U.S. Department of Transportation
Federal Transit Administration

Volume Four: Case Study 4

Transportation Planning Process for *Transit in Federal Land Management Areas*

United States Department of Transportation
Federal Transit Administration
Office of Planning and Environment

April 2008

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Transportation Planning Process for Transit in Federal Land Management Areas

Volume IV: Reds Meadow Valley/Devils Postpile National Monument Case Study

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April 2008

1. Report No. FTA-VA-26-1008-2008.1.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle *Transportation Planning Process for Transit in Federal Land Management Areas Volume IV: Reds Meadow Valley/Devils Postpile National Monument Case Study*		5. Report Date April 2008 6. Performing Organization Code
7. Author(s) Phillip Shapiro, David Anspacher, and Kris Jagarapu.		8. Performing Organization Report No.
9. Performing Organization Name and Address Vanasse Hangen Brustlin, Inc 8601 Georgia Ave, Ste. 700 Silver Spring, MD 20910 LSC Transportation Consultants, Inc. 2690 Lake Forest Road Tahoe City, California 96145-5875		10. Work Unit No. 11. Contract or Grant No. DTFH60-99-D-41026
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Transit Administration (FTA) Office of Planning and Environment 1200 New Jersey Ave., SE, E45-335 Washington, DC 20590		13. Type of Report and Period Covered 2004 to 2008 14. Sponsoring Agency Code TPE
15. Supplementary Notes. This study was conducted in cooperation with the Federal Transit Administration, National Park Service, US Fish and Wildlife Service, USDA Forest Service, and Bureau of Land Management and was managed by Julie Atkins and Sean Libberton, FTA Office of Planning and Environment.		
16. Abstract. The U.S. federal lands, among the country's greatest resources and treasures, are highly desirable visitor destinations. Unfortunately, high visitor demand at several Federal Land Management Areas (FLMAs) threatens to degrade both the natural and cultural resources and the visitor experience. During peak visitation periods, many FLMAs experience congested roads and insufficient parking, which can deter visitors from enjoying resources and are potentially harmful to the FLMAs. There are many different approaches to addressing transportation issues on federal lands. Some FLMAs are considering transit as a means to improve access to and within the FLMA, to reduce the impacts associated with private vehicles, and to improve the visitor experience. The purpose of this document is to ensure that transit planning occurs in a formal, step-by-step process using acceptable transportation planning practice. Transportation solutions can include high-cost transportation programs that are likely to require sustained funding far into the future. It is imperative that before committing to a costly program, the transportation need is fully quantified and ground rules for comparing and ultimately selecting a solution are established at the beginning of the process. Following a thorough planning process decreases the risk of implementing a project that does not respond to the goals of the FLMA and is not sustainable. This document illustrates the transportation planning process in FLMAs with a case study at Reds Meadow/Devils Postpile National Monument.		
17. Key Words. Federal land management area, transit planning, ATPPL, visitor experience, resource protection, goals, objectives, performance measures, data collection, data analysis, alternatives, National Park Service, Forest Service, Fish and Wildlife Service, Bureau of Land Management, Devils Postpile National Monument, Inyo National Forest, Reds Meadow.	18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161	

19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 75	22. Price

Form DOT F 1700.7 (8-72) Reproduction of completed pages authorized

Foreword

The U.S. federal lands, among the country's greatest resources and treasures, are highly desirable visitor destinations. Unfortunately, high visitor demand at several Federal Land Management Areas (FLMAs) threatens to degrade both the natural and cultural resources and the visitor experience. During peak visitation periods, many FLMAs experience congested roads and insufficient parking, which can deter visitors from enjoying resources and are potentially harmful to the FLMAs. There are many different approaches to addressing transportation issues on federal lands. Some FLMAs are considering transit as a means to improve access to and within the FLMA, to reduce the impacts associated with private vehicles, and to improve the visitor experience.

The purpose of this document is to ensure that transit planning occurs in a formal, step-by-step process using acceptable transportation planning practice. Transportation solutions can include high-cost transportation programs that are likely to require sustained funding far into the future. It is imperative that before committing to a costly program, the transportation need is fully quantified and ground rules for comparing and ultimately selecting a solution are established at the beginning of the process. Following a thorough planning process decreases the risk of implementing a project that does not respond to the goals of the FLMA and is not sustainable.

Volume 4 illustrates the transportation planning process in FLMAs with a case study at Reds Meadow/Devils Postpile National Monument. It is appropriate for all audiences, though some components will be more appropriate for FLMA project managers, FLMA transportation planners, and consultants.

Acknowledgements

This study was conducted in cooperation with the Federal Transit Administration, National Park Service, US Fish and Wildlife Service, USDA Forest Service, and Bureau of Land Management and was managed by Julie Atkins and Sean Libberton, FTA Office of Planning and Environment. The National Park Service contributed funding for data collection at Devils Postpile National Monument and Inyo National Forest. The authors would like to thank Kevin Percival, Gay Page, and Mike Morelli at the National Park Service, Deanna Dulen, Joe Pospisil, and other staff at Devils Postpile National Monument; Debbie Nelson and Pennie Custer at Inyo National Forest; and John Austin at Sequoia & Kings Canyon National Park.

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1. Executive Summary

NPS contracted the consultant team to conduct a transportation study in Reds Meadow Valley/Devils Postpile National Monument (NM) for two reasons. First, this study is intended to address several transportation-related concerns in Reds Meadow Valley. Second, this case study is intended to be utilized in conjunction with the Transportation Planning Guide for Transit in Federal Land Management Areas (FLMAs) to assist FLMA units with transit planning.

The Reds Meadow Valley/Devils Postpile National Monument (NM) study area is comprised of two federal land units. Devils Postpile NM was established in 1911 to protect the Devils Postpile rock formation and Rainbow Falls. The 800-acre national monument is surrounded entirely by Inyo National Forest, established in 1907. Devils Postpile is administered by the National Park Service (NPS), and Inyo National Forest is administered by the Forest Service.

Since 1979, the Forest Service has managed the Reds Meadow Shuttle with assistance from NPS. The Reds Meadow Shuttle provides a seamless transportation system between the town of Mammoth Lakes and Reds Meadow Valley. It was established in response to traffic congestion in the Reds Meadow Valley. Prior to initiation of the service, insufficient parking spaces led to overflow parking on sensitive lands, compacting soils and destroying flora. Visitors spent a substantial amount of time sitting in traffic. Unable to find parking spaces and caught in gridlock, the visitor experience suffered. Safety concerns on the steep 2.4-mile single-lane road caused stress for many visitors, particularly when passing large vehicles such as recreational vehicles (RVs). Introduction of the mandatory shuttle service substantially reduced the number of vehicles in the Reds Meadow Valley, enhancing resource protection while maintaining a positive visitor experience. It has nearly eliminated traffic congestion and has enabled more visitors to enjoy the resource than would be possible without the shuttle.

While the Reds Meadow Shuttle has greatly improved resource protection and the visitor experience, there are several additional concerns that motivated NPS and the Forest Service to initiate this study:

- The two agencies may not be able to maintain the Reds Meadow Shuttle due to escalating operating costs, limited funding, and potential loss of fee demonstration authority.
- The steep 2.4-mile single-lane road may be a safety concern for visitors and Reds Meadow Valley staff.
- NPS and the Forest Service are missing an opportunity to enhance the visitor experience because the shuttle service does not provide interpretive services and there are limited viewing opportunities through small windows.

This study develops and evaluates nine alternatives to address these concerns. It should be noted that these alternatives are preliminary and may be refined. The alternatives can be categorized based on three general approaches: shuttle services, access management, and physical improvements. They include:

- Category 1: Shuttle Services
  - Alternative 1a: No Daytime Car Cap – Identical to existing conditions except that the group discount for visitors in private vehicles (known as the "car cap") would be eliminated during the daytime. This would remove the fee inequity between accessing Reds Meadow Valley by private vehicle and by the Reds Meadow Shuttle, since shuttle users do not benefit from a similar cap in the transportation fee.
  - Alternative 1b: Purchase Americans with Disabilities Act (ADA) Compliant Vehicles – Inyo National Forest and Devils Postpile NM would purchase a new fleet of ADA compliant vehicles equipped with automated audio records and written media on the shuttle to enhance visitor interpretation and orientation.
  - Alternative 1c: Contract ADA Compliant Vehicles – Identical to Alternative 1B except that the shuttle service operator would be responsible for supplying the shuttle fleet.
- Category 2: Access Management
  - Alternative 2a: Day-Use Reservation System – Introduce a day-use vehicle reservation system (VRS) that limits vehicular access.
  - Alternative 2b: Automated Check Station – Introduce an automated check station at Minaret Vista with a day-use reservation system that limits vehicular access.
  - Alternative 2c: One-In One-Out System (at check station) – Implement a one-in one-out policy at Minaret Check Station. This policy ensures that once the vehicular carrying capacity of Reds Meadow Valley is reached, one vehicle will be permitted to enter for each vehicle that exits the area.
  - Alternative 2d: One-In One-Out System (at busiest destinations) – Introduce a one-in one-out system at the busiest parking lots, including Agnew Meadows, Devils Postpile, Rainbow Falls trailhead, and Reds Meadow Resort.
- Category 3: Physical Improvements
  - Alternative 3a: Build to Demand – Construct additional parking spaces to accommodate peak demand.
  - Alternative 3b: K-Rail – Prevent resource damage due to vehicles parking in areas not designated for parking by installing k-rail barriers around sensitive areas and locations where informal parking is common.

A fatal flaw analysis was conducted on all alternatives. Alternative 3b was eliminated because installing k-rails is unlikely to reduce resource damage and could urbanize Reds Meadow Valley.

The remaining eight alternatives were evaluated based on several performance measures. Several salient findings can be observed in Table 1-1 and Table 1-2. Most notably, nearly all of the current visitors could be served by all of the alternatives, however approximately 4% of the current visitors would not be able to enter Reds Meadow Valley on its busiest days with Alternatives 2a, 2b, and 2c.

One of the most important observations is the number of times that vehicles will pass each other in the opposite direction on the single-lane road between Minaret Check Station and Old Pavement. If Alternative 3 is chosen and parking spaces constructed to allow all visitors to drive, than the number of times that vehicles would pass each other in the opposite direction would go up substantially as compared to the shuttle options. On the busiest days, with Alternative 3a vehicles would pass each other in the opposite direction approximately 16,000 times per day. With Alternative 1a, 1b, or 1c this would occur only 1,600 times, and with alternatives 2a, 2b, and 2c it would occur 7,400 times per day. Alternative 3a would also require that 0.88 acres of land be devoted to additional parking spaces, while the other alternatives would require little additional land.

Alternatives 1b and 1c are the most expensive to implement, with a life cycle cost of over $10 million, while alternatives 2a and 2b would generate revenue of over $11 million over the same 20-year life span. If the existing service were continued $2 million of net revenue would be generated during this period. The shuttle alternatives would assure that almost all of the visitors have access to interpretive services as they ride the shuttle into Reds Meadow Valley, whereas the other alternatives do not provide that opportunity. Alternatives 2a, 2b, and 2d will reduce the amount of delay experienced by visitors since they would not have to wait for a shuttle bus or experience substantial delay due to congested roadways and parking lots.

Table 1-1: Performance Measures Derived for Alternatives

Performance Measure	Existing	Alternative 1: Shuttle Service			Alternative 2: Access Management				Alternative 3: Physical Improvements
		A. No Group Discounts during Daytime	B. Purchases ADA Compliant Vehicles	C. Contract ADA Compliant Vehicles	A. Day Use Reservation System	B. Automated Check Station	C. One-In One-Out System (Check Station)	D. One-In One-Out System (Valley Destinations)	A. Build to Demand
1.1.1 Number of vehicles passing other vehicles per day in the same direction on the single-lane road	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 37 Maximum = 96	Average = 37 Maximum = 96	Average = 37 Maximum = 96	Average = 39 Maximum = 125	Average = 39 Maximum = 125
1.2.1 Number of vehicles passing other vehicles per day in the opposite direction on the single-lane road	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 2,100 Maximum = 7,400	Average = 2,100 Maximum = 7,400	Average = 2,100 Maximum = 7,400	Average = 0 Maximum = 0	Average = 2,300 Maximum = 16,000
2.1.1 Maximum number of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0	0	0	0	0	0	0	142	0
2.1.2 Maximum percent of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.7%	0.0%
2.2.1 Number of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0	0	0	0	0	0	0	3	0
2.2.2 Percent of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%
2.3.1 Footprint of additional infrastructure (number of trees to be removed and sq ft of land to be affected)	Acres: 0.00	Acres: 0.00	Acres: 0.01	Acres: 0.01	Acres: 0	Acres: 0	Acres: 0	Acres: 0	Acres: 0.88
3.1.1 Fee per visitor (2007 dollars)	$5.78	$6.08	$6.08	$6.08	$5.49	$5.49	$0.00	$0.00	$0.00
3.2.1 Capital costs (2007 dollars)	n/a	$0	$9,653,000	$9,653,000	$324,900	$361,100	$171,000	$6,000	$158,500
3.2.2 Operating costs (2007 dollars)	$409,500	$409,500	$411,500	$411,500	$4,500	$3,500	$0	$0	$0
3.2.3 Life cycle costs (2007 dollars)	-$2,002,000	-$2,728,000	$10,295,000	$10,295,000	-$11,454,000	-$11,432,000	$230,000	$8,000	$213,000
3.3.1 Annual revenue minus annual operating costs (2007 dollars)	$74,500	$99,500	$99,500	$99,500	$442,500	$443,500	$0	$0	$0

Table 1-2: Performance Measures Derived for Alternatives (continued)

Performance Measure	Existing	Alternative 1: Shuttle Service			Alternative 2: Access Management				Alternative 3: Physical Improvements
		A. No Group Discounts during Daytime	B. Purchases ADA Compliant Vehicles	C. Contract ADA Compliant Vehicles	A. Day Use Reservation System	B. Automated Check Station	C. One-In One-Out System (Check Station)	D. One-In One-Out System (Valley Destinations)	A. Build to Demand
4.1.1 Percent of visitors that have access to orientation services	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
4.2.1 Percent of visitors that have access to interpretive services	0.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4.3.1 Reduction in average delay per visitor compared to the existing service (minutes)	n/a	0	0	0	33	33	0	32	32
4.3.2 Number of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a	0	0	0	81	81	0	81	81
4.3.3 Percent of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a	0.0%	0.0%	0.0%	66.4%	66.4%	0.0%	66.4%	66.4%
4.4.1 Percent of passengers per day that stand on the shuttle	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	n/a	n/a	n/a	n/a	n/a
4.4.2 Number of days per year when passengers stand on shuttle	25	25	25	25	n/a	n/a	n/a	n/a	n/a
4.4.3 Percent of days per year (when shuttle is operational) that passengers stand on shuttle	26.3%	26.3%	26.3%	26.3%	n/a	n/a	n/a	n/a	n/a
4.5.1 Number of visitors to Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	84,000	84,000	84,000	84,000	81,000	81,000	81,000	84,000	84,000
4.5.2 Number of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0	0	0	0	0	0	0	3	0
4.5.3 Percent of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%

2. Background

The Reds Meadow Valley/Devils Postpile National Monument (NM) study area is comprised of two federal land units located on the Western slope of the Sierra Nevada Mountain Range in Madera County, California. Devils Postpile NM was established in 1911 to protect the Devils Postpile rock formation and Rainbow Falls. The 800-acre national monument is surrounded entirely by Inyo National Forest, established in 1907. Devils Postpile is administered by the National Park Service (NPS) and Inyo National Forest is administered by the Forest Service.

Since 1979, the Forest Service has managed the Reds Meadow Shuttle with assistance from NPS, which provides a seamless transportation system between the town of Mammoth Lakes and the Reds Meadow Valley. In addition to Devils Postpile NM and Rainbow Falls, Reds Meadow Valley also includes destinations such as the Ansel Adams Wilderness, the Reds Meadow Resort and Pac Station, six campgrounds, and several trailheads (see Figure 2-1). Within Reds Meadow Valley there are numerous opportunities for hiking, nature observation, relaxation, backpacking, and fishing.

The Reds Meadow Shuttle was established in response to traffic congestion in the Reds Meadow Valley. Insufficient parking spaces led to overflow parking on sensitive lands, compacting soils and destroying flora. Visitors spent a substantial amount of time in traffic. Unable to find parking spaces and caught in gridlock, the visitor experience suffered. Safety concerns on the steep 2.4-mile single-lane road[1] caused stress for many visitors, particularly when passing large vehicles such as recreational vehicles (RVs). Introduction of the mandatory shuttle service substantially reduced the number of vehicles in the Reds Meadow Valley, enhancing resource protection while maintaining a positive visitor experience. It has enabled more visitors to enjoy the resource than would be possible without the shuttle.

Over a 14 year period, the Mammoth Mountain Ski Area operated the shuttle on behalf of Inyo National Forest. As operating costs increased, the Mammoth Mountain Ski Area requested increases in the shuttle fare. By 2002, Inyo National Forest determined that the $9 per person shuttle fare was excessive and classified the Reds Meadow Valley as a fee demonstration recreation area under the Recreational Fee Demonstration Program authorized by Congress in 1996. This designation allowed the Forest Service to extend access fees to all visitors regardless of whether they use the shuttle. Prior to the

[1] The width along the single-lane road varies, but typically is approximately 15 feet wide.

designation, a fee was levied to shuttle passengers only. The Forest Service contracted with California Cruisers, a private bus operator, to operate and maintain the shuttle service, as well as provide the vehicles. As a result of the increased revenues from the fee demonstration authority, the Forest Service reduced the fare to $5 per adult in 2002; however, the fee was subsequently increased to $7 per adult the following year, due to a funding deficit.

The major motivation behind this study was the concern that the National Park Service and the Forest Service would not be able to maintain the Reds Meadow Shuttle due to escalating operating costs, limited funding, and potential loss of fee demonstration authority. Without the shuttle service, Reds Meadow Valley would have to accept a return to the pre-1979 traffic free-for-all or introduce access management strategies that would substantially reduce the number of visitors to the park.

A second concern was that the steep 2.4-mile single-lane road may be a safety concern for visitors and Reds Meadow Valley staff. Numerous times during the day large vehicles approach each other on this road. Frequently, vehicles must back up on the road because there is insufficient space for vehicles to pass each other. While there have been no recorded incidents on this road in recent years, it continues to be stressful for some visitors.

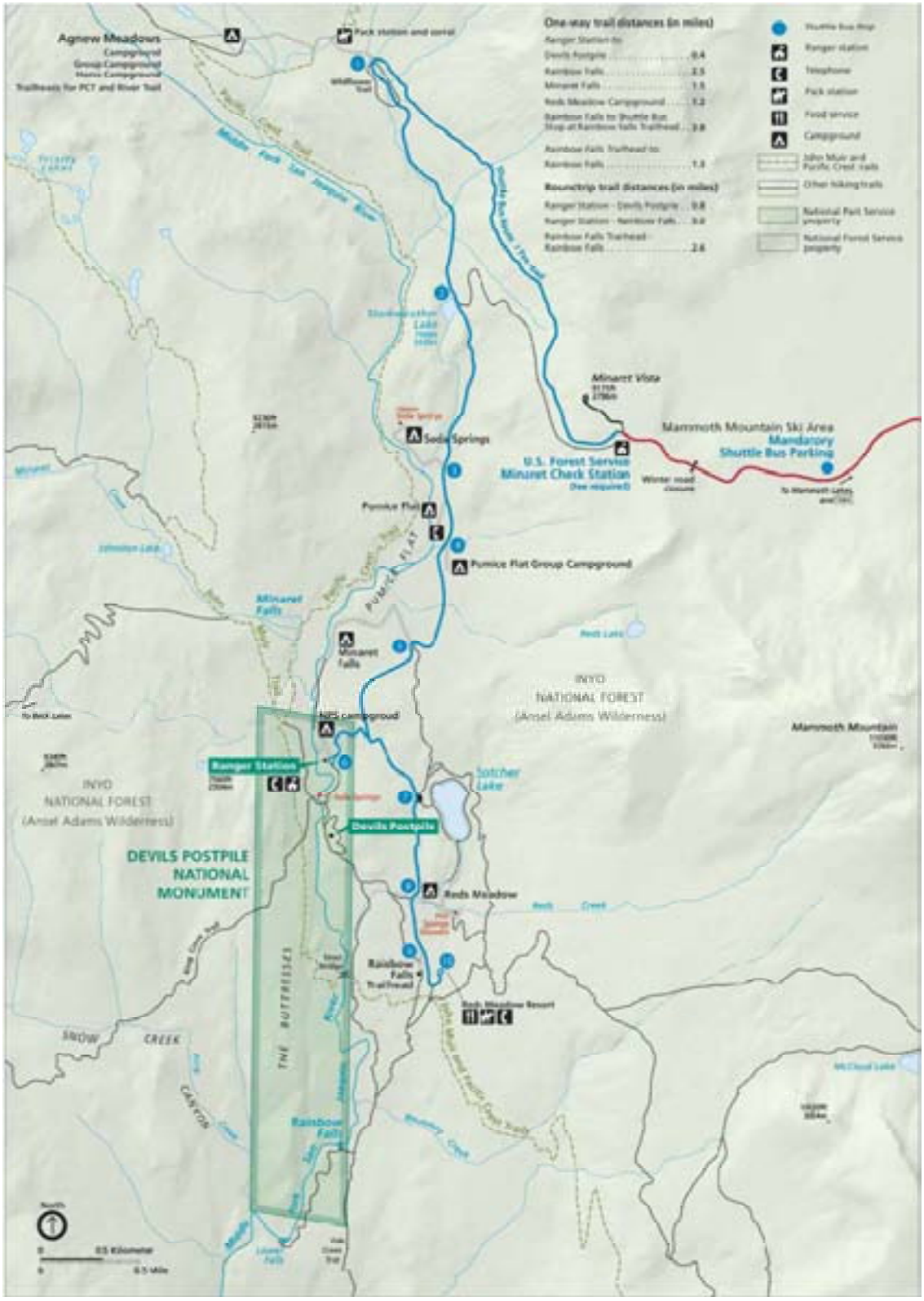
A final concern is that Reds Meadow Valley is missing an opportunity to leverage the transportation system to enhance the visitor experience. The current fleet operated by California Cruisers is composed of refurbished Blue Bird school buses, which afford limited viewing opportunities through small windows, are unable to adequately accommodate persons with disabilities, and provide inadequate seating for adults. Furthermore, a lack of audio equipment prevents Reds Meadow Valley from providing interpretive services to shuttle passengers. While the use of refurbished school buses is based on the availability of financial resources, interpretive and orientation programs would substantially improve the visitor experience.

The consultant team worked with stakeholders including Inyo National Forest and Devils Postpile NM to identify goals and objectives to address these transportation problems. The consultant team then developed performance measures to quantify the degree to which the objectives were met. The performance measures were derived from data that were collected between August 4 and August 7, 2005. This data was intended to quantify travel patterns, safety, and impacts on resources and the visitor experience. In November 2005, the consultant team led a workshop with Inyo National Forest, Devils Postpile NM, and other stakeholders, which developed nine alternative solutions to the transportation problems. The consultant team subsequently evaluated each alternative

based on the goals, objectives, and performance measures. This report documents the results of that study, as well as the methods and procedures utilized. The remainder of this report is organized as follows:

- Section 3 discusses existing conditions in 2005
- Section 4 highlights the goals, objectives, and performance measures of the study
- Section 5 discusses data collection procedures
- Section 6 provides the results of the data collection effort
- Section 7 derives the performance measures for the existing service, operated in 2005
- Section 8 describes the nine alternatives evaluated as part of this study
- Section 9 evaluates the alternatives, based on the performance measures identified above

Figure 2-1: Reds Meadow Valley and Surrounding Area (Source: National Park Service)



3. Existing Conditions

Since 1979, Devils Postpile NM and Inyo National Forest have jointly managed the Reds Meadow Shuttle, which creates a seamless transportation system between the town of Mammoth Lakes and Reds Meadow Valley, providing access to Devils Postpile NM, Reds Meadow Resort, Rainbow Falls, and other destinations. The Reds Meadow Shuttle is mandatory for all visitors, with several exemptions. Overnight guests at Reds Meadow Resort, campers, visitors transporting small watercraft for use in the lakes, or persons with disabilities can enter the Reds Meadow Valley by private vehicle. As the Minaret Check Station, located between the town of Mammoth Lakes and Reds Meadow Valley, is not maintained between 7:30 pm and 7:00 am, entry by vehicle is also permitted during that time period. See Figure 2-1 for a map of the Reds Meadow Valley and surrounding area.

The Reds Meadow Shuttle typically operates from mid-June to mid-September, though weather conditions can shorten the season. It runs between the Adventure Center (located next to Mammoth Mountain Ski Area, one mile east of Minaret Check Station) to Reds Meadow Resort, by California Cruisers. As shown in Figure 2-1, the shuttle stops at 10 destinations in Inyo National Forest and Devils Postpile National Monument, including Agnew Meadows, Starkweather Lake, Soda Springs, Pumice Flat, Minaret Falls, Devils Postpile Ranger Station, Sotcher Lake, Reds Meadow Campground, Rainbow Falls trailhead, and Reds Meadow Resort.

In 2005, operation, maintenance, and supply of buses were contracted to California Cruisers by Inyo National Forest for $376,130. Revenues during the year were approximately $460,000. The fleet was composed of 10 refurbished "Bluebird" model school buses with between 40 and 44 seats and one Americans with Disabilities Act (ADA) compliant vehicle with 29 seats provided by the Yosemite Area Transportation System (YARTS). The service follows a fixed schedule, with the first shuttle departing from the Adventure Center at 7:00 am and the last shuttle arriving at the Adventure Center at 8:30 pm. The round trip travel time is 90 minutes. California Cruisers is required to provide service on frequencies ranging from 30 to 60 minutes during the low season and 20 to 45 minutes during the high season[2]. In order to ensure that no passenger waits more than 30 minutes to board the shuttle, flexibility is built into the contract to enable unscheduled "on-demand" vehicles to accommodate peak demand. During the high season, the shuttle makes 27 scheduled trips. California Cruisers can add

[2] In 2005, high season was every day between July 1 and September 5. High season also included all Fridays, Saturdays, and holidays between June 11 and June 30. Low season was all other days the shuttle was operated.

an average of eight additional trips per day between Friday and Sunday and an average of four additional trips per day between Monday through Thursday, when appropriate. The unscheduled trips typically provide direct access to Devils Postpile NM and Reds Meadow Resort.

Fee Demonstration Authority continues to enable Inyo National Forest to charge all visitors to the Reds Meadow Valley a transportation fee, regardless of whether they ride the shuttle. Tickets for the shuttle are purchased at the Adventure Center, located at the Mammoth Mountain Ski Area. This area also serves as the launch site for the shuttle and has a large parking lot where passengers park their vehicles. Persons that are exempt from using the shuttle are charged the transportation fee at the Minaret Check Station. The fee for adults is $7 per day and for children ages 3 to 15 it is $4 per day. There is a "car cap" of $20 per vehicle in Reds Meadow Valley. In addition, a three-day pass costs $14 per adult and $8 per child, and a season pass costs $35 per adult and $20 per child.

4. Goals, Objectives and Performance Measures

The planning process began by identifying the major transportation-related issues confronting the Reds Meadow Valley. Based on these perceived transportation problems, staff and other stakeholders developed goals that articulate their vision for the area. Objectives were then established to describe desired outcomes of the goals. Then, performance measures were developed to quantify the extent to which the objectives are achieved. Based on these performance measures, a list of data requirements was established for the data collection process.

4.1. Identification of Problems and Issues

The study team conducted several meetings with stakeholders between July 25 and July 27, 2005 to discuss transportation related concerns confronting the Reds Meadow Valley. Stakeholders included staff at Devils Postpile NM, Inyo National Forest, California Cruisers, and several community members (Mammoth Mountain Ski Area, Mammoth Lakes Chamber of Commerce, and Reds Meadow Resort). The stakeholders identified the following four issues as the major transportation concerns that the transportation study should address:

- Safety concerns: excessive speed, vehicles passing shuttles, and potential collisions. Stakeholders were concerned about safety throughout Reds Meadow Valley, but especially along the 2.4-mile single-lane road segment between Minaret Check Station and Agnew Meadows. This section of road is curved, with a steep slope to one side. Vehicles traveling along this section might not have sufficient time to brake before colliding with an oncoming vehicle, particularly wide vehicles such as campers. While no major incident has occurred along this portion of the road in recent years, most stakeholders feared that a crash might happen.
- Resource damage caused by vehicles parked illegally, outside of designated areas, due to overflow parking.
- Financial feasibility of shuttle system. While in the current year the shuttle system operated with a budget surplus, even with fluctuating visitation, removal of fee demonstration authority could cause the system to operate with a budget deficit.
- Unrealized potential for visitor experience. Several stakeholders felt that the transportation system could be used to facilitate a visitor interpretation program.

4.2. Development of Goals, Objectives, and Performance Measures

To address the problems and issues identified by the stakeholders, the team developed several goals for the transportation study. These goals articulate a transportation vision for Reds Meadow Valley and include:

- Goal 1: Provide a safe means for visitors to access the resource
- Goal 2: Reduce resource damage due to vehicles parking in areas not designated for parking
- Goal 3: Provide low cost, sustainable transportation access to the Reds Meadow Valley
- Goal 4: Maximize visitor experience while traveling in the Reds Meadow Valley

Objectives were then developed to describe the desired outcome of each of the goals. The full list of goals, objectives, and performance measures for the Reds Meadow Valley transportation study is provided in Table 4-1 and Table 4-2. A description of these performance measures is provided below:

GOAL 1:	**PROVIDE A SAFE MEANS FOR VISITORS TO ACCESS THE RESOURCE**
OBJ 1.1:	**Maintain or Reduce Number of Vehicles Passing Each Other in the Same Direction on the Single-Lane Road Compared with the Existing Service (2005)**
PM 1.1.1:	**Number of Vehicles Passing Other Vehicles per Day in the Same Direction on the Single-Lane Road** On occasion, motorists overtake other vehicles driving in the same direction on the single-lane road. While this behavior may be safe on some roadways, may be unsafe on the single-lane road due to the curvature of the roadway, which may make it difficult to see oncoming vehicles. This problem is exacerbated by the narrowness of the roadway. The methodology used to evaluate this performance measure is discussed in Appendix E.
OBJ 1.2:	**Maintain or Reduce Existing Number of Vehicles Passing Each Other in the Opposite Direction on the Single-Lane Road Compared with the Existing Service (2005)**
PM 1.2.1:	**Number of Vehicles Passing Other Vehicles per Day in the Opposite Direction on the Single-Lane Road** Due to the narrowness of the single-lane roadway, every time vehicles pass each other in the opposing direction there is the potential for a crash. While to the knowledge of the consultant team there is no empirical evidence quantifying the likelihood of a crash when vehicles are permitted to travel in both directions on a single lane, it is hypothesized that the use of a single lane might lead to crashes. The methodology used to evaluate this performance measure is discussed in Appendix F.

GOAL 2: REDUCE RESOURCE DAMAGE DUE TO VEHICLES PARKING IN AREAS NOT DESIGNATED FOR PARKING

OBJ 2.1: Eliminate Vehicles Parking in Areas not Designated for Parking

PM 2.1.1: Maximum Number of Vehicles Parked in Areas Not Designated for Parking per Day at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

If the number of vehicles in Reds Meadow Valley is high enough, parking shortages will occur and many motorists will park in areas not designated for parking, damaging flora and sensitive soils. The purpose of this performance is to measure the effectiveness of alternatives in eliminating vehicles parking in areas not designated for parking. The methodology used to evaluate this performance measure is discussed in Appendix G.

PM 2.1.2: Maximum Percent of Vehicles Parked in Areas Not Designated for Parking per Day at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

The purpose (and methodology) of this performance measure is the same as PM 2.1.1.

OBJ 2.2: Vehicles Will Only Park in Areas Designated for Parking Except on the Twelve Busiest Days of the Year[3]

PM 2.2.1: Number of Days per Year when Vehicles Park in Areas Not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

This performance measure quantifies the number of days per year when visitors park in areas not designated for parking. The methodology used to evaluate this performance measure is discussed in Appendix G.

PM 2.2.2: Percent of Days per Year when Vehicles Park in Areas Not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

This performance measure quantifies the percent of days per year when visitors park in areas not designated for parking. The methodology used to evaluate this performance measure is discussed in Appendix G.

OBJ 2.3: No Net Increase in Footprint

PM 2.3.1: Footprint of Additional Infrastructure (acres)

The performance measure quantifies the footprint of additional infrastructure, such as the acres of land that would need to be cleared.

[3] The twelve busiest days of the year refer to those days with the highest visitation. As the 2005 season was 122 days, twelve days represents 10% of the season.

GOAL 3: PROVIDE LOW COST, SUSTAINABLE TRANSPORTATION ACCESS TO THE REDS MEADOW VALLEY

OBJ 3.1: Maintain the Real Existing Cost per Visitor (2007 dollars)

PM 3.1.1: Fee per Visitor (2007 dollars)

This performance measure quantifies the average cost per visitor to enter Reds Meadow Valley. The methodology used to evaluate this performance measure is discussed in Appendix I.

OBJ 3.2: Maintain Existing Transportation Costs (2007 dollars)

PM 3.2.1: Capital Costs (2007 dollars)

Capital costs represent one-time costs, such as purchasing shuttles or gravel for parking lots. The methodology used to evaluate this performance measure is discussed in Appendix I.

PM 3.2.2: Operating Costs (2007 dollars)

Operating costs represent reoccurring costs, such as labor and fuel. The methodology used to evaluate this performance measure is discussed in Appendix I.

PM 3.2.3: Life Cycle Costs (2007 dollars)

The purpose of this performance measure is to evaluate the extent to which the transportation system is financially sustainable, taking into account that capital costs are amortized over a 20-year period. The methodology used to evaluate this performance measure is discussed in Appendix I.

OBJ 3.3: Eliminate Subsidy Required to Pay Transportation Costs

PM 3.3.1: Annual Revenue minus Annual Operating Costs (2005 dollars)

The purpose of this performance measure is to evaluate the extent to which the transportation system is financially sustainable, based on whether revenue exceeds operating costs. The methodology used to evaluate this performance measure is discussed in Appendix I.

GOAL 4:	**MAXIMIZE VISITOR EXPERIENCE WHILE TRAVELING IN THE REDS MEADOW VALLEY**
OBJ 4.1:	**Provide Orientation Services to All Visitors**
PM 4.1.1:	**Percent of Visitors that have Access to Orientation Services** The purpose of this performance measure is to improve the visitor experience by orienting visitors to Reds Meadow Valley.
OBJ 4.2:	**Provide Interpretation Services to All Visitors**
PM 4.2.1:	**Percent of Visitors that have Access to Interpretive Services** The purpose of this performance measure is to improve the visitor experience by providing visitors with interpretive programs about Reds Meadow Valley.
OBJ 4.3:	**Maintain or Reduce Delay to Visitors Compared to the Existing Service**
PM 4.3.1:	**Reduction in Average Delay per Visitor Compared to the Existing Service** This performance measure evaluates the effectiveness of each alternative in maintaining or reducing travel time, compared to the existing service. The methodology used to evaluate this performance measure is discussed in Appendix J.
PM 4.3.2:	**Number of Days per Year When Reduction in Average Delay per Visitor Compared to the Existing Service Exceeds 30 Minutes** The purpose (and methodology) of this performance measure is the same as PM 4.3.1.
PM 4.3.3:	**Percent of Days per Year When Reduction in Average Delay per Visitor Compared to the Existing Service Exceeds 30 Minutes** The purpose (and methodology) of this performance measure is the same as PM 4.3.1.
OBJ 4.4:	**If a Shuttle Service is Provided, Standing on the Shuttle Will Not Occur Except on the Twelve Busiest Days of the Year[4]**
PM 4.4.1:	**Percent of Passengers per Day that Stand on the Shuttle** Estimating the percent of passengers standing on the Reds Meadow Shuttle is one way to measure the visitor experience. Standing on the shuttle detracts from the visitor experience in two ways. First, standing is a less comfortable means of travel than sitting, especially for long periods.

[4] The twelve busiest days of the year refer to those days with the highest visitation. As the 2005 season was 122 days, twelve days represents 10% of the season.

Second, standing makes it difficult for passengers to view resources in Reds Meadow Valley. The methodology used to evaluate this performance measure is discussed in Appendix K.

PM 4.4.2: Number of Days per Year when Passengers Stand on Shuttle (when Shuttle is Operational)

Estimating the number of days per year when shuttle passengers must stand is another way to measure the visitor experience. Standing on the shuttle detracts from the visitor experience in two ways, as described in PM 4.4.1. The methodology used to evaluate this performance measure is discussed in Appendix K.

PM 4.4.3: Percent of Days per Year (when Shuttle is Operational) that Passengers Stand on Shuttle

Estimating the percent of days per year when shuttle passengers must stand is another way to measure the visitor experience. Standing on the shuttle detracts from the visitor experience in two ways, as described in PM 4.4.1. The methodology used to evaluate this performance measure is discussed in Appendix K.

OBJ 4.5: Maximize Number Visitors Reds Meadow Valley without Causing Visitors to Park in Areas Not Designated for Parking

PM 4.5.1: Number of Visitors to Reds Meadow Valley without Causing Visitors to Park in Areas Not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

This performance measure evaluates the number of existing visitors to Reds Meadow Valley that could be admitted without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. The methodology used to evaluate this performance measure is discussed in Appendix C.

PM 4.5.2: Number of Days per Year when Visitors Park in Areas Not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

This performance measure quantifies the number of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. The methodology used to evaluate this performance measure is discussed in Appendix G.

PM 4.5.3: Percent of Days per Year when Visitors Park in Areas Not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

This performance measure quantifies the percent of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. The methodology used to evaluate this performance measure is discussed in Appendix G.

Table 4-1: Goals, Objectives, and Performance Measures

Goal	Objective		Performance Measure	
1. Provide a safe means for visitors to access the resource	1.1	Maintain or reduce number of vehicles passing each other in the same direction on the single-lane road compared with the existing service (2005)	1.1.1	Number of vehicles passing other vehicles per day in the same direction on the single-lane road
	1.2	Maintain or reduce existing number of vehicles passing each other in the opposite direction on the single-lane road compared with the existing service (2005)	1.2.1	Number of vehicles passing other vehicles per day in the opposite direction on the single-lane road
2. Reduce resource damage due to vehicles parked in areas not designated for parking	2.1	Eliminate vehicles parking in areas not designated for parking	2.1.1	Maximum number of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
			2.1.2	Maximum percent of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
	2.2	Vehicles will only park in areas designated for parking except on the twelve busiest days of the year	2.2.1	Number of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
			2.2.2	Percent of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
	2.3	No net increase in footprint	2.3.1	Footprint of additional infrastructure (number of trees to be removed and sq ft of land to be affected)
3. Provide low cost, sustainable transportation access to the Reds Meadow Valley	3.1	Maintain existing real user cost per visitor (2007 dollars)	3.1.1	Fee per visitor (2007 dollars)
	3.2	Maintain existing transportation costs (2007 dollars)	3.2.1	Capital costs (2007 dollars)
			3.2.2	Operating costs (2007 dollars)
			3.2.3	Life cycle costs (2007 dollars)
	3.3	Eliminate subsidy required to pay transportation costs	3.3.1	Annual revenue minus annual operating costs (2007 dollars)

Table 4-2: Goals, Objectives, and Performance Measures (continued)

Goal	Objective	Performance Measure
4. Maximize visitor experience while traveling in the Reds Meadow Valley	4.1 Provide orientation services to all visitors	4.1.1 Percent of visitors that have access to orientation services
	4.2 Provide interpretive services to all visitors	4.2.1 Percent of visitors that have access to interpretive services
	4.3 Maintain or reduce delay to visitors compared to the existing service	4.3.1 Reduction in average delay per visitor compared to the existing service (minutes)
		4.3.2 Number of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes
		4.3.3 Percent of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes
	4.4 If a shuttle service is provided, standing on the shuttle will not occur except on the twelve busiest says of the year	4.4.1 Percent of passengers per day that stand on the shuttle
		4.4.2 Number of days per year (when shuttle is operational) that passengers stand on shuttle
		4.4.3 Percent of days per year (when shuttle is operational) that passengers stand on shuttle
	4.5 Maximize number visitors Reds Meadow Valley without causing visitors to park in areas not designated for parking	4.5.1 Number of visitors to Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
		4.5.2 Number of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort
		4.5.3 Percent of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

5. Data Collection

After identifying the goals, objectives, and performance measures of the study, the next step was to collect data. Data are useful in identifying the extent of the problem, as well as serving as a baseline for evaluating the effectiveness of implemented strategies. As Figure 5-1 shows, collecting data is just one of several steps in the data collection process. Substantial preparation is required before data collection can begin, and follow up work is needed once the data have been collected. The steps in the data collection process include developing a data collection plan, collecting data, processing the data, and preparing a report that documents the findings.

Figure 5-1: Data Collection Process

5.1. Data Collection Plan

A successful data collection effort requires considerable planning and begins well in advance of the actual data collection. Detailed planning for data collection is essential to successfully obtain accurate and useful data, which in turn is critical to conduct a successful transportation study. This section details the components included in the data collection plan:

- Identify data needs
- Determine data collection concept
- Develop logistical plan
- Design survey

5.1.1. Data Needs

Data needs are a direct result of the goals, objectives, and performance measures discussed in Section 4. Determining goals, objectives, and performance measures in advance enables the data collection process to be more efficient, by deciding ahead of time which data are necessary to collect. The availability and reliability of data influences the quality of the decision-making process. While there is an abundance of data that could be collected as part of a planning study, funding constraints usually force planners to collect only the most important data. The data required to derive the performance measures developed in Section 4 were identified and are shown in Appendix A. The table in Appendix A indicates which data were already in existence and which data needed to be collected.

5.1.2. Data Collection Concept

Once a list of data needs was developed, the consultant team created a diagram of the study area to illustrate locations where data would be collected (see Figure 5-2). This diagram not only assisted the team in determining how to efficiently and effectively conduct the data collection effort, but was also instrumental in conveying the staffing needs to the NPS and Forest Service. The diagram in Figure 5-2 provides a simplified illustration of the study area. Two-lane roads are shown by solid lines while single-lane roads are shown by dashed lines. The location of data collectors is illustrated by a stick figure in a box. The data that each data collector recorded is also shown. Major destinations are labeled with a solid square, while locations where data were to be collected as time permitted are labeled with dots.

5.1.3. Logistical Plan

Once the data needs, data collection methods, and the survey techniques are determined, it is important to develop a logistical plan for collecting data. This plan indicates staffing

requirements and the specific tasks that each staff member will perform. It also indicates the equipment that is necessary and the field sheets that will be used to record data.

For each location where data was to be collected, the logistical plan identifies the date, time, and location of the data collection, as well as the data that was to be collected and the equipment that needed to be provided. The logistical plan is shown in Table 5-1.

Figure 5-2: Reds Meadow/Devils Postpile Data Collection Diagram

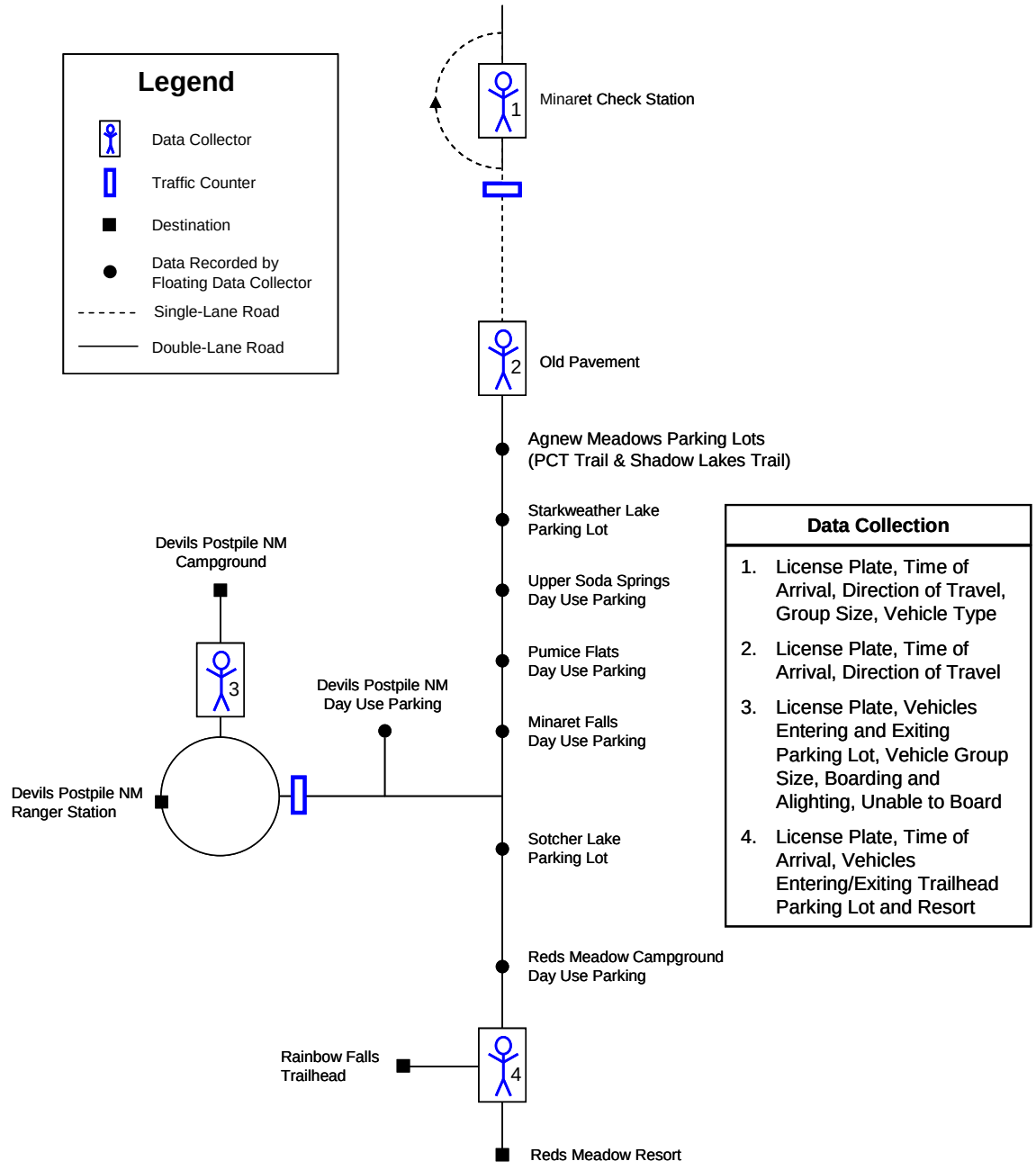


Table 5-1: Logistical Plan

Data		Minaret Check Station	Old Pavement	Devils Postpile NM	Rainbow Falls Trailhead Parking Lot	Other Parking Lots (1)	Shuttle Stops	License Plates of Campers (2)	Orientation Tallies (3)
Date					August 4, 2005 to August 7, 2005				
Time		7:00 am to 8:00 pm	9:45 am to 5:00 pm and 6:00 pm to 8:30 pm	7:00 am to 8:00 pm	7:30 am to 8:00 pm	Every 60 minutes or as time permits	7:00 am to 8:00 pm	6:00 AM	7:00 am to 8:00 pm
Data	License plate at start of day			X	X			X	
	License plate	X	X	X	X				
	Shuttle #	X	X	X	X		X		
	Vehicle arrival time in queue	X							
	Vehicle arrival time	X	X	X	X				
	# of vehicles in parking lot					X			
	Direction of travel	X	X	X	X				
	Persons per vehicle	X		X					
	Vehicle type	X							
	# of boardings/alightings			X	X		X		
	# of people unable to board			X	X		X		
	# of complaints								X
	# of questions								X
Equipment	Field sheets (# of copies)	50	50	50	50	5	50	5	50
	Stop watch (to record time)	X	X	X	X	X		X	X
	Pens	X	X	X	X	X		X	X
	Clipboard	X	X	X	X	X		X	
	Chair	X	X	X	X				
	Reflective Vest	X	X	X	X				
	Water	X	X	X	X				

(1) Locations: PCT Trailhead parking lot, Shadow Lakes trailhead parking lot, Starkweather Lake parking lot, Minaret Falls parking lot, Upper Soda Springs parking lot, Pumice Flat parking lot, Pumice Flat Campground parking lot, Devils Postpile NM Overnight Hikers Parking lot, Reds Meadow Campground parking lot

(2) Locations: Minaret Falls Campground, Upper Soda Springs Campground, Pumice Flat Campground, Devils Postpile NM Campground, Reds Meadow Campground, Reds Meadow Resort

(3) Locations: Mammoth Mountain Visitor Center, Adventure Center, Minaret Vista Entrance Station, Devils Postpile NM Ranger Station

5.1.4. Staffing Plan

Finally, a staffing schedule was developed. An example of the staffing plan used on Thursday, August 4, 2005 is provided in Table 5-2. For each staff member, the staffing plan identifies their data collection location, the data collection time period, and the total number of hours they were assigned to collect data. In addition, an arrival time and location for their first shift of the day were also included.

5.1.5. Field Sheets

Fields sheets were prepared for data collection at each location and are shown in Appendix L. The type of data collected for each location is summarized below:

- **Minaret Check Station Field Sheet** – records vehicle license plate number or shuttle number, time of arrival at the check station, direction of travel, party size, queue delay, and vehicle type
- **Minaret Check Station Queue Data Field Sheet** – records vehicle license plate number or shuttle number and time vehicle entered the queue at the check station
- **Old Pavement Field Sheet** – records vehicle license plate number or shuttle number, time of arrival at Old Pavement
- **Devils Postpile NM Field Sheet** – records vehicle license plate number, time of arrival or departure, party size, and whether the vehicle entered or exited the Devils Postpile campground
- **Reds Meadow Resort/Rainbow Falls Trailhead Field Sheet** – records vehicle license plate number, time of arrival or departure, and whether vehicle entered or exited Reds Meadow Resort or Rainbow Falls trailhead parking lot
- **Shuttle On/Off Count Field Sheet** – records the number of passengers that board and alight at each shuttle stop, the number of passengers unable to board
- **Minor Parking Lot Field Sheet** – records the number of vehicles at eight minor parking lots
- **Agnew Meadows Parking Lot Field Sheet** – records the license plate of each vehicle parked at 6:00 am
- **Devils Postpile NM Parking Lot Field Sheet** – records the license plate of each vehicle parked at 6:00 am
- **Reds Meadow Parking Lot Field Sheet** – records the license plate of each vehicle parked at 6:00 am
- **Rainbow Falls Trailhead Parking Lot Field Sheet** – records the license plate of each vehicle parked at 6:00 am
- **Campground Parking Lot Field Sheet** – records the license plates of vehicles parked at seven campgrounds at 6:00 am
- **Mammoth Mountain Visitor Center Field Sheet** – records the number of questions and complaints received
- **Adventure Center Field Sheet** – records the number of questions and complaints received

- **Minaret Check Station Field Sheet** – records the number of questions and complaints received
- **Devils Postpile NM Ranger Station Field Sheet** – records the number of questions and complaints received

Table 5-2: Staffing Plan for Thursday, August 4, 2005

Person	Arrival Time & Location	Shift	Minor Parking Lots		Minaret Check Station		Old Pavement		Devils Postpile NM		Rainbow Falls Trailhead		Hours	
			Start	End	Start	End	Start	End	Start	End	Start	End	Shift	Total
Melissa	10:45:00 AM Devils Postpile	1					11:00	13:30					**2:30**	
		2							15:00	18:00			**3:00**	**7:00**
		3					19:00	20:30					**1:30**	
Scott S.	7:15:00 AM Devils Postpile	1							7:30	9:15			**1:45**	
		2					9:45	11:00					**1:15**	**7:00**
		3							12:00	14:00			**2:00**	
		4					15:00	17:00					**2:00**	
Megan	10:45:00 AM Devils Postpile	1									11:00	13:00	**2:00**	
		2							14:00	15:00			**1:00**	**3:00**
		3											**0:00**	
Christy	1:15:00 PM Devils Postpile	1					13:30	15:00					**1:30**	
		2									16:00	17:30	**1:30**	**5:30**
		3							18:00	20:30			**2:30**	
Bobby	12:45:00 PM Devils Postpile	1									13:00	16:00	**3:00**	
		2									17:30	20:30	**3:00**	**3:00**
		3											**0:00**	
Lauren	9:00:00 AM Devils Postpile	1							9:15	12:00			**2:45**	
		2											**0:00**	**2:45**
		3											**0:00**	
Scott F.	6:45:00 AM Minaret Check Station	1			7:00	9:00							**2:00**	
		2			9:30	11:00							**1:30**	**3:30**
		3											**0:00**	
Entrance Station Employee	Already at Minaret Check Station	1			12:00	15:00							**3:00**	
		2											**0:00**	**3:00**
		3											**0:00**	
Joe	Rainbow Falls Trailhead	1									7:30	11:00	**3:30**	
		2											**0:00**	**8:00**
		3	16:00	20:30									**4:30**	
Kris	Devils Postpile	1	6:45	11:00									**4:15**	
		2			11:00	16:00							**5:00**	**9:15**
		3											**0:00**	
Dave	Minaret Check Station	1			9:00	9:30							**0:30**	
		2	11:00	16:00									**5:00**	**10:00**
		3			16:00	20:30							**4:30**	
Site Hours			**13:45**		**13:00**		**8:45**		**13:00**		**13:00**			

5.2. Data Collection

Data was collected between August 4 and August 7, 2005 by two consultants, a transportation scholar working for Devils Postpile NM, and several park rangers, between 6:45 am and 8:30 pm. There were two notable problems that were encountered during the data collection period. The biggest problem was poor weather conditions on Friday, Saturday, and Sunday afternoons. While the weather certainly affected travel patterns on each of these days, based on comparisons with visitation from 2004, the number of visitors to Reds Meadow Valley on each day was not substantially reduced. However, on Sunday the travel patterns appear to be substantially affected, with a mass exodus of visitors from the park during the afternoon. As a result, data collected on Sunday was only considered in certain situations. In addition, there were several downpours in the study area on Friday, Saturday, and Sunday. At other locations, which included Rainbow Falls trailhead and Devils Postpile NM, data was not collected for short intervals due to downpours and lightning.

The second major problem concerned vehicle counts at the Devils Postpile NM parking lot. On Friday, August 5, 2007 (Day 2), the consultant team realized that the data collectors were erroneously counting vehicles that drove through the parking lot to get to and from Devils Postpile NM campground, in addition to the vehicles parking in the Devils Postpile NM parking lot, resulting in an overestimation of vehicle accumulation at the parking lot. The field sheets were revised by noon on Friday, and the data collectors were immediately advised of the changes. During the data processing task, all vehicles that were identified as campers were removed from the count of vehicles that parked in the Devils Postpile NM parking lot.

Due to a shortage of staff, data was not collected at the Old Pavement location during the entire study period. This problem was addressed by generating vehicle counts based on vehicles observed entering and exiting the Minaret Check Station, which can be considered a reasonable proxy for the missing Old Pavement data.

5.3. Data Collection Problems

Several data collection problems were encountered. First, daily visitation data collected by NPS and the Forest Service throughout the 2005 season was incomplete and at times inaccurate. Because large-scale data collection efforts such as this only take place over a few days, conditions throughout the season must be extrapolated based on daily

visitation. Therefore, it was necessary for the consultants to correct differences in daily visitation data and impute missing data.

Visitation tallies at Minaret Check Station are comprised of passengers riding the Reds Meadow Shuttle, auto visitors, and visitors in charter buses. While comprehensive data was available for the number of persons entering Reds Meadow Valley at Minaret Check Station by shuttle and charter bus, auto visitation was incomplete. In Reds Meadow Valley, auto visitation is recorded by pneumonic tubes placed just beyond the Minaret Check Station. Tube contacts record the number of vehicles that both enter and exit Reds Meadow Valley. After subtracting trips made by the Reds Meadow Shuttle, the counts are divided by two to reflect only those vehicles entering Reds Meadow Valley. These vehicle counts are then multiplied by 2.4 persons per vehicle to estimate daily visitation in private vehicles.

Several problems affected the quality of the data at this location. First, pneumonic tubes are known to sometimes be inaccurate at counting vehicles, particularly when the tubes stretch over long distances. The tube at Minaret Check Station is approximately 100 feet long. Second, during the 2005 season, several days of pneumonic tube counts were not recorded – especially at the beginning and end of the season. Third, on several days the pneumonic tube counts were not reset, making it difficult to determine daily visitation. Appendix B discusses methods used to adjust for inaccurate or missing data.

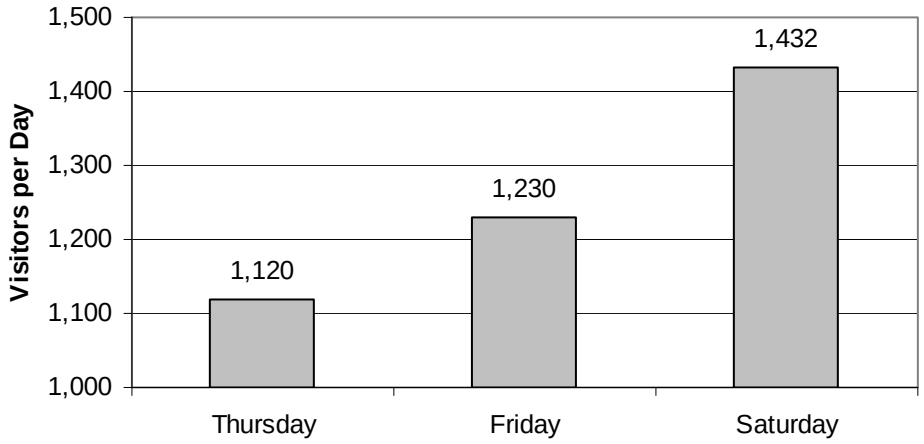
6. Data Analysis

The consultant team analyzed the data collected between August 4 and August 7, 2005. The data was used to summarize travel patterns during the four-day study period. These results are documented in this section. Second, the data was used to derive the performance measure identified in Section 4. It extrapolates trends for the entire 2005 season based on the results recorded during the four-day study and therefore serves as the baseline for evaluating the alternatives described in Section 7.

6.1. Travel Patterns

Between 7:00 am and 8:00 pm during the study period, visitation ranged from 1,120 persons on Thursday to 1,432 persons on Saturday (Figure 6-1).

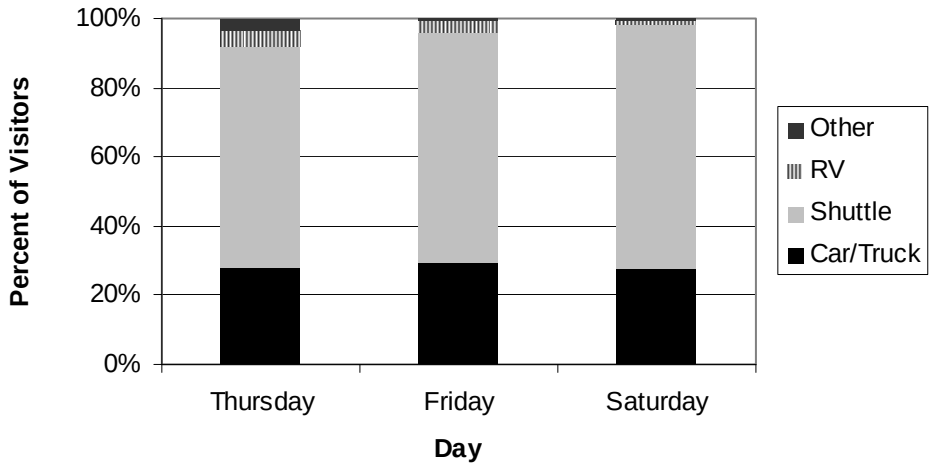
Figure 6-1: Daily Visitation



As noted above, access to Reds Meadow Valley is provided by a mandatory shuttle service that begins at the Mammoth Mountain Ski Area and circulates throughout the Reds Meadow Valley. Visitors park at the Mammoth Mountain Ski Area parking lot where they can purchase tickets for the shuttle. Exemptions allow some users to enter by private vehicle, including those with overnight accommodations, persons with boats, and persons with disabilities[5]. Overall, nearly two-thirds of visitors to Reds Meadow Valley entered the area via the shuttle during the three-day data collection period. Twenty-nine percent of visitors entered the area in a car or truck, while 3% entered in a RV and 1% entered on a charter bus (see Figure 6-2).

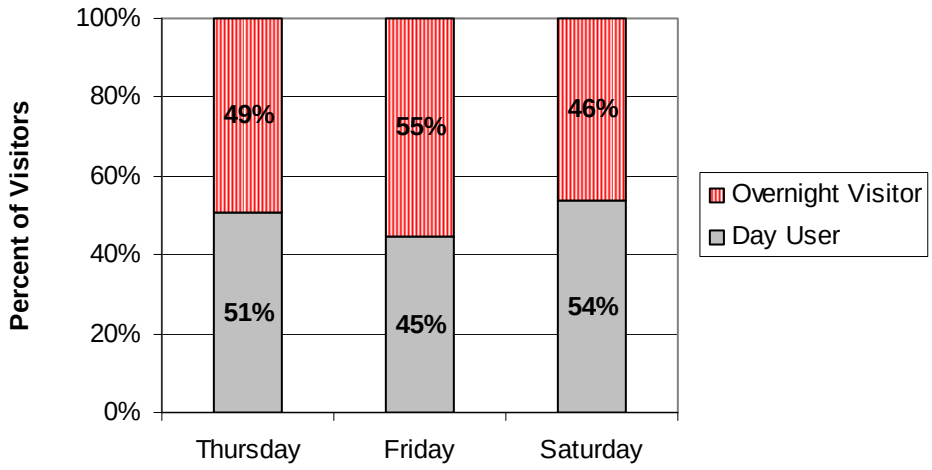
[5] Forest Service staff indicates that motorists often enter Reds Meadow Valley by exploiting exemptions to mandatory shuttle use. In particular, some visitors attach a boat to their vehicles, which qualifies them for one of the exemptions, but the boat is never used.

Figure 6-2: Mode Split[6]



Of those motorists that enter Reds Meadow Valley by private vehicle, on average 49% are day users and 51% are overnight visitors (Figure 6-3).

Figure 6-3: Visitor Trip Purpose at Minaret Check Station (Motorists Only)



6.2. Traffic

Figure 6-4 shows the number of vehicles that entered and exited Reds Meadow Valley at Minaret Check Station between 7:00 am and 8:00 pm, on Saturday, August 6, 2005. Consistently during the four-day study period the number of vehicles leaving the Reds Meadow Valley exceeded the number entering the area. This could have been a result of several factors. First, many visitors may arrive early in the week, staying several days and

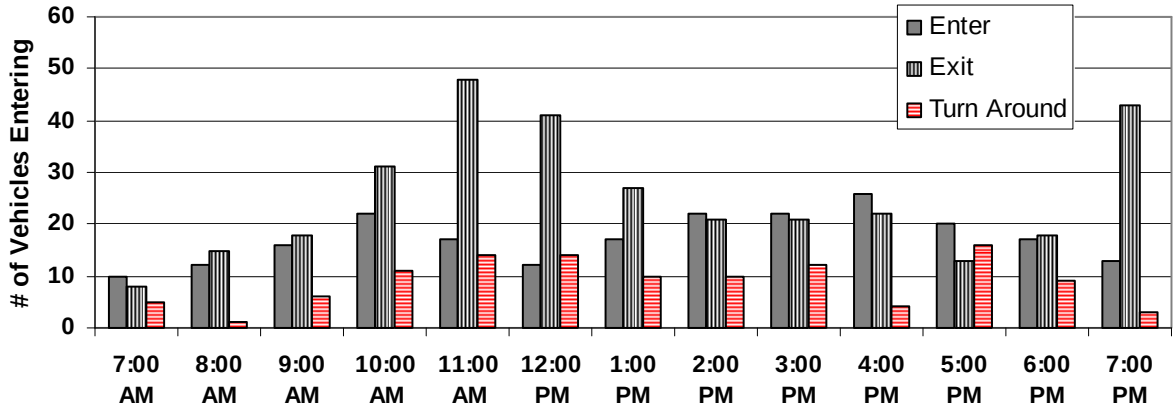
[6] Mode split only includes visitors traveling by motorized vehicle.

then leaving later in the week. Second, since the check station is unmanned between 8:00 pm and 7:00 am, but vehicle access is permitted, many visitors arrive after hours to avoid paying the transportation fee. The number of vehicles entering Reds Meadow Valley during this period likely exceeds the number of vehicles exiting the area during this time period.

On Saturday, the number of vehicles entering Reds Meadow Valley peaks twice during the day: between 9:00 am and 10:00 am there is a small peak in private vehicles entering Reds Meadow Valley, while a larger peak occurs between 4:00 am and 5:00 pm (see Figure 6-4). Over 40% of private vehicles enter Reds Meadow Valley after 3:00 pm. This is likely because campers are exempt from using the shuttle. Overall, there are a greater number of private vehicles exiting Reds Meadow Valley than entering. There are two peaks in private vehicles exiting Reds Meadow Valley. Between 11:00 am and 12:00 pm nearly 50 private vehicles exited Reds Meadow Valley, while between 7:00 pm and 8:00 pm over 40 private vehicles exited the area.

Additionally, Figure 6-4 shows the number of vehicles that were forced to turn around at Minaret Check Station because they were not exempt from using the mandatory shuttle. Approximately 30% of motorists that arrive at Minaret Check Station in the inbound direction were required to turn around and take the shuttle. This may in part represent visitors who are unaware that there is a mandatory shuttle but may also represent visitors who are hoping (unsuccessfully) to avoid using the shuttle. The percentage of these visitors that ultimately choose to enter Reds Meadow Valley by the shuttle is unknown.

Figure 6-4: Vehicle Movements at Minaret Check Station (Saturday)



Those vehicles that entered Reds Meadow Valley by private vehicle carried on average 2.4 persons per vehicle (see Table 6-1). Compared with this average, a modal analysis shows that visitors traveling by RV tend to carry more persons per vehicle while commercial trucks and motorcyclists tend to carry fewer persons per vehicle. In particular, visitors by car or truck tend to have 2.4 persons per vehicle, RVs contain on

average more than 3.0 persons, and commercial trucks and motorcycles carry on average approximately 1.2 persons per vehicle.

Table 6-1: Persons per Vehicle at Minaret Check Station

	Day			
Vehicle Type	**Thursday**	**Friday**	**Saturday**	**Average**
Car/Truck	2.4	2.4	2.4	2.4
RV	3.1	3.0	2.7	3.0
Commercial Truck	1.3	1.0	--	1.2
Motorcycle	--	1.0	1.2	1.2
Total	2.5	2.4	2.3	2.4

The average number of persons per private vehicle entering Devils Postpile during the three-day study period was 2.4, which is the same average vehicle occupancy recorded at the Minaret Check Station (Table 6-3).

Table 6-2: Average Number of Persons per Vehicle Entering Devils Postpile NM Parking Lot

Day	**Average Persons per Vehicle**
Thursday	2.5
Friday	2.5
Saturday	2.2
Average	2.4

6.3. Parking

Parking accumulation studies were conducted at seven parking facilities: Agnew Meadows (Pacific Coast Trail [PCT] trailhead and Shadow Lakes trailhead), Starkweather Lake, Devils Postpile NM, Sotcher Lake, and Rainbow Falls trailhead. Since none of these parking lots are paved, the number of vehicles that can park in each lot depends on how motorists align their vehicles. Table 6-3 provides a low, high, and average estimate of the number of parking spaces available at these parking lots.

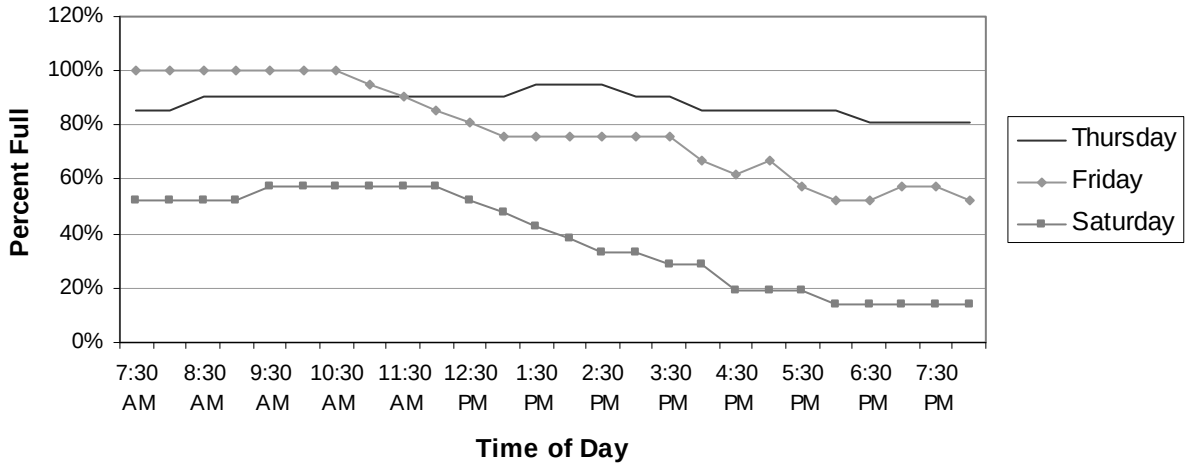
Table 6-3: Parking Lot Capacity

	Parking Spaces		
Parking Facility	**Low**	**High**	**Average**
Agnew Meadows (Shadow Lakes)	37	39	38
Agnew Meadows (PCT)	20	21	20
Starkweather Lake	12	16	14
Devils Postpile NM	56	64	60
Sotcher Lake	16	20	18
Rainbow Falls Trailhead	39	49	44
Reds Meadow Resort	24	28	26

The two parking facilities at Agnew Meadows, PCT trailhead and Shadow Lakes trailhead, experienced the greatest demand. This is probably a reflection of their proximity to several trailheads and the Agnew Meadows pac station, where visitors can take horseback riding trips. The activities that visitors engage in at these locations typically last several hours and reduce the number of vehicles that can park during the course of a day. It was estimated that the PCT parking lot could hold 20 or 21 vehicles, while the Shadow Lake parking lot could hold between 37 and 39 vehicles. Due to the nature of these parking lots, it was assumed that a parking facility was fully occupied if at least 90% of the average number of spaces were occupied.

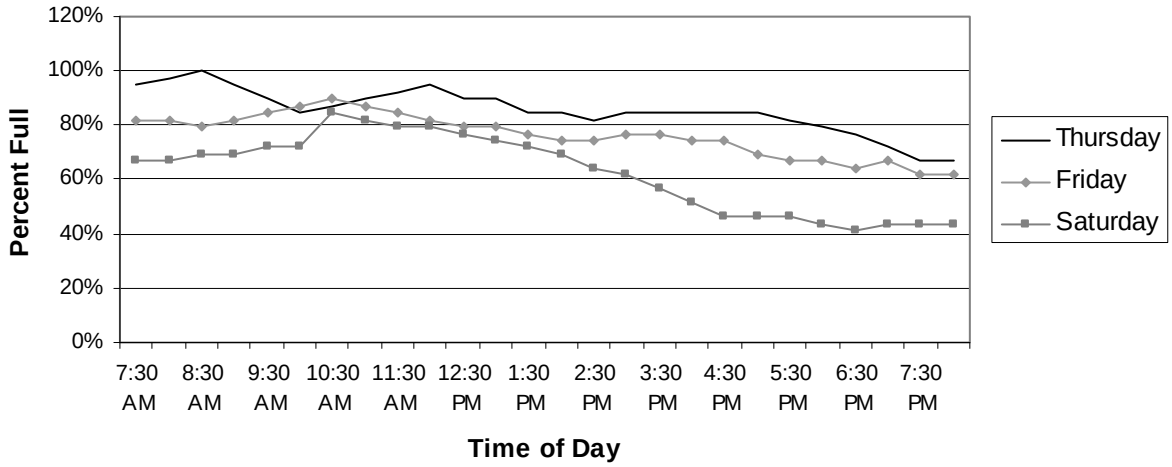
On both Thursday and Friday, the number of vehicles parked at the PCT trailhead exceeded 95%, indicating that they were full (see Figure 6-5). On Saturday they approached 60% of capacity. The steady drop in parked vehicles throughout the day is may be partially a reflection of poor weather conditions on these days. In addition, on both Thursday and Friday, the occupancy rate for the PCT trailhead parking lot exceeded 50% at 8:00 pm, which is likely due to visitors taking overnight hiking trips.

Figure 6-5: Parking Accumulation at Agnew Meadows (PCT Trailhead)



Similarly, parking demand at the Shadow Lakes trailhead reached 80% on all days, with over 40% of the parking spaces remaining occupied after 8:00 pm. During both Thursday and Friday, the parking facilities were full (at least 90% occupied) for several hours (Figure 6-6).

Figure 6-6: Parking Accumulation at Agnew Meadows (Shadow Lakes Trailhead)



Parking occupancy varies considerably at Starkweather Lake, which has approximately 14 parking spaces (Figure 6-7). However, only on one occasion did parking exceed 50% of capacity.

Figure 6-7: Parking Accumulation at Starkweather Lake

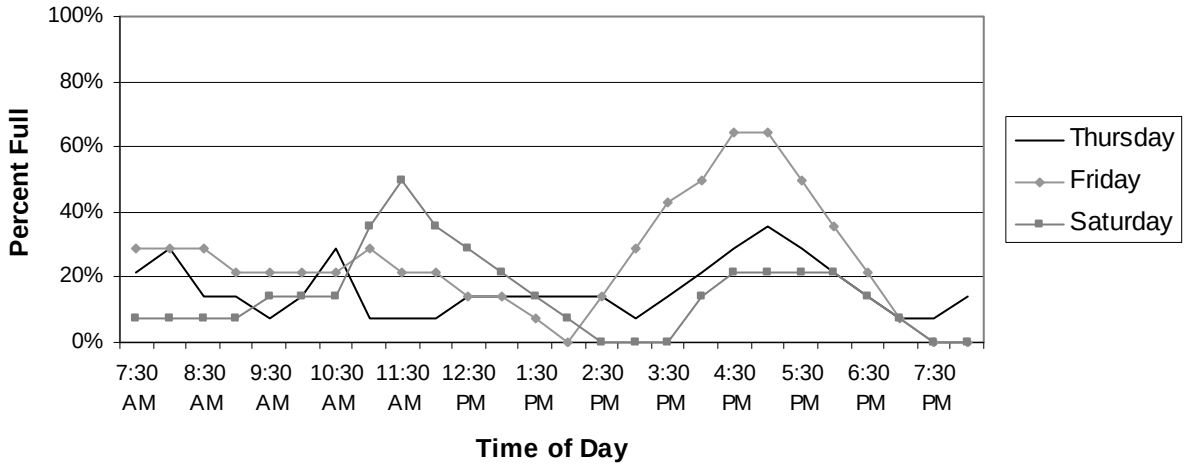
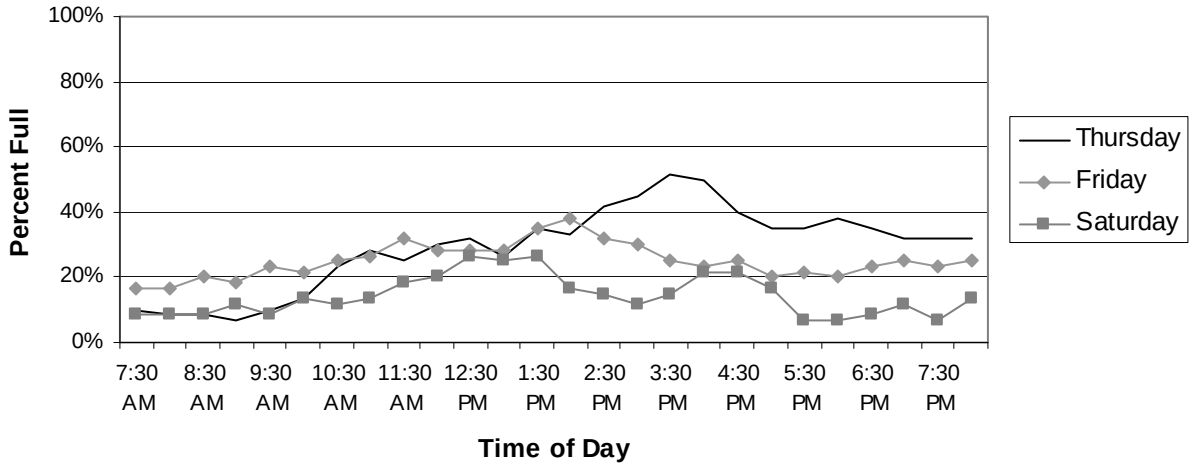


Figure 6-8 shows parking accumulation at the Devils Postpile NM parking lot, between Thursday and Saturday. Only on Thursday did parking accumulation exceed 50% of available spaces. On Friday and Saturday afternoons, cloudy skies and occasional showers may have reduced the number of motorists entering Reds Meadow Valley.

Figure 6-8: Parking Accumulation at Devils Postpile NM



Parking accumulation varies greatly throughout the day at Sotcher Lake (see Figure 6-9). Parking demand tends to be greatest in the early morning (above 40%) and drops during late morning, probably because fishermen tend to use the facility during the early morning hours. Parking demand was the greatest on Friday, when it reached 60% of capacity in the early morning and late afternoon.

Figure 6-9: Parking Accumulation at Sotcher Lake

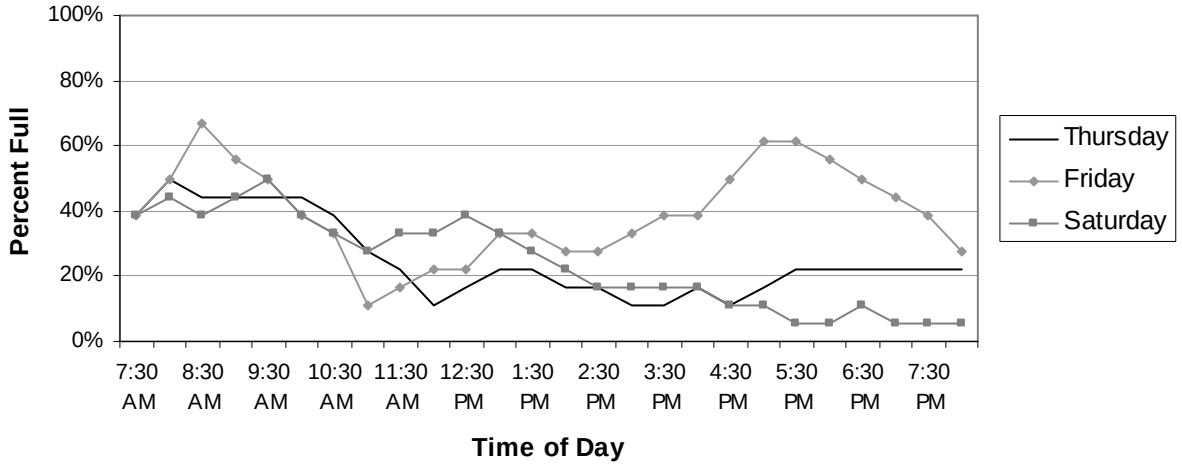
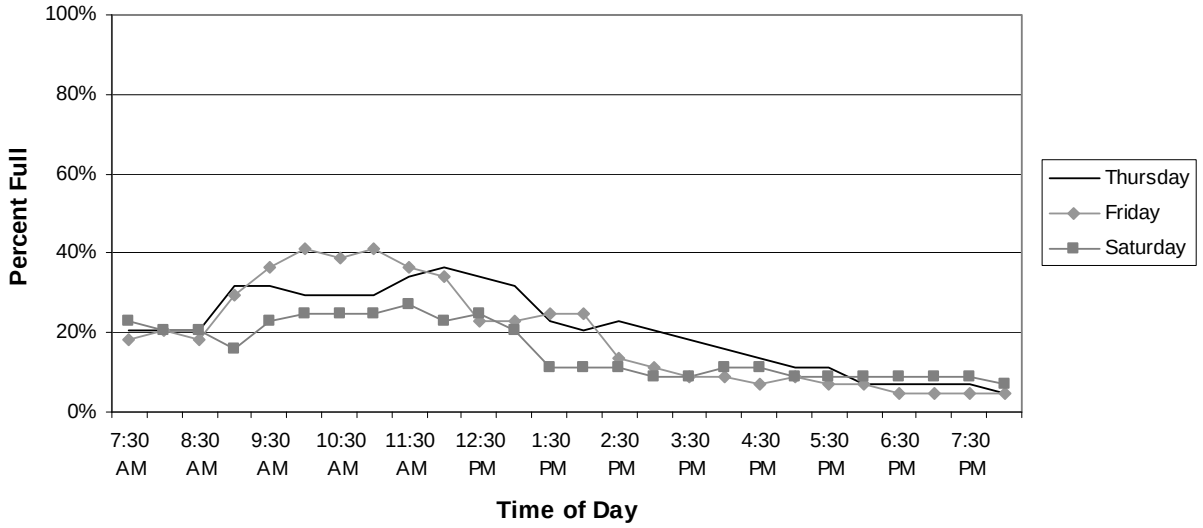


Figure 6-10 shows that parking at Rainbow Falls trailhead never exceeded 50% of capacity and falls steadily starting in the early afternoon. Few vehicles remain parked at the trailhead at 8:00 pm.

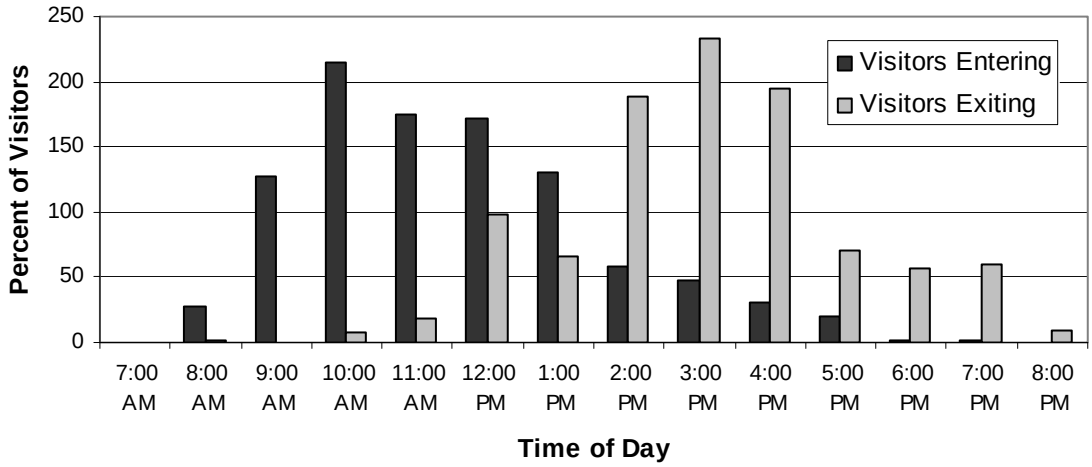
Figure 6-10: Parking Accumulation at Rainbow Falls Trailhead



6.4. Shuttle

The consultant team collected several types of data to evaluate operations of the Reds Meadow Shuttle. This includes the number of shuttle visitor entering and exiting at Minaret Check Station, boardings and alightings at each shuttle stop, average group size riding the shuttle and type travel times by the shuttle. The Adventure Center serves as the launching point for bringing visitors into Reds Meadow Valley on the Reds Meadow Shuttle. The total number of boardings and alightings at this shuttle stop therefore reflect the entering and exiting patterns for most people using the shuttle. Figure 6-11 shows the number of shuttle riders that entered and exited Reds Meadow Valley by time of day on Saturday, August 6, 2005. The number of shuttle visitors entering Reds Meadow Valley peaked in late morning (10:00 am to 11:00 am), when over 200 visitors entered Reds Meadow Valley on the shuttle. This is noticeably different from the travel patterns of visitors entering by private vehicle, shown previously in Figure 6-4. Visitors entering Reds Meadow Valley by private vehicle peaked during the late afternoon (3:00 pm to 4:00 pm). Exiting by the shuttle peaked between 3:00 pm and 4:00 pm, when over 230 visitors left Reds Meadow Valley.

Figure 6-11: Number of Shuttle Riders Entering & Exiting Park by Time of Day (Saturday)



The average group size for shuttle riders is 3.0 persons, which is 0.6 persons per group more than the average number of persons entering Reds Meadow Valley by private vehicle. Since the transportation fee for all visitors is $7 per adult ($4 per child) but for visitors by automobile that fee is capped at $20 per vehicle, the average cost to enter Reds Meadow Valley for a group on and Table 6-6 show the total number of boardings and alightings at each shuttle stop in the inbound and outbound directions. The data reveals that the major destinations for shuttle riders are the shuttle can exceed that of a group entering Reds Meadow Valley by private vehicle.

Table 6-4: Average Shuttle Group Size

Day	Average Group Size
Thursday	3.0
Friday	3.1
Saturday	3.0
Average	3.0

Table 6-5 and Table 6-6 show the total number of boardings and alightings at each shuttle stop in the inbound and outbound directions. The data reveals that the major destinations for shuttle riders are Devils Postpile NM and Reds Meadow Resort. Nearly 55% of boardings and alightings occur at Devils Postpile NM and 27% occur at Reds Meadow Resort. Minor destinations include Agnew Meadows (6.3%), Rainbow Falls trailhead (6.6%), Reds Meadow Campground (2.2%) and Sotcher Lake (1.1%). The remaining stops account for only 2.1% of all boardings and alightings.

If all passengers got on and off the shuttle at the same shuttle stop, the sum of boardings in the inbound and outbound direction would equal the sum of alightings in the inbound and outbound direction. However, there are substantially more boardings at Rainbow Falls trailhead/Reds Meadow Resort (1,732) than alightings (691) over the three-day

period. Conversely, at Devils Postpile NM there are substantially more alightings (2,455) than boardings (1,477). It is likely that approximately 45% of visitors that get off the shuttle at Devils Postpile NM then walk to Rainbow Falls trailhead/Reds Meadow Resort, possibly stopping at Rainbow Falls on the way.

Table 6-5: Number of Boardings and Alightings (Inbound Direction)

	Thursday		Friday		Saturday		Total	
Bus Stop	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**
Mammoth Mountain	774	0	864	0	1005	0	2,643	0
Agnew Meadows	26	66	18	58	18	54	62	178
Starkweather Lake	6	0	7	0	11	2	24	2
Upper Soda Springs	10	13	0	0	5	0	15	13
Pumice Flat	0	1	0	7	0	4	0	12
Minaret Falls	2	3	0	0	0	2	2	5
Devils Postpile	137	587	171	723	240	852	548	2,162
Sotcher Lake	5	4	6	7	6	12	17	23
Reds Meadow Campground	12	18	1	22	0	24	13	64
Rainbow Falls Trailhead	27	105	60	40	50	104	137	249
Reds Meadow Resort	0	124	0	166	0	152	0	442
Total	999	921	1,127	1,023	1,335	1,206	3,461	3,150

Table 6-6: Number of Boardings and Alightings (Outbound Direction)

	Thursday		Friday		Saturday		Total	
Bus Stop	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**	**Board**	**Alight**
Mammoth Mountain	0	774	0	864	0	1,005	0	2,643
Agnew Meadows	40	25	66	33	32	15	138	73
Starkweather Lake	0	2	0	0	5	0	5	2
Upper Soda Springs	7	4	0	0	4	8	11	12
Pumice Flat	5	6	0	7	0	0	5	13
Minaret Falls	3	3	21	0	0	2	24	5
Devils Postpile	317	92	245	69	367	132	929	293
Sotcher Lake	4	0	0	2	19	13	23	15
Reds Meadow Campground	17	13	10	8	24	6	51	27
Rainbow Falls Trailhead	19	0	20	0	50	0	89	0
Reds Meadow Resort	444	0	517	0	545	0	1,506	0
Total	856	919	879	983	1,046	1,181	2,781	3,083

6.5. Safety

Perhaps the greatest safety concern in Reds Meadow Valley is a 2.4-mile single-lane road between Minaret Check Station and just before Agnew Meadows. The steep descent to the valley floor is marked by sharp curves and precipitous drop offs. Adding to the safety concerns along this road is that it is the only road in and out of Reds Meadow Valley and is frequently used by large vehicles, including shuttles, tour buses, RVs, and commercial vehicles.

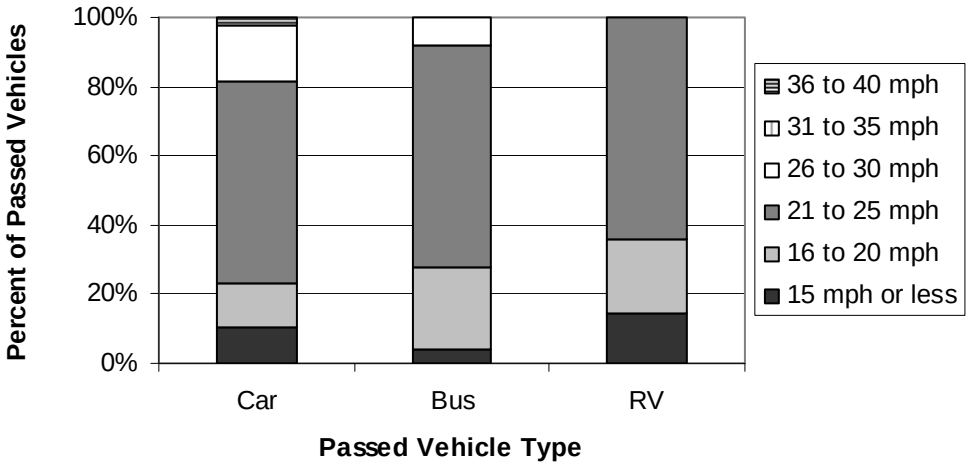
This section evaluates passing in the same direction, passing in the opposite direction, and speed on the single-lane road. Passing in the same direction occurs when one vehicle overtakes another vehicle from behind. While there are signs near both Minaret Check Station and Agnew Meadows that prohibit motorists from passing in the same direction, this behavior still occurs. Shuttle drivers report it is common that vehicles pass them from behind. Table 6-7 shows the number and percent of vehicles that passed zero, one, two, or three vehicles while traveling along the single-lane road in both directions. Overall, passing in the same direction is more common in the outbound direction, where 12% of all vehicles passed at least one vehicle. In the inbound direction, only 5% of vehicles passed at least one vehicle. One thing to note is that some of the vehicles passing in the same direction may be because one vehicle stopped at scenic vistas.

Table 6-7: Vehicles Passed in the Same Direction

	Inbound		Outbound		Total	
# of Passed Per Vehicle	**No.**	**%**	**No.**	**%**	**No.**	**%**
Passed 0 Vehicles	429	94.8%	558	90.0%	987	92.0%
Passed 1 or More Vehicles	24	5.2%	62	10.0%	86	8.0%
Total	452	100.0%	620	100.0%	1,073	100.0%

Figure 6-12 shows the speed that passing vehicles are traveling, by the type of vehicle that they pass. Cars tend to be passed at higher speeds than shuttles or RVs, most likely because they tend to travel at faster speeds.

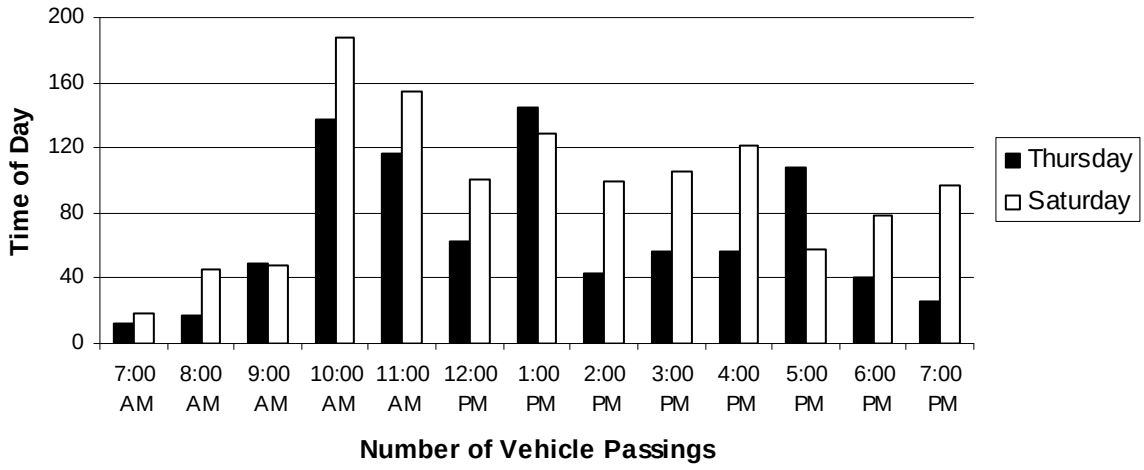
Figure 6-12: Speed Traveled by Passing Vehicle by Passed Vehicle Type



Passes in the opposing direction occur when vehicles entering the park and vehicles exiting Reds Meadow Valley meet on the single-land road. This is potentially a hazardous situation, due to the narrowness of the road and the width of larger vehicles. While vehicles traveling downhill are required to pull over to the side of the road to allow vehicles traveling uphill to pass, there remains a safety concern because many visitors are

either unaware of this or choose to ignore it[7]. In addition, in several sections the road is not wide enough to accommodate large vehicles (shuttles, tour buses, RVs, and commercial vehicles) traveling in opposing directions, creating a situation in which one of the vehicles must back up to allow the other to pass. Figure 6-13 shows the number of times vehicles passed each other in the opposing direction on the single-lane road on Thursday and Saturday. The highest number of passings during a one-hour period occurred between 10:00 am and 11:00 am on Saturday, when vehicles passed each other 188 times.

Figure 6-13: Number of Vehicle Passes in Opposite Direction



The posted speed limit on the single-lane road is 15 mph. To determine whether the speed limit was being followed, vehicle traveling speeds were recorded by radar gun at two locations: Pumice Wall and Falling Rock. At Pumice Wall, the road is straight to the south, while to the north it approaches a curve. Falling Rock is located between two blind curves, so visibility is limited. The average speed in both directions was higher at Pumice Flat (24.9 mph) than Falling Rock (21.3 mph). The safe travel speed is considered to be the 85th percentile speed on the roadway. The American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highways and Streets (2001) states that, "Posted speed limits, as a matter of policy, are not the highest speeds that might be used by drivers. Instead, such limits are usually set to approximate the 85th percentile speed of traffic as determined by measuring the speeds of a sizable sample of vehicles. The 85th-percentile speed is usually within the 'pace' or the 15-km/h (10-mph) speed range used by most drivers." Therefore, based on the 85th percentile speed, the highest speeds should be 30 mph at Pumice Flat and 25 mph at Falling Rock.

[7] Minaret Check Station staff typically inform motorists to pull over to the side of the road to allow vehicles traveling in the uphill direction to pass.

Table 6-8: Speed at Pumice Flat

	Speed by Direction (mph)		
	Downhill	**Uphill**	**Total**
Average	24.0	25.8	24.9
85th Percentile	30.0	30.0	30.0

Table 6-9: Speed at Falling Rock

	Speed by Direction (mph)		
	Downhill	**Uphill**	**Total**
Average	21.3	21.3	21.3
85th Percentile	25.9	24.0	25.0

The average speed on the single-lane road was 17.5 mph in the inbound (downhill) direction and 20.0 mph in the outbound (uphill) direction. Cars and trucks travel at an average speed of 19.4 mph in the inbound direction and 20.6 mph in the outbound direction. On average, cars and light trucks travel at a faster speed than shuttles and RVs.

Table 6-10: Average Speed on Single Lane Road

	Inbound		Outbound		Total	
Vehicle Type	**Mean**	**85th Pct**	**Mean**	**85th Pct**	**Mean**	**85th Pct**
Car/Truck	19.4	24.0	20.6	24.0	20.1	24.0
Shuttle	13.6	16.0	17.0	20.6	15.2	18.0
RV	13.5	16.0	18.8	20.6	16.2	20.6
Average	17.5	24.0	20.0	24.0	19.0	24.0

7. Existing Service (2005)

Currently, access to the Reds Meadow Valley is provided by a mandatory shuttle service. There are some exceptions that permit visitors to enter the area in a private vehicle, resulting in approximately two-thirds of visitors enter the area by shuttle. The Reds Meadow Shuttle service is contracted to California Cruisers, which provides all operating and maintenance functions. In addition, the contractor supplies all but one of the shuttle vehicles, which are refurbished "Blue Bird" model school buses with approximately 40 to 44 seats. These vehicles are not ADA compliant. An ADA compliant YARTS bus is used to transport persons with disabilities. The Reds Meadow Shuttle operates between mid-June to mid-September, though weather conditions can shorten the season. Service starts at 7:00 am, and the last shuttle returns at 8:30 pm. During the high season the shuttle runs on headways of 20 to 30 minutes while during the low season the shuttle runs on headways of 30 to 60 minutes.

The Forest Service manages the fee policy for Reds Meadow Valley. In 2005, the fee for adults was $7 per day, and for children ages 3 to 15 it was $4 per day. These fees remain the same in 2007. One exception is the "car cap," which limits the cost of entering Reds Meadow Valley by automobile to $20 per vehicle for groups that have overnight accommodations. For example, if five adults in one vehicle have camping reservations, rather than paying a transportation fee of $35 the transportation fee would be capped at $20. In addition, a three-day pass costs $14 per adult and a season pass costs $35 per adult. Fees are collected by Forest Service employees at the Adventure Center for persons entering Reds Meadow Valley by the shuttle and at the Minaret Check Station for person entering Reds Meadow Valley by automobile.

Visitor orientation and interpretation is limited to activities provided at the Mammoth Mountain Visitor Center and the Devils Postpile Ranger Station.

The performance measures for the existing service are derived in Table 7-1 and Table 7-2. The results of this analysis are for comparison with the alternatives in Section 9.

For Objective 1.1, which is to maintain or reduce the number of vehicles passing each other in the same direction on the single-lane road compared with the existing service (2005), the consultant team found that there was an average of 17 vehicles per day (maximum of 40 vehicles per day) passing other vehicles in the same direction on the single-lane road.

For Objective 1.2, which is to maintain or reduce the number of vehicles passing each other in the opposite direction on the single-lane road compared with the existing service (2005), the consultant team found that there was an average of 550 vehicles per day

(maximum of 1,600) passing other vehicles in the opposite direction on the single-lane road.

For Objective 2.1, which is to eliminate vehicles parking in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort, the consultant team found that there were no vehicles parked in areas not designated for parking.

For Objective 2.2, which is that vehicles will only park in areas designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort except on the twelve busiest days of the year, the consultant team found that there are no days in which vehicles parked in areas not designated for parking.

For Objective 2.3, which is to have a no net increase in the footprint required to implement the alterative, there is no increase in the footprint.

For Objective 3.1, which is to maintain the existing real user cost per visitor (2007 dollars), the consultant team found that the existing fee per visitor is $5.78.

For Objective 3.2, which is to maintain the existing transportation costs (2007 dollars), the consultant team found that there are no additional capital costs associated with the existing service. Operating costs are approximately $409,500 per year. Life cycle revenues are $2.0 million over a 20-year period.

For Objective 3.3, which is to eliminate the subsidy required to pay transportation costs, the consultant team found that net revenue under the existing service is $74,500.

For Objective 4.1, which is to provide orientation services to all visitors, the consultant team found that all visitors have access to orientation under the existing service.

For Objective 4.2, which is to provide interpretive services to all visitors, the consultant team found that there are no interpretive services under the existing service.

For Objective 4.3, which is to maintain or reduce delay to visitors compared to the existing service, the consultant team found that there is no reduction in delay.

For Objective 4.4, which is if a shuttle service is provided, standing on the shuttle will not occur except on the twelve busiest says of the year, the consultant team found that the percent of passengers per day that stand on the shuttle is 3.2% on average and a maximum of 14.6%. The consultant team also found that there are 25 days when passengers stand, which represents 26.3% of days that the shuttle is operational.

For Objective 4.5, which is to maximize number visitors Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort, the consultant team found that the number of visitors to Reds Meadow Valley without causing visitors to park in areas not designated for parking is 84,000. The consultant team also found that there are no days in the existing service when vehicles park in areas not designated for parking.

Table 7-1: Performance Measures Derived Existing Service

Performance Measure		Existing
1.1.1	Number of vehicles passing other vehicles per day in the same direction on the single-lane road	Average = 17 Maximum = 40
1.2.1	Number of vehicles passing other vehicles per day in the opposite direction on the single-lane road	Average = 550 Maximum = 1,600
2.1.1	Maximum number of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0
2.1.2	Maximum percent of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%
2.2.1	Number of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0
2.2.2	Percent of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0.0%
2.3.1	Footprint of additional infrastructure (acres)	Acres: 0.00
3.1.1	Fee per visitor (2007 dollars)	$5.78
3.2.1	Capital costs (2007 dollars)	n/a
3.2.2	Operating costs (2007 dollars)	$409,500
3.2.3	Life cycle costs (2007 dollars)	-$2,002,000
3.3.1	Annual revenue minus annual operating costs (2007 dollars)	$74,500

Table 7-2: Performance Measures Derived Existing Service (continued)

Performance Measure		Existing
4.1.1	Percent of visitors that have access to orientation services	100.0%
4.2.1	Percent of visitors that have access to interpretive services	0.0%
4.3.1	Reduction in average delay per visitor compared to the existing service (minutes)	n/a
4.3.2	Number of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a
4.3.3	Percent of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a
4.4.1	Percent of passengers per day that stand on the shuttle	Average = 3.2% Maximum = 14.6%
4.4.2	Number of days per year when passengers stand on shuttle	25
4.4.3	Percent of days per year (when shuttle is operational) that passengers stand on shuttle	26.3%
4.5.1	Number of visitors to Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	84,000
4.5.2	Number of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0
4.5.3	Percent of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%

8. Alternatives Development

8.1. Alternatives Workshop

A data collection analysis presentation and alternatives workshop was conducted with stakeholders on November 16 and 17, 2005. The presentation included a review of the planning goals, objectives, and performance measures that were developed during the initial site visit in July 2005. The data analysis was then presented for discussion. The workshop culminated in the development of nine preliminary alternatives for access to Reds Meadow Valley. Stakeholders in attendance at the workshop represented:

- Devils Postpile NM
- Inyo National Forest
- Sequoia Kings Canyon National Monument
- National Park Service Pacific West Regional Office
- National Park Service Washington Office

The alternatives can be categorized based on three general approaches: shuttle services, access management, and physical improvements, as listed below:

- Category 1: Enhanced Shuttle Service
  - Alternative 1a: No Daytime "Car Cap"
  - Alternative 1b: Purchase ADA Compliant Vehicles
  - Alternative 1c: Contract ADA Compliant Vehicles
- Category 2: Access Management (no shuttle)
  - Alternative 2a: Day-Use Reservation System
  - Alternative 2b: Automated Check Station
  - Alternative 2c: One-In One-Out System (at check station)
  - Alternative 2d: One-In One-Out System (at busiest destinations)
- Category 3: Physical Improvements
  - Alternative 3a: Build to Demand
  - Alternative 3b: K-Rail

The following sections describe the existing conditions and the nine alternatives, which are summarized in Table 8-1.

8.2. Category 1: Enhanced Shuttle Service

The Reds Meadow Shuttle allows the Forest Service and the National Park Service to serve unrestricted visitor demand to Reds Meadow Valley, while containing the adverse impacts to the area. Category 1 provides three variations of shuttle service. These variations include eliminating the daytime car cap, purchasing ADA compliant vehicles, and contracting ADA compliant vehicles.

8.2.1. Alternative 1a: No Group Discounts during Daytime

Alternative 1a is identical to existing conditions except that the "car cap" would be eliminated during the daytime. This alternative is intended to remove the fee inequity between accessing Reds Meadow Valley by automobile and shuttle, because shuttle users do not benefit from a cap in the transportation fee. During the night when the shuttle does not operate, the car cap will remain in effect.

8.2.2. Alternative 1b: Purchase ADA Compliant Vehicles

The major difference between Alternative 1b and existing conditions is that Inyo National Forest and Devils Postpile NM would purchase an entirely new fleet of shuttles. The current fleet of refurbished school buses affords limited viewing opportunities through small windows, is unable to accommodate persons with disabilities, offers no interpretive programs, and provides inadequate seating for large adults. The new vehicles, such as those used by the Yosemite Valley Shuttle System, would provide a superior visitor experience. The shuttles would include large windows, seat 40 passengers, and produce low emissions and noise levels. The entire fleet would be composed of low-floor, ADA compliant vehicles. Vehicles would be purchased through the Federal Transit Administrations Transportation in Parks and Public Lands (ATPPL) grant program.

In addition, this alternative would provide enhanced visitor interpretation and orientation. Automated audio records and written media providing information about Reds Meadow Valley would be provided on the Reds Meadow Shuttle. This would be supplemented by six information kiosks that interpret the significance of Reds Meadow Valley. Two kiosks would be located outside of Reds Meadow Valley at the Mammoth Mountain Visitor Center and the Adventure Center. Four kiosks would be located in Reds Meadow Valley at Agnew Meadows, Devils Postpile NM, Rainbow Falls trailhead, and Reds Meadow Resort.

8.2.3. Alternative 1c: Contract ADA Compliant Vehicles

Alternative 1c is identical to Alternative 1b except that the shuttle service operator would be responsible for supplying the shuttle fleet.

8.3. Category 2: Access Management

Access management strategies are intended to contain the adverse impacts to resources by restricting the number of visitors to Reds Meadow Valley. There are four access management alternatives considered in this section: day-use reservation system, automated check station, one-in one-out system for Reds Meadow Valley, and one-in-one-out system for the busiest parking lots. In these alternatives, the Reds Meadow Shuttle service is not provided and the visitor experience is not addressed.

8.3.1. Alternative 2a: Day-Use Vehicle Reservation System

One effective way to manage access to Reds Meadow Valley is to implement a day-use vehicle reservation system (VRS). Between 7:00 am and 7:30 pm, the Forest Service and the National Park Service would restrict vehicular access at Minaret Check Station based on the estimated number of vehicles that can enter Reds Meadow Valley before parking shortages occur at Devils Postpile NM, Reds Meadow Resort, or the Rainbow Falls trailhead parking lot[8]. Sixty percent of vehicles permitted to enter Reds Meadow Valley each day would be allocated based on pre-reservation. The remaining 40% of slots would be available for same-day admissions. Visitors with overnight accommodations and reservations at the pac stations would not be exempt from these rules. Therefore, if it is determined that 1,000 vehicles can enter the area during the daytime, 600 slots would be allocated based on reservations and 400 slots would be allocated the same day based on a first-come, first-serve basis. Any slots that are not reserved would be available for same-day admission. At night, vehicular access would be unlimited.

Visitors could make reservations by calling a reservation hotline or via the internet. After all same-day slots have been taken, visitors arriving at Minaret Check Station without a reservation, overnight accommodations, or reservations at the pac stations would not be allowed to enter Reds Meadow Valley by vehicle until 7:30 pm. The per vehicle entrance fee would be $15.00 per day, of which $4.00 would be dedicated to operating the reservation system. The Reds Meadow Shuttle would not operate.

Several information sources would be provided to apprise visitors of the remaining number of vehicles permitted to enter Reds Meadow Valley each day, in real-time. Information would be provided at the Mammoth Mountain Visitor Center, via telephone recordings, and on the internet.

8.3.2. Alternative 2b: Automated Check Station

A variation of the day-use vehicle reservation system model described in Alternative 2a is to implement an automated check station at Minaret Vista. As with Alternative 2a, this alternative would establish a maximum number of vehicles that can be admitted to Reds Meadow Valley at any given time. Sixty percent of the slots would be available by pre-

[8] The Agnew Meadows parking lots are not included because they often reach capacity due to long-term parking by overnight hikers.

reservation. The remaining slots could be purchased at the automated check station on the day of the visit. The main difference with Alternative 2a is that once all slots are taken, additional visitor vehicles would be allowed to enter the area once a vehicle leaves. At night, vehicular access would be unlimited.

As with Alternative 2a, visitors could make reservations by calling a reservation hotline or via the internet. After all same-day slots have been taken, visitors arriving at Minaret Check Station without a reservation, overnight accommodations, or reservations at the pac stations would not be allowed to enter Reds Meadow Valley by vehicle until 7:30 pm. The per vehicle entrance fee would be $15 per day, of which $4 would be dedicated to operating the reservation system. The Reds Meadow Shuttle would not operate.

In addition, several information sources would be provided to apprise visitors of the remaining number of vehicles permitted to enter Reds Meadow Valley each day, in real-time. Information would be provided at the Mammoth Mountain Visitor Center, via telephone recordings, and on the internet.

8.3.3. Alternative 2c: One-In One-Out System (Check Station)

A third access management alternative is to implement a one-in one-out policy for Reds Meadow Valley. The Forest Service and NPS would restrict vehicular access at Minaret Check Station once parking shortages occur at Devils Postpile NM, Reds Meadow Resort, or the Rainbow Falls trailhead parking lot. Staff stationed at the Devils Postpile NM Ranger Station and Rainbow Falls trailhead would inform Forest Service staff at the Minaret Check Station when approximately 90% of parking spaces are full. At this time, additional vehicles would be permitted to enter Reds Meadow Valley once a vehicle leaves. The Reds Meadow Shuttle would not operate.

In addition, to reduce the number of vehicles passing each other on the single-lane road, traffic would be permitted to travel in one direction at a time on this road segment. Traffic would be managed by traffic signals constructed just beyond Minaret Check Station and after "Old Pavement." The traffic signals would be timed so that there is sufficient time for all drivers to traverse the single-lane road before traffic in the opposite direction is allowed to proceed. It is envisioned that a 40 minute traffic signal cycle would be established that would permit travel in the inbound and outbound directions separately, in 20 minute increments. For example, between 7:00 am and 7:20 am vehicles would be permitted to travel in the inbound direction only and then between 7:20 am and 7:40 am vehicles would be permitted to travel in the outbound direction only. Signs would be put in place to warn drivers to only stop on the single-lane road in case of emergency. Currently, signs warn passengers to drive carefully on the single-lane road.

8.3.4. Alternative 2d: One-In One-Out System (Valley Destinations)

Alternative 2d would implement a one-in one-out system at the busiest parking lots, including Agnew Meadows, Devils Postpile, Rainbow Falls trailhead, and Reds Meadow Resort. Each parking lot would include staff-operated gates that restrict access once that parking lot is full. Since parking spaces are not delineated, rangers would be required to visually decide when the parking lot is full. A one-in one-out policy at each location would be implemented once parking lots are full. In this alternative, the Reds Meadow Shuttle, transportation fee, and Minaret Check Station would be eliminated.

8.4. Category 3: Physical Improvements to Reduce Illegal Parking

Two final alternatives include physical improvements in the Reds Meadow Valley to reduce illegal parking. Potential strategies include adding additional parking spaces to accommodate peak visitor demand and installing k-rail barriers to prevent illegal parking. The Reds Meadow Shuttle would not operate in this alternative.

8.4.1. Alternative 3a: Add Additional Parking Spaces

Alternative 3a seeks to reduce the impacts of vehicles parking areas not designated for parking by constructing additional parking spaces to accommodate peak demand. When overcrowding occurs, visitors are either unable to visit the resource or must park their vehicles in areas not designated for parking. This adversely impacts the visitor experience, as well as the resources. While building new parking spaces would adversely impact resources, this alternative is intended to concentrate those impacts in a limited area, while enabling more visitors to enjoy the resources.

8.4.2. Alternative 3b: K-Rail

A final alternative is to prevent resource damage due to illegal parking by installing k-rail barriers around sensitive areas and locations where illegal parking is common. K-rail barriers, such as the one shown to the right, are often used on roadways to separate opposing lanes of traffic on high speed roads or to block off road construction. The Reds Meadow Valley shuttle would not operate in this alternative and no other access management strategies would be implemented.

8.5. Fatal Flaw Analysis

A fatal flaw analysis was conducted on all alternatives. Alternative 3b was eliminated because installing k-rails is unlikely to reduce resource damage and could urbanize Reds Meadow Valley.

Table 8-1: Alternatives from November 2005 Workshop

		Alternative 1: Shuttle Service			Alternative 2: Access Management				Alternative 3: Physical Improvements	
Characteristics	**Baseline**	**A. No Group Discount during Daytime**	**B. Purchases ADA Compliant Vehicles**	**C. Contract ADA Compliant Vehicles**	**A. Day Use Reservation System**	**B. Automated Check Station**	**C. One-In One-Out System (Check Station)**	**D. One-In One-Out System (Valley Destinations)**	**A. Build to Demand**	**B. K-Rail Barriers**
Concept	Mandatory shuttle	Mandatory shuttle; daytime car cap of $20 is removed	Mandatory shuttle; 100% of vehicles are ADA compliant; vehicles purchased through FTA grant	Mandatory shuttle; 100% of vehicles are ADA compliant; vehicles provided by contractor	Restricted access via day use reservation system	Pre-purchased tickets used to enter automated Check Station	One-In One-Out policy implemented at Minaret Vista once parking lots are full	One-In One-Out policy at busiest parking lots using automated gates once lots are full	Expand parking lots to accommodate peak demand	K-rail Barriers to prevent illegal parking
Shuttle Service	Mandatory	Mandatory	Mandatory	Mandatory	No	No	No	No	No	No
Vehicles	Refurbished "Blue Bird" model school buses with 40-44 seats. Not ADA accessible	Same as Existing	Buses (FTA Grant 3021 program); low emissions & noise; 100% of fleet ADA compliant	40 seat capacity buses; low emissions & noise; 100% of fleet ADA compliant	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Orientation & Interpretation	None	None	Automated interpretation & written media on bus; informational kiosks	Automated interpretation & written media on bus; informational kiosks	None	None	None	None	None	None
Additional Infrastructure	Not applicable	None	Informational kiosks at five locations (1); bus shelters	Informational kiosks at five locations (1); bus shelters	Reservation system	Automated Check Station	Traffic signals at each end of single lane road & power; signs	Additional automatic gates at parking lots and power service	Additional gravel parking spaces to accommodate peak demand	K-rail barriers
Minaret Vista Check Station	Staffed	Staffed	Staffed	Staffed	Staffed	Automated	Staffed	None	None	None
Span of Service (Mid June to Mid September)	7:00 am to 7:30 pm	Same as Existing	Same as Existing	Same as Existing	Same as Existing	24/7	Same as Existing	24/7	24/7	24/7
Frequency of Service	High season: 20-30 min; Low season: 30-60 min	Same as Existing	Same as Existing	Same as Existing	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Shuttle: Operations & Maintenance	Contractor	Contractor	Contractor	Contractor	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Shuttle: Vehicle Provider	Contractor	Contractor	DEPO/INYO	Contractor	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Fee Policy	Managed by Forest Service; per vehicle fee capped at $20; no passes permitted	Managed by Forest Service; "Car cap" removed for day use; no passes permitted	Managed by Forest Service; "Car cap" removed for day use; no passes permitted	Managed by Forest Service; "Car cap" removed for day use; no passes permitted	$15.00 entrance vehicle fee; no passes permitted	$15.00 entrance vehicle fee; no passes permitted	No fee charged	No fee charged	No fee charged	No fee charged

(1) Informational kiosks at Mammoth Mountain Visitor Center, the Adventure Center, Agnew Meadows, Devils Postpile NM Ranger Station, Rainbow Falls trailhead and Reds Meadow Resort

9. Alternatives Analysis

This section discusses the extent to which each alternative meets the objectives established in Section 4, based on a derivation of the performance measures. The alternatives are not final, but can be reconfigured to provide an effective and efficient transportation system for the Reds Meadow Valley.

9.1. Evaluation of Objectives

For Objective 1.1, which is to maintain or reduce the number of vehicles passing each other in the same direction on the single-lane road compared with the existing service (2005), the consultant team found that the objective was met for Alternatives 1a, 1b, and 1c (see Table 9-1). These alternatives would experience an average of 17 passings per day, and a maximum of 40 passings on July 3rd (the day with the highest visitation). Alternatives 2d and 3a would experience the greatest number of passings in the same direction with an average of 39 per day and a maximum of 125 per day on July 3rd.

Table 9-1: Number of Vehicles Passing Other Vehicles per Day in the Same Direction on the Single-Lane Road

Alternative	Average	Maximum
Existing Service	17	40
1a. No Daytime Car Cap	17	40
1b. Purchases ADA Compliant Vehicles	17	40
1c. Contract ADA Compliant Vehicles	17	40
2a. Day Use Reservation System	37	96
2b. Automated Check Station	37	96
2c. One-In One-Out System (Check Station)	37	96
2d. One-In One-Out System (Valley Destinations)	39	125
3a. Build to Demand	39	125

For Objective 1.2, which is to maintain or reduce the number of vehicles passing each other in the opposite direction on the single-lane road compared with the existing service (2005), the consultant team found that the objective was met for Alternatives 1a, 1b, 1c, and 2d (see Table 9-2). Alternative 2d would completely eliminate passings in the opposite direction by restricting travel on the single-lane road to one direction at a time using traffic signals, while Alternatives 1a, 1b, and 1c maintain the existing number of passings in the opposite direction, with an average of 550 passings per day, and a maximum of 1,600 passings on July 3rd (the day with the highest visitation). Alternative 3a would experience the greatest number of passings in the opposite direction with an average of 2,300 per day and a maximum of 16,000 per day on July 3rd.

Table 9-2: Number of Vehicles Passing Other Vehicles per Day in the Opposite Direction on the Single-Lane Road

Alternative	Average	Maximum
Existing Service	550	1,600
1a. No Daytime Car Cap	550	1,600
1b. Purchases ADA Compliant Vehicles	550	1,600
1c. Contract ADA Compliant Vehicles	550	1,600
2a. Day Use Reservation System	2,100	7,400
2b. Automated Check Station	2,100	7,400
2c. One-In One-Out System (Check Station)	2,100	7,400
2d. One-In One-Out System (Valley Destinations)	0	0
3a. Build to Demand	2,300	16,000

For Objective 2.1, which is to eliminate vehicles parking in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort, the consultant team found that the objective was met for all alternatives except Alternative 2d (Table 9-3). On July 3rd (the day with the highest visitation), 142 vehicles would park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort, if Alternative 2d was implemented. This represents 12.7% of all vehicles that would want to park.

Table 9-3: Maximum # and % of Vehicles Parked in Areas not Designated for Parking per Day at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

Alternative	Max Number	Max Percent
Existing Service	0	0.0%
1a. No Daytime Car Cap	0	0.0%
1b. Purchases ADA Compliant Vehicles	0	0.0%
1c. Contract ADA Compliant Vehicles	0	0.0%
2a. Day Use Reservation System	0	0.0%
2b. Automated Check Station	0	0.0%
2c. One-In One-Out System (Check Station)	0	0.0%
2d. One-In One-Out System (Valley Destinations)	142	12.7%
3a. Build to Demand	0	0.0%

For Objective 2.2, which is that vehicles will only park in areas designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort except on the twelve busiest days of the year, the consultant team found the objective was met for all alternatives (see Table 9-4). For all alternatives, except Alternative 2d, there were no days when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. For Alternative 2d there were three days when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. This represents 2.5% of all days.

Table 9-4: Number and Percent of Days When Vehicles Park in Areas not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

Alternative	Number of Days	Percent of Days
Existing Service	0	0.0%
1a. No Daytime Car Cap	0	0.0%
1b. Purchases ADA Compliant Vehicles	0	0.0%
1c. Contract ADA Compliant Vehicles	0	0.0%
2a. Day Use Reservation System	0	0.0%
2b. Automated Check Station	0	0.0%
2c. One-In One-Out System (Check Station)	0	0.0%
2d. One-In One-Out System (Valley Destinations)	3	2.5%
3a. Build to Demand	0	0.0%

For Objective 2.3, which is to have no net increase in the footprint required to implement the alterative, the consultant team found that there is no footprint for Alternatives 1a, 2a, 2b, 2c, and 2d (see Table 9-5). The footprint for Alternatives 1b and 1c is almost nonexistent (<0.01 acres). Alternative 3a, which requires 124 additional parking spaces would require clearing 0.88 acres of land.

Table 9-5: Footprint of Additional Infrastructure (acres)

Alternative	Acres
Existing Service	0.00
1a. No Daytime Car Cap	0.00
1b. Purchases ADA Compliant Vehicles	0.01
1c. Contract ADA Compliant Vehicles	0.01
2a. Day Use Reservation System	0.00
2b. Automated Check Station	0.00
2c. One-In One-Out System (Check Station)	0.00
2d. One-In One-Out System (Valley Destinations)	0.00
3a. Build to Demand	0.88

For Objective 3.1, which is to maintain the existing real user cost per visitor (2007 dollars), the consultant team found that Alternatives 2a, 2b, 2c, 2d, and 3a met the objective (Table 9-6). There is no user fee for Alternatives 2c, 2d, and 3a. While Alternative 1a, 1b, and 1c would have a user cost that exceeds the existing service, it is only 5% higher.

Table 9-6: Maintain the Existing Real User Cost per Visitor (2007 dollars)

Alternative	Fee per Visitor (2007 dollars)
Existing Service	$5.78
1a. No Daytime Car Cap	$6.08
1b. Purchases ADA Compliant Vehicles	$6.08
1c. Contract ADA Compliant Vehicles	$6.08
2a. Day Use Reservation System	$5.49
2b. Automated Check Station	$5.49
2c. One-In One-Out System (Check Station)	$0.00
2d. One-In One-Out System (Valley Destinations)	$0.00
3a. Build to Demand	$0.00

For Objective 3.2, which is to maintain existing transportation costs (2007 dollars), the consultant team found the following (see Table 9-7):

- Only Alternative 1a met the objective for capital costs. For the other alternatives, capital costs range from a low of $6,000 for Alternative 2d to a high of $9.7 million for Alternatives 1b and 1c.
- Nearly all alternatives met the objective for operating costs (though Alternatives 1b and 1c slightly exceed the existing operating costs. Operating costs for Alternatives 2a, 2b, 2c, 2d, and 3a are less than $5,000 per year. There are no operating costs for Alternatives 2c, 2d, and 3a.
- Alternatives 1a, 2a, and 2b met the objective for life cycle costs over a 20-year period. Alternative 1a has a net life cycle revenue of approximately $2.7 million over a 20-year period and Alternatives 2a and 2b have net life cycle revenue of nearly $11.5 million. Alternatives 1b and 1c have a net life cycle cost of over $10.3 million.

Table 9-7: Capital, Operating, and Life Cycle Costs (2007 dollars)

Alternative	Capital Costs	Operating Costs	Life Cycle Costs
Existing Service	$0	$409,500	-$2,002,000
1a. No Daytime Car Cap	$0	$409,500	-$2,728,000
1b. Purchases ADA Compliant Vehicles	$9,653,000	$411,500	$10,295,000
1c. Contract ADA Compliant Vehicles	$9,653,000	$411,500	$10,295,000
2a. Day Use Reservation System	$324,900	$4,500	-$11,454,000
2b. Automated Check Station	$361,100	$3,500	-$11,432,000
2c. One-In One-Out System (Check Station)	$171,000	$0	$230,000
2d. One-In One-Out System (Valley Destinations)	$6,000	$0	$8,000
3a. Build to Demand	$158,500	$0	$213,000

For Objective 3.3, which is to eliminate the annual subsidy required to pay transportation costs, the consultant team found that alternatives met the objective, with all but three generating net annual revenue (see Table 9-8). Alternatives 2a and 2b

generate the largest annual revenue at approximately $443,000 per year, while Alternatives 2c, 2d, and 3a break even because there is no revenue or operating cost.

Table 9-8: Net Annual Revenue (2007 dollars)

Alternative	Subsidy
Existing Service	$74,500
1a. No Daytime Car Cap	$99,500
1b. Purchases ADA Compliant Vehicles	$99,500
1c. Contract ADA Compliant Vehicles	$99,500
2a. Day Use Reservation System	$442,500
2b. Automated Check Station	$443,500
2c. One-In One-Out System (Check Station)	$0
2d. One-In One-Out System (Valley Destinations)	$0
3a. Build to Demand	$0

For Objective 4.1 and Objective 4.2, which are to provide orientation services and interpretive services to all visitors, the consultant team found the following (see Table 9-9):

- All alternatives provide orientation services to all visitors.
- Only alternatives 1a, 1b, and 1c provide interpretive services to all visitors.

Table 9-9: Percent of Visitors with Access to Orientation and Interpretive Services

Alternative	Orientation Services	Interpretive Services
Existing Service	100%	0%
1a. No Daytime Car Cap	100%	100%
1b. Purchases ADA Compliant Vehicles	100%	100%
1c. Contract ADA Compliant Vehicles	100%	100%
2a. Day Use Reservation System	100%	0%
2b. Automated Check Station	100%	0%
2c. One-In One-Out System (Check Station)	100%	0%
2d. One-In One-Out System (Valley Destinations)	100%	0%
3a. Build to Demand	100%	0%

For Objective 4.3, which is to maintain or reduce delay to visitors compared to the existing service, the consultant team found that all alternatives met the objective (see Table 9-10).

- Alternatives 2a, 2b, 2d, and 3a reduce delay per visitor by over 30 minutes, compared with the existing service. There is no reduction in delay for Alternatives 1a, 1b, 1c, and 2c.
- Alternatives 2a, 2b, 2d, and 3a reduce delay per visitor by over 30 minutes between 81 and 84 days per year. There are no days when delay per visitor for Alternatives 1a, 1b, 1c, and 2c is reduced by over 30 minutes.

- Alternatives 2a, 2b, 2d, and 3a reduce delay per visitor by over 30 minutes on approximately two-thirds of all days that Reds Meadow Valley is open. There are no days when delay per visitor for Alternatives 1a, 1b, 1c, and 2c is reduced by over 30 minutes.

Table 9-10: Delay per Visitor

Alternative	Reduction in Delay Compared to Existing Service (min)	Reduction in Delay Exceeds 30 Minutes	
		# of Days per Year	% of Days per Year
Existing Service	n/a	n/a	n/a
1a. No Daytime Car Cap	0	0	0.0%
1b. Purchases ADA Compliant Vehicles	0	0	0.0%
1c. Contract ADA Compliant Vehicles	0	0	0.0%
2a. Day Use Reservation System	33	81	66.4%
2b. Automated Check Station	33	81	66.4%
2c. One-In One-Out System (Check Station)	0	0	0.0%
2d. One-In One-Out System (Valley Destinations)	32	81	66.4%
3a. Build to Demand	32	81	66.4%

For Objective 4.4, which is if a shuttle service is provided, standing on the shuttle will not occur except on the twelve busiest says of the year, the consultant team found the following (see Table 9-11):

- For alternatives 1a, 1b, and 1c, on average, 3.2% of passengers stand on the shuttle per day. A maximum of 14.6% of passengers stand on the shuttle on July 3rd (the day with the highest number of shuttle passengers).
- For alternatives 1a, 1b, and 1c there are 25 days during the season when passengers stand on the shuttle. This represents over one-fourth of all days the shuttle is operational.
- This objective is not applicable to Alternatives 2a, 2b, 2c, 2d, and 3b, as they assume the shuttle is not operational.

Table 9-11: Passengers Standing on the Reds Meadow Shuttle

Alternative	Passengers per Day		Days Passengers Stand	
	Average Percent	Maximum Percent	# of Days per Year	% of Days per Year
Existing Service	3.2%	14.6%	25	26.3%
1a. No Daytime Car Cap	3.2%	14.6%	25	26.3%
1b. Purchases ADA Compliant Vehicles	3.2%	14.6%	25	26.3%
1c. Contract ADA Compliant Vehicles	3.2%	14.6%	25	26.3%
2a. Day Use Reservation System	n/a	n/a	n/a	n/a
2b. Automated Check Station	n/a	n/a	n/a	n/a
2c. One-In One-Out System (Check Station)	n/a	n/a	n/a	n/a
2d. One-In One-Out System (Valley Destinations)	n/a	n/a	n/a	n/a
3a. Build to Demand	n/a	n/a	n/a	n/a

For Objective 4.5, which is to maximize number visitors Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort, the consultant team found the following (see Table 9-12 and Table 9-13):

- For Alternatives 1a, 1b, 1c, and 2d, 100% of existing visitors would be able to access Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort.
- For Alternatives 2a, 2b, and 2c, 96.4% of existing visitors would be able to access Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort.

Table 9-12: Number of Visitors to Reds Meadow Valley Without Causing Visitors to Park in Areas not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

Alternative	# of Visitors	% of Visitors
Existing Service	84,000	100.0%
1a. No Daytime Car Cap	84,000	100.0%
1b. Purchases ADA Compliant Vehicles	84,000	100.0%
1c. Contract ADA Compliant Vehicles	84,000	100.0%
2a. Day Use Reservation System	81,000	96.4%
2b. Automated Check Station	81,000	96.4%
2c. One-In One-Out System (Check Station)	81,000	96.4%
2d. One-In One-Out System (Valley Destinations)	84,000	100.0%
3a. Build to Demand	84,000	100.0%

- For all alternatives, except Alternative 2d, there were no days when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. For Alternative 2d there were 3 days when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls trailhead, or Reds Meadow Resort. This represents 2.5% of all days.

Table 9-13: Number and Percent of Days When Vehicles Park in Areas not Designated for Parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort

Alternative	Number of Days	Percent of Days
Existing Service	0	0.0%
1a. No Daytime Car Cap	0	0.0%
1b. Purchases ADA Compliant Vehicles	0	0.0%
1c. Contract ADA Compliant Vehicles	0	0.0%
2a. Day Use Reservation System	0	0.0%
2b. Automated Check Station	0	0.0%
2c. One-In One-Out System (Check Station)	0	0.0%
2d. One-In One-Out System (Valley Destinations)	3	2.5%
3a. Build to Demand	0	0.0%

9.2. Additional Considerations

Several additional considerations are worth mentioning for several of the alternatives. For example, Alternative 2b, which would regulate visitation using an automated check station, may have one unintended consequence. On busy days, when the number of vehicles permitted to enter Reds Meadow Valley is reached, many visitors will continue to arrive at the check station unaware that they will not be permitted entry. Currently, vehicles are able to use the loop road just beyond Minaret Check Station to turn around. However, if an unmanned automated check station replaces the existing check station, vehicles will not be able to turn around. In addition, staff, emergency vehicles and delivery vehicles would need a way to have access to Reds Meadow Valley. A lack of staff available to facilitate traffic at the check station could lead to safety concerns and resource damage.

For Alternative 2d, which would implement a one-in one-out system at several destinations within Reds Meadow Valley, queues may form outside of the entrance gates: This could have the following negative consequences:

- Visitors may park in areas not designated for parking outside of the gates. While this alternative would succeed in limiting resource damage due to vehicles parked in non-designated areas within the specific destination, it may push resource damage to other areas.
- Vehicle queues may result in impeded access to various destinations. For example, vehicle queues at Devils Postpile NM may impede visitors with overnight accommodations at Devils Postpile NM campground.

For Alternative 3a, while the average number of passings in the opposite direction is similar to Alternatives 2a, 2b, and 2c. The maximum number of passings in the opposite direction is substantially greater for Alternative 3a (approximately 16,000). One way to eliminate this problem, though not a part of this alternative would be to operate the Reds Meadow Shuttle only during the busiest days of the year. Unfortunately, it may be difficult to find a vendor willing to operate a shuttle for only a few days.

Table 9-14: Performance Measures Derived for Alternatives

Performance Measure	Existing	Alternative 1: Shuttle Service			Alternative 2: Access Management				Alternative 3: Physical Improvements
		A. No Group Discounts during Daytime	B. Purchases ADA Compliant Vehicles	C. Contract ADA Compliant Vehicles	A. Day Use Reservation System	B. Automated Check Station	C. One-In One-Out System (Check Station)	D. One-In One-Out System (Valley Destinations)	A. Build to Demand
1.1.1 Number of vehicles passing other vehicles per day in the same direction on the single-lane road	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 17 Maximum = 40	Average = 37 Maximum = 96	Average = 37 Maximum = 96	Average = 37 Maximum = 96	Average = 39 Maximum = 125	Average = 39 Maximum = 125
1.2.1 Number of vehicles passing other vehicles per day in the opposite direction on the single-lane road	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 550 Maximum = 1,600	Average = 2,100 Maximum = 7,400	Average = 2,100 Maximum = 7,400	Average = 2,100 Maximum = 7,400	Average = 0 Maximum = 0	Average = 2,300 Maximum = 16,000
2.1.1 Maximum number of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0	0	0	0	0	0	0	142	0
2.1.2 Maximum percent of vehicles parked in areas not designated for parking per day at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.7%	0.0%
2.2.1 Number of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0	0	0	0	0	0	0	3	0
2.2.2 Percent of days per year when vehicles park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead, or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%
2.3.1 Footprint of additional infrastructure (number of trees to be removed and sq ft of land to be affected)	Acres: 0.00	Acres: 0.00	Acres: 0.01	Acres: 0.01	Acres: 0	Acres: 0	Acres: 0	Acres: 0	Acres: 0.88
3.1.1 Fee per visitor (2007 dollars)	$5.78	$6.08	$6.08	$6.08	$5.49	$5.49	$0.00	$0.00	$0.00
3.2.1 Capital costs (2007 dollars)	n/a	$0	$9,653,000	$9,653,000	$324,900	$361,100	$171,000	$6,000	$158,500
3.2.2 Operating costs (2007 dollars)	$409,500	$409,500	$411,500	$411,500	$4,500	$3,500	$0	$0	$0
3.2.3 Life cycle costs (2007 dollars)	-$2,002,000	-$2,728,000	$10,295,000	$10,295,000	-$11,454,000	-$11,432,000	$230,000	$8,000	$213,000
3.3.1 Annual revenue minus annual operating costs (2007 dollars)	$74,500	$99,500	$99,500	$99,500	$442,500	$443,500	$0	$0	$0

Table 9-15: Performance Measures Derived for Alternatives (continued)

Performance Measure	Existing	Alternative 1: Shuttle Service			Alternative 2: Access Management				Alternative 3: Physical Improvements
		A. No Group Discounts during Daytime	B. Purchases ADA Compliant Vehicles	C. Contract ADA Compliant Vehicles	A. Day Use Reservation System	B. Automated Check Station	C. One-In One-Out System (Check Station)	D. One-In One-Out System (Valley Destinations)	A. Build to Demand
4.1.1 Percent of visitors that have access to orientation services	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
4.2.1 Percent of visitors that have access to interpretive services	0.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4.3.1 Reduction in average delay per visitor compared to the existing service (minutes)	n/a	0	0	0	33	33	0	32	32
4.3.2 Number of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a	0	0	0	81	81	0	81	81
4.3.3 Percent of days per year when reduction in average delay per visitor compared to the existing service exceeds 30 minutes	n/a	0.0%	0.0%	0.0%	66.4%	66.4%	0.0%	66.4%	66.4%
4.4.1 Percent of passengers per day that stand on the shuttle	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	Average = 3.2% Maximum = 14.6%	n/a	n/a	n/a	n/a	n/a
4.4.2 Number of days per year when passengers stand on shuttle	25	25	25	25	n/a	n/a	n/a	n/a	n/a
4.4.3 Percent of days per year (when shuttle is operational) that passengers stand on shuttle	26.3%	26.3%	26.3%	26.3%	n/a	n/a	n/a	n/a	n/a
4.5.1 Number of visitors to Reds Meadow Valley without causing visitors to park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	84,000	84,000	84,000	84,000	81,000	81,000	81,000	84,000	84,000
4.5.2 Number of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0	0	0	0	0	0	0	3	0
4.5.3 Percent of days per year when visitors park in areas not designated for parking at Devils Postpile NM, Rainbow Falls Trailhead or Reds Meadow Resort	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%

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Report Number **FTA- FTA-VA-26-1008-2008.1.**