DENA park management contributes to the success of the transit service. Because DENA visitors are required to use the transportation system, the role of the transit provider is critical to ensuring the park's continued viability as a premier tourist destination in Alaska and within NPS.

Denali National Park Commercial Services Division

Based at the park's headquarters, the Commercial Services Division staff consists of a chief of commercial services, three concession management specialists, one supervisory revenue and fee business manager, and nine seasonal visitor use assistants. Some members of the division staff have prior experience working for the private sector as a concessioner in other NPS units, which helps them to better understand the needs of the provider and how to foster a productive relationship.

The division bears the primary responsibility for the transportation system, and manages the contract that authorizes Doyon/ARAMARK JV to operate in the park. The transportation contract includes provisions related to bus replacement, preventive maintenance, driver training, bus cleanliness, adherence to Department of Transportation regulations, breakdown and repair documentation, and pre-trip inspections by drivers and documentation.

The division approves all ticket pricing annually, and NPS staff work closely with JV managers to develop shuttle schedules. The division interacts with JV managers and staff on a nearly daily basis during the operating season, and regularly communicates during the rest of the year. The division dedicates approximately 1.5 full-time equivalent (FTE) positions and 24 percent of the division's annual budget to overseeing the transportation contract.

In addition to the transportation contract, the division oversees 18 other concession contracts such as mountain guides, air taxi glacier landings, interpretive guided hiking, sport hunting, dog sled passenger, and dog sled freight hauling services. The division also oversees approximately 50 commercial use authorizations.

Transportation Provider

Doyon Limited is a native regional corporation authorized by Congress in 1971 as part of the Alaska Native Claims Settlement Act (ANCSA). Doyon is the largest private landowner in Alaska and one of the state's 10 largest Alaska-owned companies. Its mission includes promoting the economic and social well-being of its current and future native shareholders, strengthening the native way of life,

and protecting and enhancing its land and resources.[5] ARAMARK is a global professional services company, providing food services, facilities management, and uniform and career apparel to health care institutions, universities and school districts, stadiums and arenas, and businesses around the world.[6] The JV of these two companies first began providing transportation services at Denali in 2002.

The concession consists of a staff of approximately 300 to 350 employees, including 125 bus drivers, transportation managers and mechanics, sales and support staff at the Wilderness Access Center, and other support staff associated with employee housing and dining, maintenance facilities, campground management, visitor food and beverage, and administrative offices.

Many JV drivers have over 20 years of experience as drivers and guides in the park. Low driver turnover contributes to a strong relationship between the concessionaire and the park, and demonstrates the commitment of the drivers to the visitor experience.

Park Road and Transit System Performance Management

NPS has invested significant time and funds in recent years to better manage the Park Road and the vehicle restrictions and enhance the visitor experience. It has accomplished this through a scientific, performance based approach to road management, strong relationships with the transportation provider, and creative approaches to manage the transit operations.

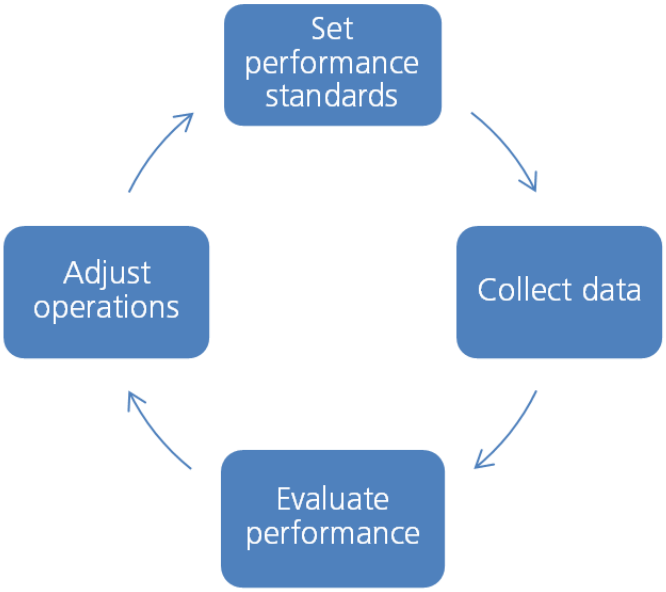
DENA places a strong emphasis on ongoing management of the 92-mile Park Road, which involves monitoring the transportation system, with mechanisms in place to adjust operations to improve performance. Over the past several years, DENA has systematically approached management of traffic on the Park Road through three primary initiatives:

1. Studying the roadway capacity needs and establishing metrics
2. Collecting and analyzing data
3. Adjusting operations based on data

[5] http://www.doyon.com

[6] http://www.aramark.com/default.aspx

Figure 3
Park Road Performance Management Cycle



Park Road Studies and Standards

The 1986 Denali General Management Plan established an allowable seasonal limit of 10,512 vehicles on the Park Road past Mile 15 between May and September. The limit is intended to protect wildlife health and habitat, as well as opportunities for viewing scenic landscapes. While the vehicle limit has succeeded in managing traffic, NPS eventually found that it could not rely on this one measure alone to ensure adequate protection of park resources while providing flexibility for visitors to travel throughout the park. Faced with increasing visitation and interest from tour providers to increase the maximum vehicle limitation, DENA staff recognized that the vehicle limitation was based on visitation levels, rather than a rigorous, defendable scientific analysis of the roadway carrying capacity.

Over the past several years DENA has used revenues collected via concession franchise fees to fund studies and to model the Park Road. The concession agreement provides millions of dollars each year in revenue to the park. Because the concession contract concentrates so heavily on transportation, DENA has invested much of those funds back into studies and models of the Park Road and the transportation system.

To begin to explore the vehicle limitation issue, in 2006 DENA initiated a multidisciplinary Road Capacity Study to better understand the impacts of traffic volume and traffic patterns on the park's physical, biological, and social environment. The Road Capacity Study assumed that visitation to Alaska and the Denali area would continue to increase in the near future. The study explored visitor perceptions of crowding at wildlife stops and rest stops; interactions between buses and wildlife; and wildlife movements along the Park Road corridor. The study also included social science surveys to quantify the importance of key indicators of visitor satisfaction, and analyzed the impacts of traffic on physical factors such as dust and soundscapes. The analysis led to the Vehicle Management Plan, which explores ways to allow greater flexibility in managing the number of vehicles using the Park Road.

Vehicle Management Plan

Building on the results of the Road Capacity Study, DENA moved forward to develop the Denali Park Road Vehicle Management Plan (VMP), which was completed in 2012. The VMP provides a management framework for the road based on defendable science. The plan establishes measurable indicators and standards to ensure adequate protection of key park resources and values along the Park Road, while providing a high quality visitor experience.

Visitor Experience Indicators:

- numbers of vehicles at wildlife stops
- numbers of vehicles in viewsheds
- numbers of vehicles at rest stops
- hiker wait time
- nighttime traffic levels
- large vehicle traffic
- sheep gap spacing

The VMP focuses on managing the number of vehicles, their schedules, and behavior in an effort to meet visitor demand while maintaining standards for resource conditions and visitor experience. Several times each season, DENA monitors key indicators to determine whether the system is meeting its standards. Figure 4 shows an example of some of the indicators and standards established in the VMP.

Shift to Outcome Based Metrics

A significant result of the VMP is that instead of managing to a limit that was based on historic numbers on the Park Road, the transportation provider is now given standards to meet (e.g., numbers of vehicles in particular areas at one time or hiker wait times) and it gets to decide how to meet them. This approach focuses more on enhancing the visitor experience than regulating the annual number of vehicles on the road. As a result, this approach will be more challenging for the provider, but also allows for more flexibility in the system, autonomy and more creativity. DENA plans to continue to conduct periodic surveys of visitor satisfaction and perceived value of the transportation system to guide decision making.

Figure 4
Vehicle Standards for Wildlife Viewing Stops
Source: Vehicle Management Plan, 2012

Indicator	Standard		
	Wildlife Viewing Subzone 1	Wildlife Viewing Subzone 2	Wildlife Viewing Subzone 3
Number of vehicles at a wildlife stop	At least 75% of wildlife stops will have three or fewer vehicles, averaged over five years.	At least 75% of wildlife stops will have two or fewer vehicles, averaged over five years.	At least 75% of wildlife stops will have one or fewer vehicles, averaged over five years.
Number of vehicles at a wildlife stop	No one year will have less than 70% of wildlife stops with three or fewer vehicles.	No one year will have less than 70% of wildlife stops with two or fewer vehicles.	No one year will have less than 70% of wildlife stops with one or fewer vehicles.
(continued)	At least 90% of wildlife stops will have four or fewer vehicles, averaged over five years.	At least 90% of wildlife stops will have three or fewer vehicles, averaged over five years.	At least 90% of wildlife stops will have two or fewer vehicles, averaged over five years.
	No one year will have less than 85% of wildlife stops with four or fewer vehicles.	No one year will have less than 85% of wildlife stops with three or fewer vehicles.	No one year will have less than 85% of wildlife stops with two or fewer vehicles.
	At least 95% of wildlife stops will have five or fewer vehicles, averaged over five years.	At least 95% of wildlife stops will have four or fewer vehicles, averaged over five years.	At least 95% of wildlife stops will have three or fewer vehicles, averaged over five years.
	No one year will have less than 90% of wildlife stops with five or fewer vehicles.	No one year will have less than 90% of wildlife stops with four or fewer vehicles.	No one year will have less than 90% of wildlife stops with three or fewer vehicles.

Data Collection and Analysis

In addition to tracking the number of tickets sold for each run and the number of passengers, all DENA transit vehicles have installed Global Positioning System (GPS) units, which record data on each trip. The GPS units are able to identify the locations and durations of all DENA vehicle stops. The GPS units also record entrance to the various zones and rest stop areas within the park; the zones are all mapped, allowing park staff and the transportation provider to monitor when buses enter areas of specific interest.

DENA buses make stops along the route for various reasons, including: picking up hikers, viewing or yielding to wildlife, yielding to other buses, or yielding to construction. In addition to the data

gathered by the GPS units, DENA depends on the bus drivers to log information related to the stops, in order to provide ongoing monitoring of the system performance and compare against the standards provided in the VMP. Bus drivers are critical to the data collection efforts at DENA, and the park benefits from having many drivers who return year after year. The transit provider also clearly recognizes the benefit of low driver turnover for many aspects of their business, including their ability to institutionalize data collection and continue to improve transit service.

One key concern for the park relates to vehicle crowding at the locations where buses stop to view wildlife alongside the road. The VMP developed standards for numbers of vehicles at wildlife viewing locations in each of three subzones (Figure 4). Each vehicle is equipped with a special Message Display Terminal (MDT) screen panel (Figure 5) for the driver to input information related to the stop. The MDTs are designed to record information on wildlife stops; the information is linked to GPS data to better track how many vehicles are stopped at given locations at the same time, and for how long. It tracks back directly to the performance standard related to numbers of vehicles at wildlife stops and viewsheds.

Figure 5
Message Display Terminal
Source: NPS

Drivers also collect information when picking up hikers along the Park Road. Drivers ask how long hikers have been waiting; this information is recorded manually and turned in to the dispatcher at the end of the day. NPS tracks how long hikers wait to be picked up at various points along the Park Road and uses that information as an indicator of how well the transportation system is able to meet visitor needs. This measure is a very high priority for the park.

In order to improve data collection, the park and the JV agreed to a contract provision that requires bus drivers to document the reason for any prolonged stop. While some drivers viewed this requirement as an unnecessary burden, the JV worked with drivers to communicate the importance of the data collection and in some cases took steps to enforce the requirement. Overall, however, using drivers to collect data has been very successful. The longstanding driver relationships support this in two ways – first, returning drivers do not need as much annual training in the data collection protocol. Second, many of the longstanding drivers feel a sense of pride and commitment to the

success of the transit service. Many of them are also customers, using the service to travel within the park when they are not working.

Data Analysis

The park dedicates the equivalent of 3.5 full time staff from the Resource Division to study the road and analyze the data collected by each vehicle and driver. There is some real-time data analysis to manage hiker demand and wait times and ensure that the transportation provider is meeting the standards; at the end of the season, park staff conduct extensive data analysis to help plan for the following year.

Park staff use the vehicle data to understand crowding levels, animal movements, and transit system bottlenecks. The data support various models of the road and transit system and help to determine whether the system meets the roadway standards. The analysis feeds in to any decision to adjust transit operations to better accommodate demand and meet roadway standards.

Operational Adjustments

DENA's multi-year agreement with the JV allows for either party to propose changes to the operating plan at any time. Any changes with major financial impacts need to be negotiated; if the changes have only minor financial impacts, the two parties work together to identify funds or find another way to address the issue. The focus on system performance and the strength of the working relationship have led to creative and productive service improvements. The following are examples of how DENA has used the data and worked with the transportation provider to improve operations.

Scheduling Adjustments

Every fall, DENA and the JV review data from the previous season, identify trends, and work together to develop the schedule for the coming season. They invest significant effort into advance preparations, and are also constantly making real-time adjustments. The schedule must meet passenger demand as well as the Park Road performance standards.

The JV is constantly monitoring weather, events, and other factors that may impact demand, and can adjust accordingly, to add buses during peak weekends, for example. They have a workbook that provides guidance on what events or indications would trigger the need for additional capacity. They try to work enough in advance to have at least a two day notice to make changes, but can adjust more quickly if there is an available vehicle and driver.

Monitoring Shuttle Occupancy and Capacity

For the past 10 years, the provider has placed an additional dispatcher at the Eielson Visitor Center. The dispatcher tracks how many people get on and off the shuttle buses at this location; this data is critical to understanding how many people are on the buses and how many are on the road at any given time. If there are significant discrepancies, the dispatcher can signal back to the base that there may be need for additional return capacity.

Optimizing Shuttle Occupancy

A definitive experience at Denali is to take a VTS bus out, hike for some period of time (that day or for multiple days), and then re-board a bus to return to the Visitor Center. Hikers may signal to the bus anywhere along the route to pick them up, and space permitting, they can board. A standard in the VMP is that hikers should wait no more than one hour to be picked up. DENA staff and the transit provider review data collected from drivers on how long hikers have waited, and have found long waits at specific popular hiking spots in the late afternoon. One operational change was to adjust scheduling so that enough buses with empty seats can go past these points in the afternoon to accommodate the rush of visitors trying to return. The provider must also manage reservations

and ticket sales to maintain a substantial proportion of open seats on those buses, and not allow them to be full when traveling outbound.

DENA and the transit provider have found that a daily shuttle occupancy rate of approximately 75 percent has allowed them to achieve 95-97 percent of hikers waiting less than one hour. They spent a year reviewing the data, holding regular meetings, and refining the approach to address the wait time issue. After going through this long process together, DENA now allows the provider to run the system and does not set a required occupancy rate. The park continues to monitors hiker wait time through visitor surveys and data collected by the drivers, and as long as the provider can meet the standard, they can rely on their experience and intuition to determine how to best operate the system.

Mitigating Bus Breakdowns

It takes approximately 6 ½ hours to drive the length of the 92-mile Park Road one-way. If a shuttle bus encounters a mechanical problem or breaks down for any reason, it can take a long time to get a spare bus out to serve the passengers. Through analyzing service data, DENA found that broken buses were a key factor leading to increased hiker wait time. For the past several years, DENA and the provider have stationed a spare bus and driver at the 30-mile mark, to reduce the time it takes to replace the damaged vehicle.

The transit provider initially resisted using the staged bus, viewing it as a wasted bus. DENA insisted that it was needed to improve visitor service, and provided additional compensation for an initial period of time to help mitigate the additional cost to the concessioner. While DENA no longer provides additional compensation, the provider has come to view the staged bus as very useful. It is used fairly often, sometimes up to 10-15 times per month. It can be used to rescue a broken shuttle or tour bus, or to pick up additional hikers if needed late in the day.

Lessons Learned

- **Strong Park Leadership is Essential to the Success of the System**
  Park Management is committed to rigorous data collection and analysis, and to the success of the transportation system. The level of funding and staff resources dedicated to roadway studies and modeling, as well as the ongoing relationship with the JV reflect this commitment.

- **Flexibility to use franchise fees to fund comprehensive data gathering yields beneficial analysis**
  DENA is able to use income generated by the transportation service to re-invest into studies and analyses that help it to improve the visitor experience while protecting the natural resources.

- **Limited access for private vehicles to the majority of the park raises the profile of the shuttle system**
  The shuttle system at DENA is not simply a mode of transportation; rather, it is a key component in providing a high quality visitor experience that embraces the natural surroundings and minimizes impacts on wildlife. The park leadership recognizes the importance of the transportation system and commits resources accordingly.

- **Flexibility of operating agreement leads to sustained improvement in service**
  The JV and the park are both committed to improving the visitor experience at a park heavily reliant on a well-performing transit operation. The concessions agreement allows for either party to propose changes to the operating plan at any time. Both parties agree to

review the operating agreement frequently and, when necessary, act to make such changes as adding new buses into service and performing critical data collection.

- **Outcome-based approach fosters creativity in operational service planning**
  The new VMP sets standards to which the transit provider must manage and allows it to determine how to meet them, creating an environment that fosters creativity and commits the provider to the performance of the system.

- **Prior experience of park staff having worked in concessions fosters better understanding of needs**
  Key staff members at DENA have worked previously in the private sector for other concessioners, and bring a unique perspective on how to create a productive working relationship and meet the needs of all parties.

- **Low Driver Turnover Supports Successful Transit System**
  Many VTS drivers have worked at DENA for years, if not decades. Many of the drivers are personally invested in the service and are committed to its success. The JV has worked hard with drivers to have them understand the importance of the data collection; returning drivers also do not need as much annual training in the data collection protocol.

- **Communication between park and concessioner leads to frequent collaboration and both sharing and implementation of best practices**
  The park and the concessioner are in contact on an almost daily basis, and also have regularly scheduled meetings to discuss both the successes and challenges in the service. Both parties are committed to solving problems together. While many of the day to day operational decisions are left to the provider, the park is very engaged in the process and is involved beyond contract oversight.

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This is the first in a series of briefs exploring best practices in the various ways to provide transit service in national parks. While Denali operates in a unique environment, the Visitor Transportation Service experience offers many lessons related to managing natural resources, using performance measures, working effectively with concessioners, and operating shuttle systems.
Lessons learned include:
- Strong park leadership and visionary thinking is essential to the success of a shuttle system.
- Flexibility to use franchise fees to fund comprehensive data gathering yields beneficial analysis.
- Limited access for private vehicles to the majority of the park raises the profile of the shuttle system.
- Flexibility of operating agreement leads to sustained improvement in service.
- Outcome-based approach fosters creativity in operational service planning.

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