

Transportation Study

April 2000



MESA VERDE

National Park • Colorado

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

April 18, 2000

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CHAPTER 1: INTRODUCTION

PURPOSE

The purpose of this study is to provide information on current and anticipated transportation and visitor use conditions in Mesa Verde National Park. It also identifies a range of transportation, managerial, and visitor use concepts that may be considered in future planning. This study identifies data collection needs and defines issues for further study in upcoming planning projects. This study does not make decisions or recommendations about specific transportation alternatives or visitor management strategies. A secondary purpose of this study is to provide data and analysis in support of the completion of future environmental compliance activities for Mesa Verde.

BACKGROUND

In early 1976, a variety of transportation alternatives for Mesa Verde were presented during the assessment phase of the park's General Management Plan (GMP) development process. By the fall of 1976, these alternatives had been evaluated, and the GMP was completed in 1978 and approved in May of 1979. Since then, the GMP for Mesa Verde has guided the park's development and management. The following items were transportation and visitor use considerations in the GMP:

- Stabilize and address carrying capacity for the 13 sites open to public use.
- Rehabilitate the roads for safe access.
- Construct new facilities at or near the entrance of the park including: Interpretation and Orientation Center, Administrative Headquarters, Maintenance Functions that would operate more efficiently at the park's entrance, artifact and archival storage and research facilities.
- Once new facilities were constructed, Spruce Tree area buildings and the Far View Visitor Center would be reevaluated to determine the optimal use of these facilities.
- Continue shuttle service to Wetherill Mesa from Far View. This service since has had to be discontinued in favor of the current tram loop due to the poor condition of the road.
- Develop a similar mini-bus service for Chapin Mesa. Evaluate and consider parkwide alternative transportation systems upon completion of the planned facilities near the entrance.

Since 1979, many studies have been completed towards meeting the GMP goals. A 1981 Environmental Assessment and subsequent 1982 Finding of No Significant Impact determined that the Park Entrance road should not be realigned. Those two studies concluded that the road could be stabilized along the existing alignment.

In 1988 another Environmental Assessment was completed for new facilities near the park entrance. That study evaluated a proposed new visitor center with a 200-car parking lot and bus stalls, located near the park entrance, which would replace the center currently located at Far View. That assessment found No Significant Impact and that an EIS would not be needed.

In the 1990s several studies considered components of the existing transportation system, from parking, to traffic, to transportation system management. Those studies concluded that relatively minor improvements and changes could address near-term transportation problems. Several additional studies of the development of an interpretation/orientation center near the current entrance also have been undertaken.

Events in the late 1990s prompted a need to re-open the consideration of transportation alternatives beyond transportation system management. The entrance road has had several substantial failures, one resulting in a death. Programmed funding has proven inadequate to keep pace with maintenance needs. Wetherill Mesa road has not been repaved. A Denver University Study has revived interest in a pre-GMP concept of building an aerial tramway or gondola to the mesa top.

STUDY OVERVIEW

This report describes the visitation trends at Mesa Verde National Park (see Park Features map). It also relates trends to the capacity of park features, and discusses the impacts of those trends on the transportation system and visitor experience of the park. The traffic operations, safety and visitor information implications of current and projected future conditions are identified. From an analysis of this information base and policy input from NPS, the purpose and need for transportation and visitor management improvements in Mesa Verde is identified.

The report begins with a discussion of historic visitation patterns at Mesa Verde. These visitation patterns are then compared to trends at other parks in the Four Corners region and to the national park system. The visitation patterns of Mesa Verde are also compared to population and economic trends in Montezuma County and the Four Corners region. From this information, forecasts of future visitation at Mesa Verde to the year 2020 are developed.

Traffic operations, based upon recent counts, the distribution of vehicles by type, and the parking capacity and use patterns at the various sites are each analyzed. The utilization of the Wetherill Mesa tram system and the concession-operated tour busses are also reviewed. From recent survey data, visitor use of the transportation system is more fully described. Based on this understanding, visitation projections are applied to the transportation system, and the impacts upon each component are identified.

The report also presents field observations including estimates of the amount of time visitors spend at selected park features and how visitors respond to the existing information and orientation systems. The visitation capacity of major attractions within the park is estimated, based on current use patterns and the size of visitor facilities. The collection and analyses of this information provides the basis for estimating the visitation capacity of the three ticketed sites (Balcony House, Cliff Palace, and Long House) and some of the other major park features (Spruce Tree House and the adjacent activity area) in view of the projected future visitation demand and the potential for enhancements to visitor orientation and information systems.

A statement of purpose and need for transportation and visitor management improvements is defined based on the relationship between the park's capacity and projected demand for visitation. A preliminary range of alternatives is suggested for future evaluation. Recommendations are made regarding the types of data collection that would be required to support the alternative evaluation and selection process, and the environmental compliance process that would accompany a decision regarding visitor management and transportation.

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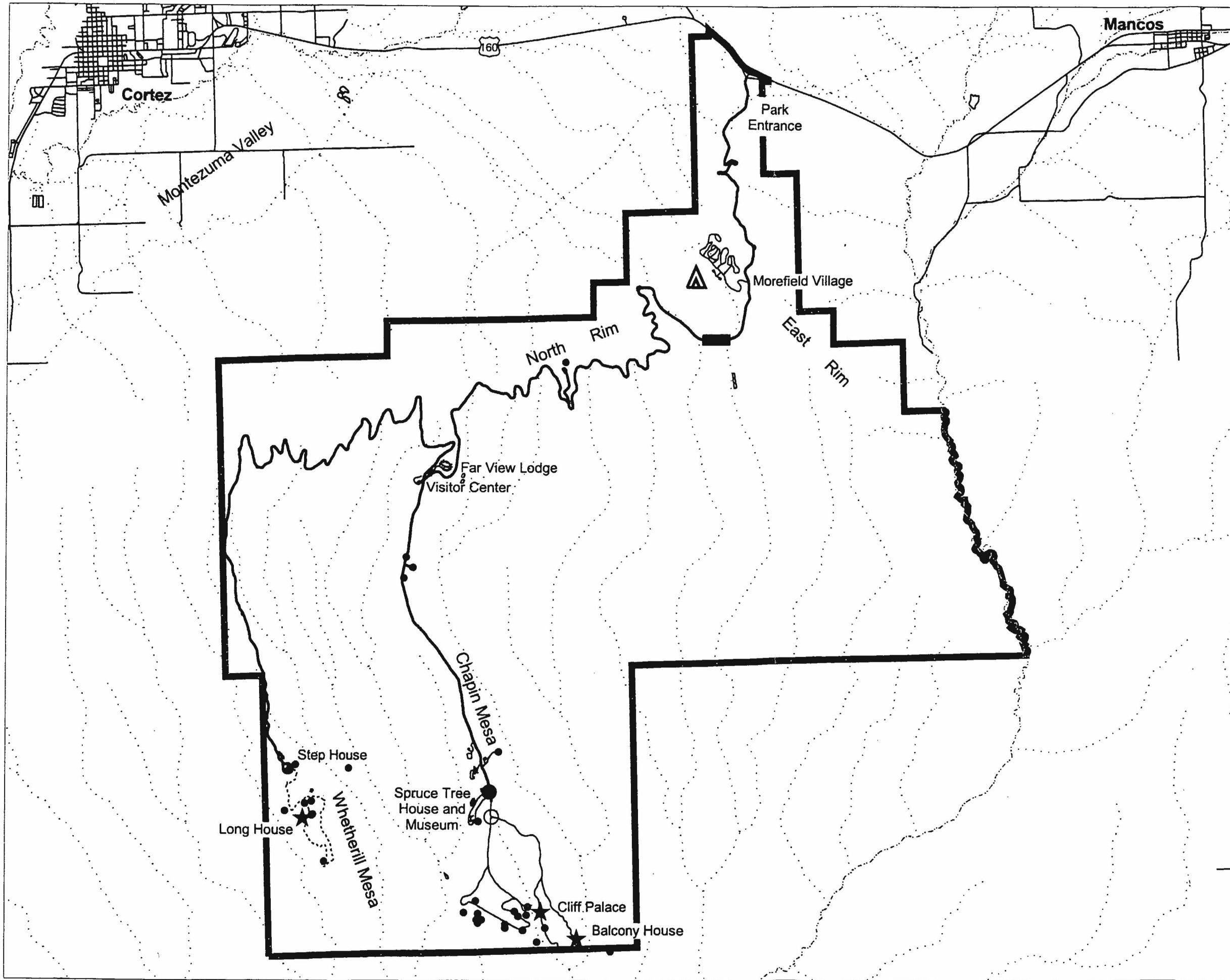
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PARK FEATURES

LEGEND

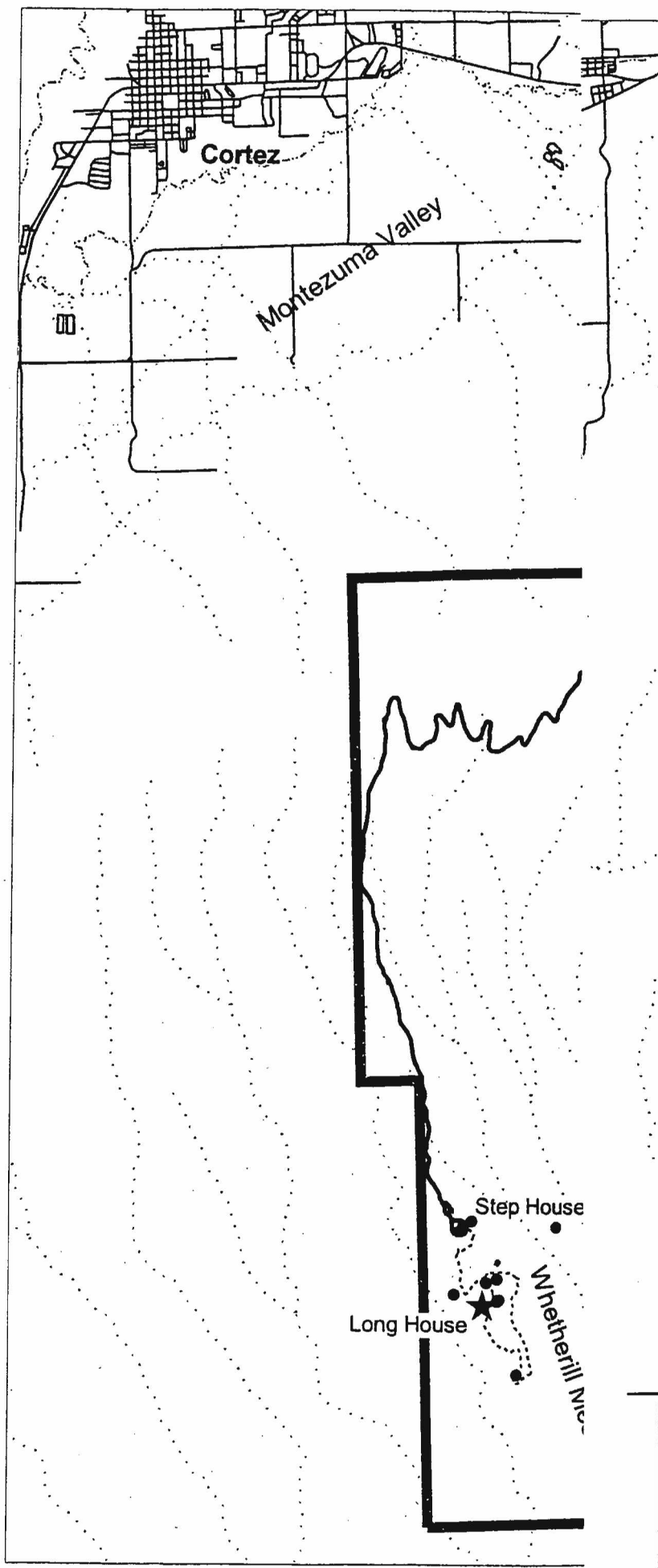
- 4-way Intersection
- 3-way Intersection
- ★ Ticket Attraction
- Other Attraction
- Park Road
- - - Tram Route
- Minor Park Road
- Tunnel
- - - Intermittent Stream
- - - Perennial Stream
- Lake
- ▭ Park Boundary



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PARK FEATURES

LEGEND

● 4-way Intersection

○ 3-way Intersection

★ Ticket Attraction

• Other Attraction

↗ Park Road

⋯ Tram Route

↘ Minor Park Road

■ Tunnel

⋯ Intermittent Stream

⋯ Perennial Stream

□ Lake

▮ Park Boundary



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CHAPTER 2: PARK HISTORY AND OPERATIONS

This chapter provides a description of the context of this study. The first section in this chapter provides a brief history of how the park developed and gives basic statistics about the park. The second section in this chapter describes how the park's transportation systems have developed over time. Third and finally, there is a short section on current operating policies and practices. All three of the sections of this chapter establish assumptions and baseline information that are used in later chapters.

GENERAL HISTORY OF MESA VERDE

Mesa Verde protects and interprets the remnants of a people and a culture which first formed about 2,000 years ago. The society, which began as a culture of basket makers (0-400 AD), grew to encompass the craft of pottery and the construction of roofed dwellings and pit houses (400-750 AD). Between the years of 750 and 1100 AD, construction techniques became more complex, involving a wider variety of materials and designs, and the dwellings were also clustered together in pueblos. Between 1100 and 1276 AD, the construction of dwellings moved off the mesa tops and into the cliff walls along the canyons. Beginning about 1276 AD, the inhabitants left the area, leaving a rich legacy of artifacts and structures.

It is unclear when the name Mesa Verde, "green table" in Spanish, began to be used. It is known that two Franciscan Friars, Dominguez and Escalante, passed north of Mesa Verde in August 1776, en route from Santa Fe, NM to Monterrey, CA (Wenger). Several other Spanish explorers passed that way between 1776 and 1859. Apparently the name was known and in common oral use by 1859. In 1859, John S. Newberry, a professor of geology, wrote the first known Anglo-American mention of Mesa Verde. Between 1874 and 1891 a variety of prospectors, archaeologists, and surveyors noted the existence of, and began collecting artifacts from Mesa Verde. During this period, several articles were published in Denver and in Durango suggesting that the area might be made into a national park. Attempts were made to pass bills in the U.S. Congress between 1901 and 1905 in order to make Mesa Verde a national park. It wasn't until 1905, however, that such a bill was passed. The park was officially established in 1906.

In 1908, work began to excavate and restore the known major sites in order to make them available for the general public's viewing. Excavation of Chapin Mesa continued through 1950. No additional excavation occurred until 1959, when the unearthing of sites on Wetherill Mesa was begun. The excavation of Long House, Mug House, and Step House on Wetherill Mesa continued through 1972, although Mug House has never been opened to the public.

The entire park contains 52,073 acres (81.3 square miles) of land, with over four thousand known archaeological sites. Of the sites, more than 600 are cliff dwellings. The majority of the sites open to visitors are located in the southern tip of the park, which includes approximately 15 square miles or one-fifth of the park's total area. These areas are between 20 and 30 miles from the park entrance.

HISTORY OF PARK TRANSPORTATION

Although the park was established in 1906, the National Park Service was not established until 1916. Access to the park was via horse trail during this time. Expansion of the horse trail into a road wide enough for automobiles occurred prior to the 1930s. Public access to the park has always been provided from north of the park boundary.

The road was improved, with stone curbing and other upgrades being made during the 1930s by the Civilian Conservation Corps (CCC). During the 1930's, car caravans of visitors were guided to the top of the mesa by park rangers (Wenger).

One section of the main road, known as the Knife Edge Road, was abandoned in 1957 when a tunnel was built between Morefield Canyon and Prater Canyon and rerouted. The Knife Edge Road was converted to a set of hiking trails. This change eliminated a section of road that was subject to continual damage from slides. It also had the effect of isolating the amphitheater and Morefield Campground off of the rerouted main road.

Based on historic USGS maps, trails and unimproved roads were present on Wetherill Mesa as early as the 1950s. It wasn't until 1959, however, that a road was developed to support an improved unearthing of sites on Wetherill Mesa. Sometime during the 1960s, the road was topped with a thin layer of pavement. Wetherill Mesa was opened to the public in the late 1960s. The Wetherill Mesa Tram began operating in the early 1970s. It originally ran the entire 16-mile length of the mesa from the intersection of the Wetherill Mesa road with the main road. Due to the poor condition of the road, the tram was downscaled to a 4-mile loop at the end of the mesa. Since the time the tram was downscaled, visitors in their private vehicles, vehicles under 25,000 pounds, drive the remaining 12 miles to a parking area where they board the tram.

In 1972, the Watanka Lift Co. provided an unsolicited proposal to Mesa Verde National Park. In their proposal, the company stated its general interest in developing gondola transportation at parks in general, and further developing the concept for Mesa Verde in particular. While not built, this project opened a discussion that continues to the present about the possibility of gondolas and aerial tramways as alternatives to entering the park on the main road. A tram is needed to provide access to the Long House ticketed site. Capacity of the tram limits the number of people who can go to Long House on one tour.

A number of years ago, Spruce Tree Loop road was reconfigured from two-way traffic to one-way traffic to accommodate the turning radius of large vehicles. The traffic has operated one-way in clockwise and counter-clockwise directions; the direction of travel has been reversed several times.

PARK OPERATIONS AND POLICY OVERVIEW

At the time this report was initially prepared, the following park policies and operating procedures were in effect.

1. There is a vehicle size limitation on the Wetherill Mesa Road: Maximum length 25 feet or less, and maximum weight 8,000 GVW. These limitations could be removed if the Wetherill Mesa Road were improved.

2. There are no identified bicycle trails or bicycle lanes along roads. This policy could change if appropriate alternative transportation alternatives and resource protection strategies were developed.
3. Wetherill Mesa is closed to visitor access from September to May each year. Tickets are not available and tours are not conducted in the winter months to the three ticketed sites (Cliff Palace, Balcony House, and Long House) due to safety concerns related to snow and ice on paths, ladders and stairs.
4. There are currently no specific plans or policies that would open any additional sites for public visitation. Additional plans would be required, following analysis and stabilization of other alcove sites, to change this policy.
5. Current regulations allow the park to adjust the ticket prices to charge visitors only the actual cost of providing interpretive services. Using pricing as a means to manage visitation demand would require a policy change.
6. Table 2-1 shows the operating hours for selected facilities in the park.

TABLE 2-1: PARK OPERATING HOURS – 2000

Period	Entrance Gate	Cliff Palace	Balcony House	Long House
Nov. 1 – March 4	8:00 am - 4:00 pm	Closed	Closed	Closed
March 5 – April 8	8:00 am - 4:00 pm	Closed	Closed	Closed
April 9 – May 13	8:00 am - 4:00 pm	9:00 am - 5:00 pm	Closed	Closed
May 14 – May 27	8:00 am - 4:00 pm	9:00 am - 5:00 pm	9:00 am - 5:00 pm	Closed
May 28 – Sept. 4	6:30 am - 10:00 pm	9:00 am - 6:00 pm	9:00 am - 5:00 pm	10:00 am - 5:00 pm
Sept. 5 – Oct. 14	6:30 am - 10:00 pm	9:00 am - 5:00 pm	9:00 am - 5:00 pm	Closed
Oct. 15 – Nov. 5	6:30 am - 10:00 pm ¹	9:00 am - 4:00 pm	Closed	Closed
Nov. 6 – March 4	8:00 am - 4:00 pm	Closed	Closed	Closed

Source: Mesa Verde National Park, 2000

1. Operating hours occasionally changed to 8:00 am - 4:00 pm during this period due to weather conditions.

CHAPTER 2 SUMMARY

The following summarizes the main findings and conclusions of this chapter applicable to the remainder of the report:

- The park contains 52,073 acres (81.3 square miles) of land. The majority of the sites open to visitors are located in the southern tip of the park that includes approximately 15 square miles or one-fifth of the park's total area. These areas are between 20 and 30 miles from the park entrance.
- Public access to the park has always been from the north along a single access road.

- The Wetherill Mesa Tram began operating in the early 1970s and originally ran the entire 16-mile length of the mesa. Due to the poor condition of the road, the tram has been downscaled to a 4-mile loop at the end of the mesa.
- There are no current plans to offer access to additional sites during the winter months or open any additional ticket sites during the summer. Current policy prohibits ticket prices in excess of the actual cost of interpretive services.

CHAPTER 3: VISITATION TRENDS AND VISITOR USE

The purpose of this chapter is to describe current and projected visitation patterns within Mesa Verde National Park. These visitor patterns form the basis for analyses later in this chapter and in subsequent chapters on the capacity of sites and their associated transportation needs.

This chapter is comprised of four main sections: visitation, visitor survey results, visitor use observations, and future visitation. The first section reviews visitation trends since 1945. The second section discusses the results of an exit survey of visitors. Surveys conducted in July and August 1997 provide information on how many visitors went to each site, how many sites they saw, and what time of day they saw them. Third, direct observations were made of visitor movements to estimate how long visitors spent at each site and to evaluate the visitor information and orientation systems. Fourth and finally, future visitation levels and visitor demand patterns are projected based on current use and historic trends.

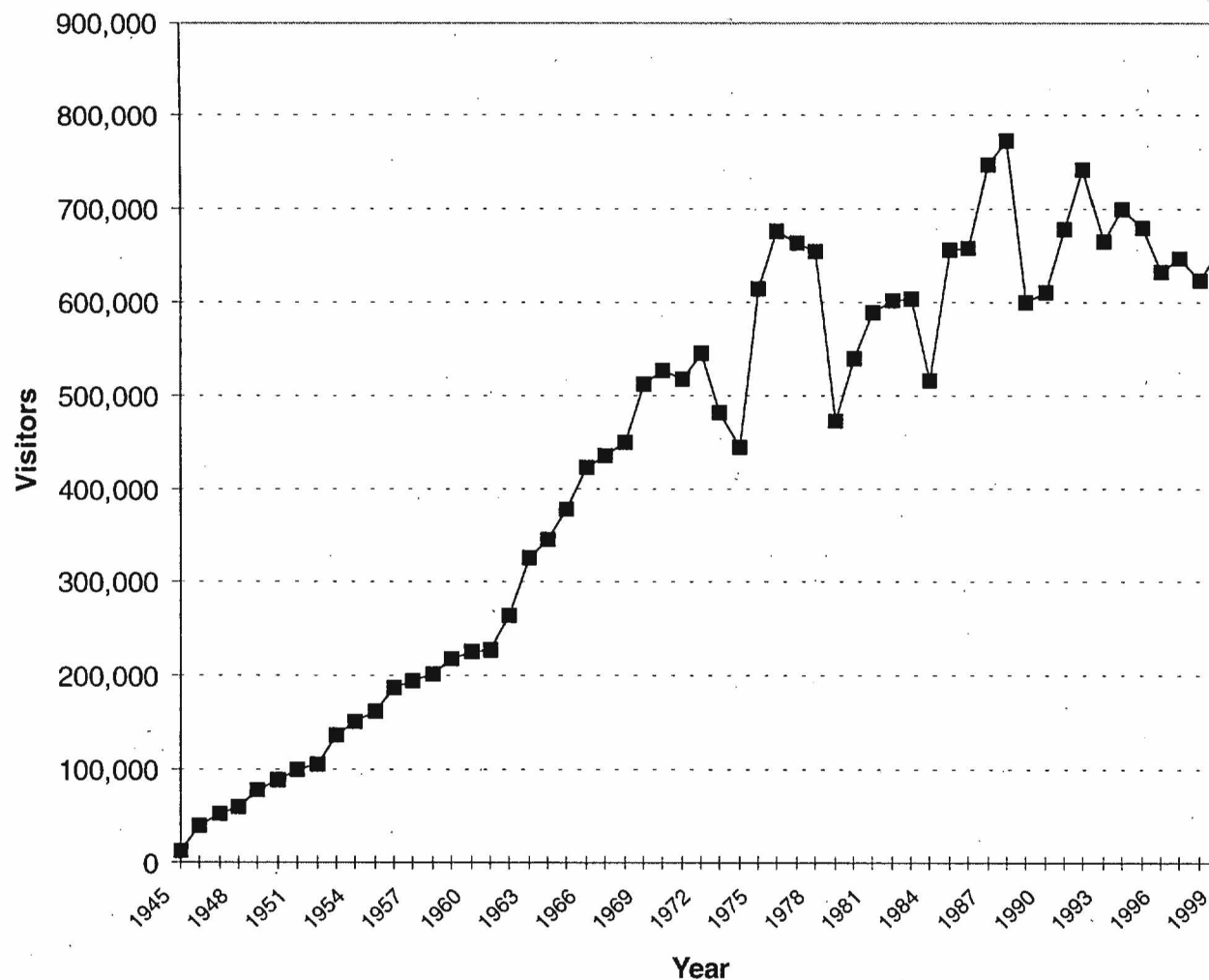
VISITATION

Figure 3-1 shows annual visitation (based on recorded vehicle entries at the gate) at Mesa Verde National Park over the period 1945 through 1999. According to National Park Service (NPS) records, Mesa Verde attracted approximately 12,994 visitors in 1945. From 1945 to 1960 Mesa Verde experienced steady and sustained growth in visitation. Visitation increased dramatically from 1961 to 1969, possibly as a result of the excavation and opening of Wetherill Mesa sites during this time. In terms of major visitation milestones, Mesa Verde attracted over 100,000 visitors in 1952. By 1958 it attracted 200,000 visitors and in 1969, Mesa Verde attracted over 500,000 visitors annually.

Since 1970, year-to-year visitation has fluctuated. In many years, visitation declined from the previous year's level. In other years, visitation increased significantly over the previous year reported. Annual visits peaked at 772,183 in 1988. Large declines in visitation occurred in 1973-74, 1979, 1984, 1989, 1995-96, and 1998. No study of the causes of visitation increases or decreases has been conducted for Mesa Verde or other attractions in the region. Visitation declines, however, may possibly be attributed to the oil crises of 1973 and 1979 and the recession of 1989. More recent declines in visitation may be attributed variously to the Hanta virus outbreak in the southwest Four-Corners area which began about 1992, the cessation of the Colorado Tourism Board in 1994, Federal Government shutdowns in late 1995/early 1996, and the Chapin 5 fire of 1996. Declines in 1998 may be attributed to the national and international publicity about three convicts who escaped from prison murdered a sheriff and disappeared into the remote areas of the Four Corners region. (Mesa Verde National Park 1997 & 2000, and Montezuma County Council on Economic Development information, 1997)

In the Four Corners area, Mesa Verde draws the largest number of visitors of any attraction. In 1997, Mesa Verde attracted 648,596 visitors. Also in 1997, visitation was reported for the following attractions: 198,434 passengers on the Durango and Silverton Narrow Gauge Railroad; 141,490 visitors at Navajo National Monument; 63,154 visitors at Aztec National Monument; and 25,079 visitors at Hovenweep National Monument.

Figure 3-2 and Table 3-1 show the range of monthly visitor entries to the park between 1989 and 1999. The months of June through August are the most popular visitation months. An average of 61% of the annual visitation occurs from June through August. An average of 83% of visitation occurs from May through September. In general, months with the highest visitation have the greatest year-to-year variability in visitation.



ANNUAL VISITATION TO MESA VERDE NATIONAL PARK

LEGEND

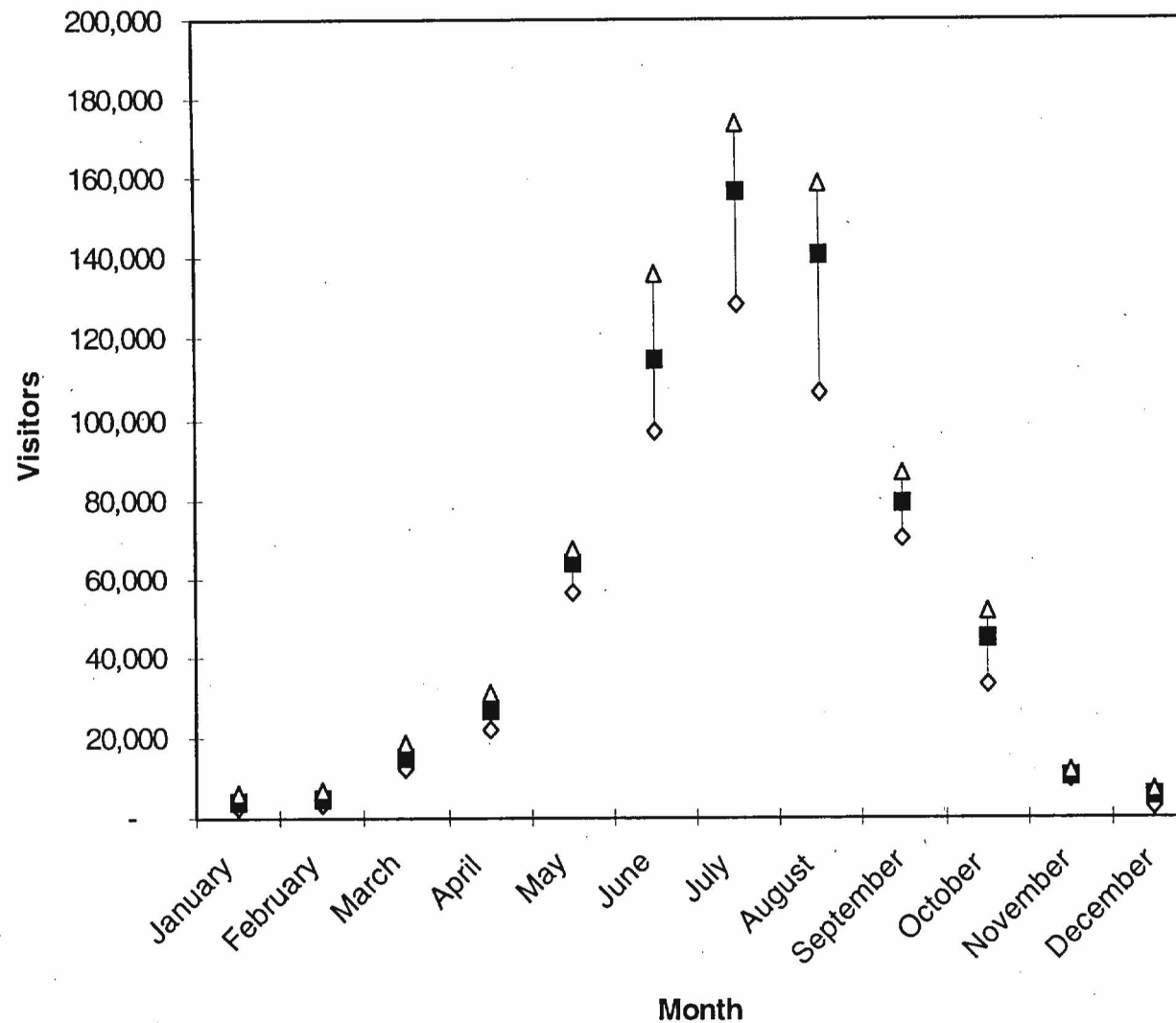
Figure 3-1

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

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Source: National Park Service Data, 2000.

**VISITATION
STATISTICS
1989-1999**



Source: National Park Service Data, 2000.

LEGEND

- ◇ 11-Yr. Low
- 11-Yr. Avg.
- △ 11-Yr. High

Figure 3-2

**MESA VERDE
NATIONAL PARK**

TRANSPORTATION STUDY

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TABLE 3-1: MESA VERDE NATIONAL PARK VISITOR ENTRIES, 1989 - 1999

Month	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
January	2,990	3,926	3,885	5,090	3,768	6,126	4,938	4,486	4,427	4,905	6,103
February	3,401	4,232	6,001	6,545	4,666	3,947	6,711	5,636	4,771	4,666	6,552
March	14,593	12,856	12,317	14,614	13,283	18,802	16,567	16,716	16,547	13,526	19,502
April	21,683	25,531	22,225	31,207	28,575	26,196	27,605	29,373	25,781	25,886	24,474
May	57,557	56,647	61,574	67,353	67,690	66,517	64,167	67,113	61,288	62,091	63,487
June	111,661	111,215	96,769	136,273	116,572	119,260	109,197	114,588	116,398	109,226	115,043
July	128,270	142,952	173,774	172,012	154,507	159,407	171,053	152,711	148,967	137,955	143,283
August	134,791	136,791	158,191	158,503	145,628	147,527	137,981	106,638	135,008	123,132	130,354
September	70,471	69,788	80,823	86,893	81,698	83,579	82,474	74,899	77,961	80,306	82,142
October	37,899	33,157	45,855	48,508	48,728	51,733	46,707	44,533	42,539	45,949	45,062
November	10,457	9,583	11,434	10,097	10,015	9,798	10,452	10,785	9,477	8,482	12,219
December	6,272	4,801	5,227	4,925	5,724	6,752	2,981	6,150	5,702	7,386	7,802
Yearly Total	600,045	611,479	678,075	742,020	680,854	699,644	680,833	633,628	648,866	623,510	656,023

Source: Mesa Verde National Park, Superintendent's Office, 2000.

Table 3-2 shows the annual visitation at Mesa Verde National Park, along with visitation at nearby parks and the national park system between 1992 and 1998. Mesa Verde experienced declines in recent visitation in each year except 1994 and 1997. The Aztec Ruins National Monument and the Navajo National Monument parallel Mesa Verde's visitation trends. Mesa Verde's visitation trends also mirror national trends indicating that slower growth periods for the national system coincide with drops in visitation at Mesa Verde (see Figure 3-3).

Figure 3-4 shows those regional parks with trends that are dissimilar to those of Mesa Verde. Canyonlands NP, Hovenweep NM, Hubble Trading Post, Natural Bridges, and the Colorado National Monument have trends that do not follow those of Mesa Verde. These parks realized visitation increases in years when Mesa Verde had decreases and vice versa.

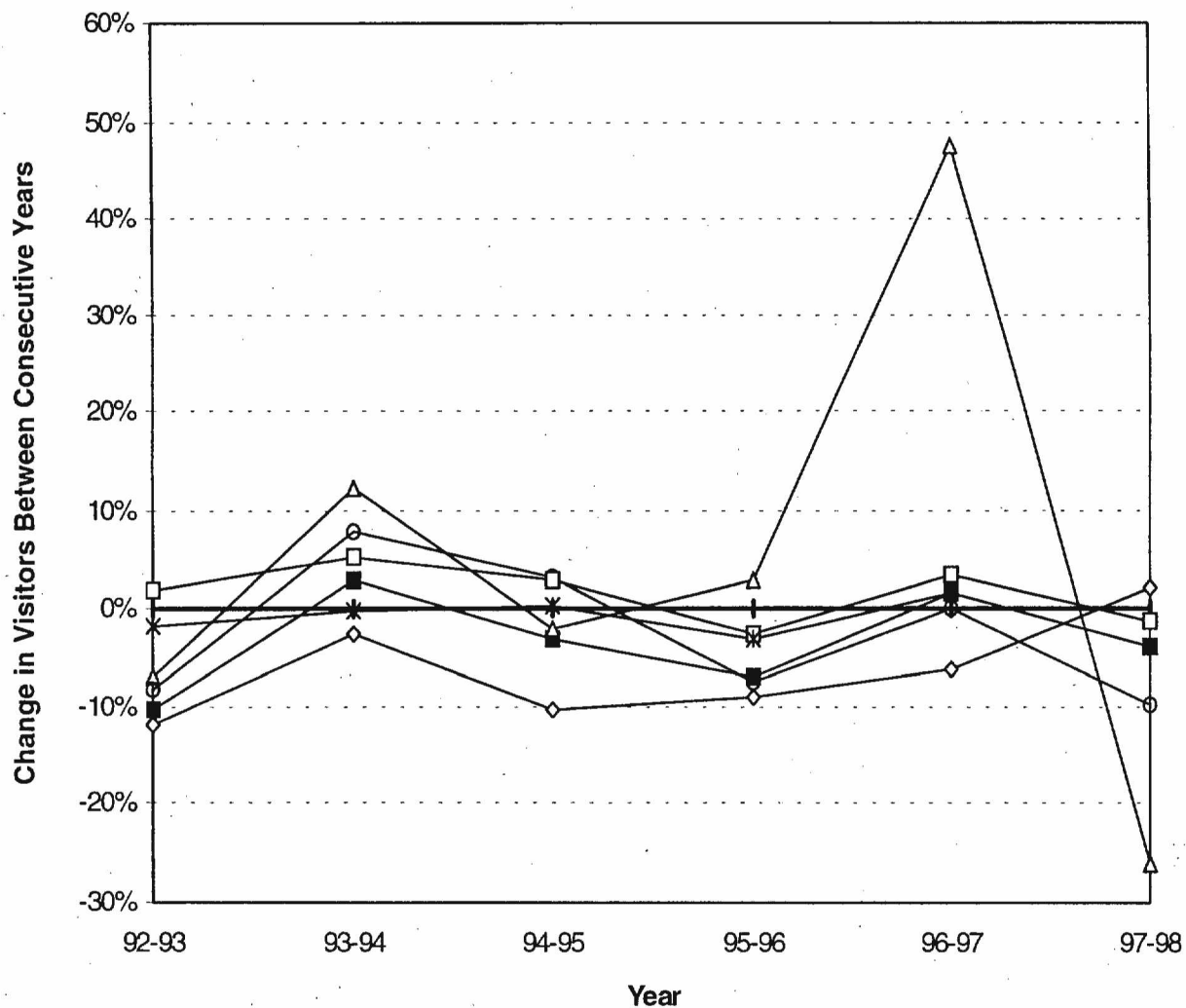
Table 3-3 and Figure 3-5 show the visitation trends at two other non-National Park Service sites in Colorado. The Anasazi Heritage Center visitation trends are similar to those of Mesa Verde. The Colorado Welcome Center visitation numbers have followed different trends, particularly between 1992 and 1996.

TABLE 3-2: VISITS TO THE NATIONAL PARK SYSTEM: SELECT UNITS & PARKS

Geographic Location	1992	1993	1994	1995	1996	1997	1998
All National Park Units ¹	274,694,549	273,120,925	268,636,169	269,564,307	265,796,163	275,236,335	286,715,388
All National Parks ¹	58,729,193	59,785,682	62,984,052	64,754,503	63,061,828	65,258,880	64,461,974
Four Corners States ¹							
Arizona Units ²	12,416,800	12,782,500	12,586,100	12,896,000	12,416,157	12,226,578	11,566,630
Colorado Units	6,153,800	6,132,900	6,029,519	5,837,918	5,870,983	5,853,085	5,820,870
New Mexico Units	2,265,400	2,283,500	2,289,092	2,250,766	2,180,832	2,253,186	2,076,080
Utah Units	9,681,600	9,833,000	9,111,875	8,998,204	9,353,274	8,996,930	8,902,716
Four Corners Total	30,517,600	31,031,900	30,016,586	29,982,888	29,821,246	29,329,779	28,366,296
Vicinity Parks ³							
Aztec Ruins NM	95,500	84,400	82,200	73,800	67,203	63,154	64,072
Canyonlands NP	396,900	434,800	429,900	448,800	447,527	432,697	436,524
Chaco Culture NHP	78,400	73,000	81,900	80,000	82,431	121,900	89,912
Colorado NM	707,300	780,700	496,000	485,000	547,008	548,856	528,964
Hovenweep NM	27,500	26,000	25,300	27,500	27,942	25,079	23,999
Hubble Trading Post	237,100	255,800	241,600	242,900	257,707	269,536	275,937
Mesa Verde NP ⁴	746,900	677,800	699,600	680,800	633,628	648,596	623,510
Natural Bridges NM	140,000	152,300	138,000	147,400	137,168	142,373	127,160
Navajo NM	147,000	137,700	145,400	150,200	129,259	141,490	140,164
Vicinity Parks Total	2,576,600	2,622,500	2,339,900	2,336,400	2,329,873	2,393,681	2,310,242

Source: National Park Service, Statistical Abstracts 1992-1998.

1. Includes recreation visits only.
2. '94 and '95 data include corrections made since the publication of the Statistical Abstracts for those years.
3. Includes recreation and non-recreation visits.
4. Discrepancies between these Mesa Verde data and those in previous tables are the result of rounding and changes made to the data by NPS staff since their publication in the Statistical Abstracts.



Source: National Park Service Data, 2000.

PARKS WITH VISITATION TRENDS SIMILAR TO THOSE OF MESA VERDE

LEGEND

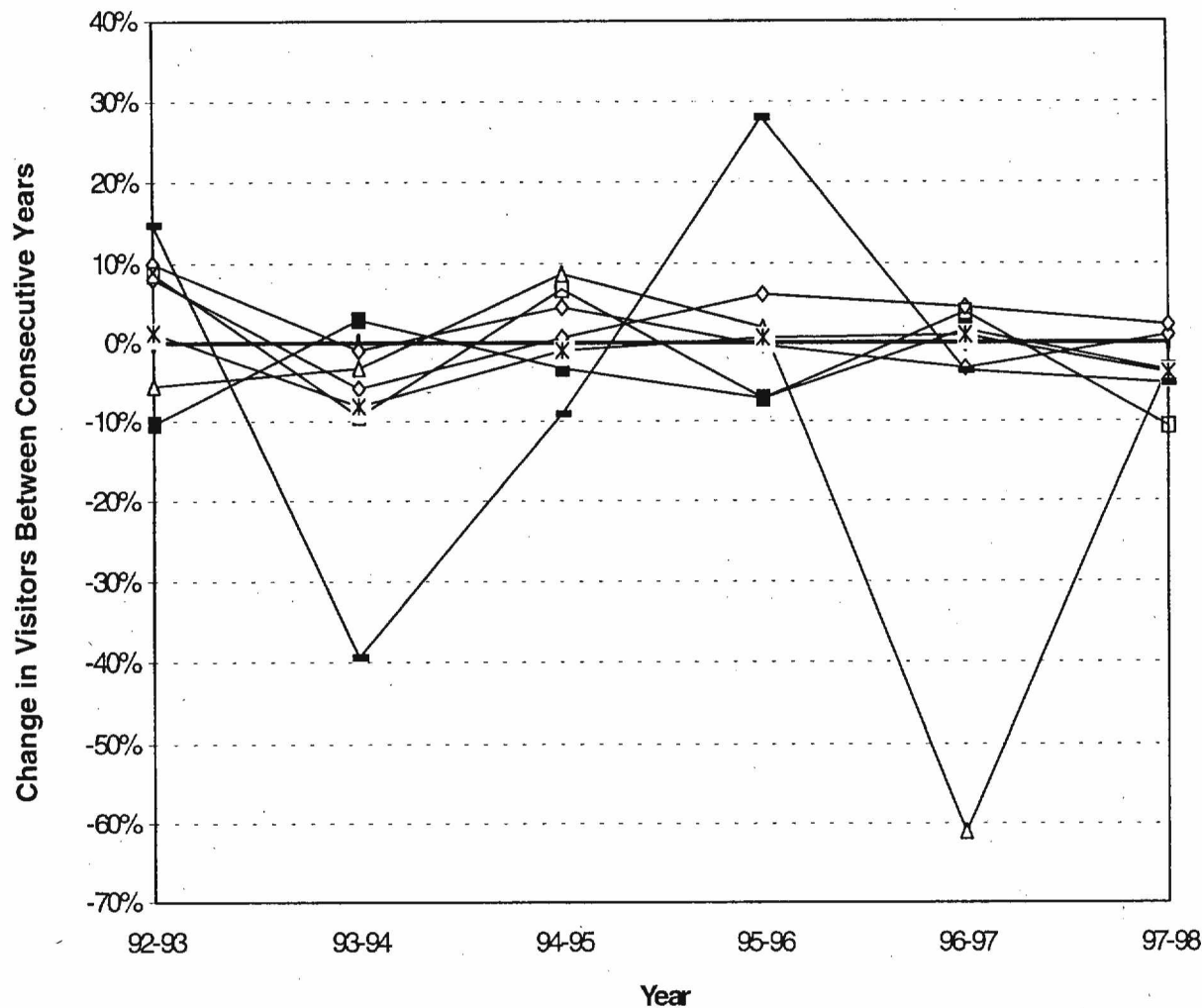
- Mesa Verde
- ◇ Aztec Ruins
- △ Chaco Culture
- Navajo
- All National Parks
- * Vicinity Parks (Except CNM)

Figure 3-3

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

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**PARKS WITH VISITATION
TRENDS DISSIMILAR TO
THOSE OF MESA VERDE**



Source: National Park Service Data, 2000.

LEGEND



Figure 3-4

**MESA VERDE
NATIONAL PARK**

TRANSPORTATION STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC / MAR 2000 /

TABLE 3-3: COMPARISON OF VISITATION AT MESA VERDE AND NON-NPS SITES ¹

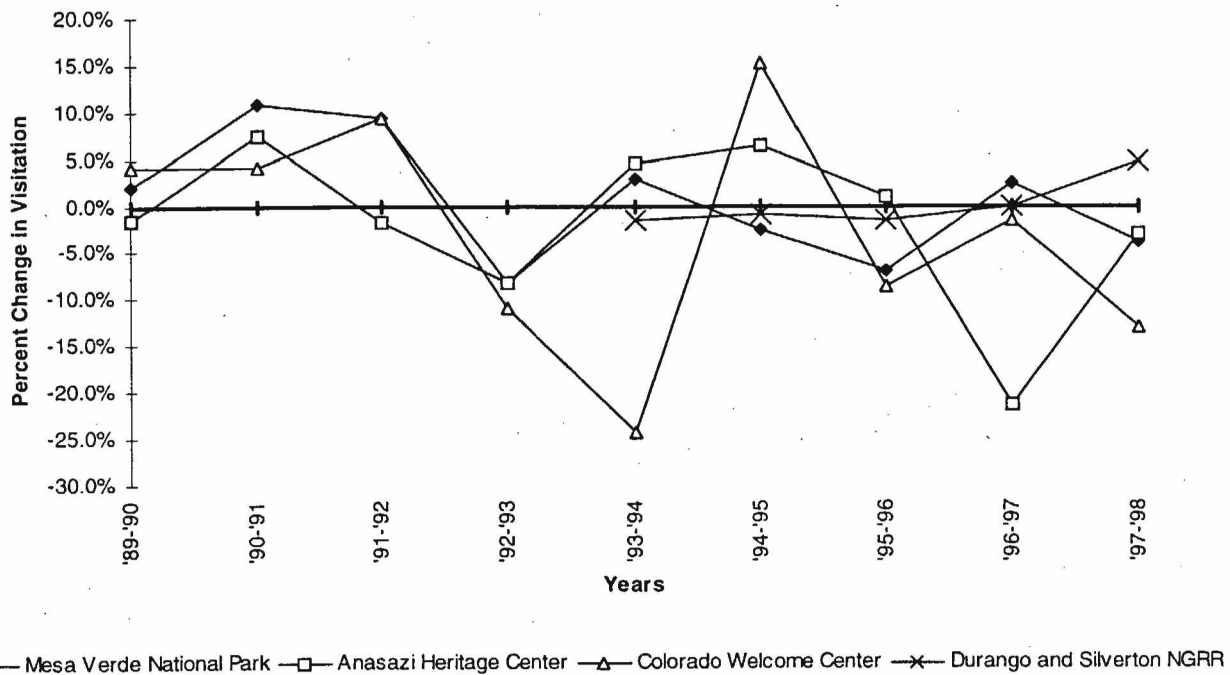
Visitor Site	Visitation									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Mesa Verde National Park	600,045	611,479	678,075	742,020	680,854	699,644	680,833	633,628	648,596	623,510
Anasazi Heritage Center	38,302	37,702	40,542	39,851	36,606	38,272	40,697	41,087	32,246	31,300
Colorado Welcome Center	62,859	65,374	68,102	74,427	66,307	50,214	57,864	52,795	51,974	45,241
Durango & Silverton NGRR					206,723	203,394	201,696	198,504	198,434	208,000

Visitor Site	Percent Change in Visitation								
	'89-'90	'90-'91	'91-'92	'92-'93	'93-'94	'94-'95	'95-'96	'96-'97	'97-'98
Mesa Verde National Park	1.9%	10.9%	9.4%	-8.2%	2.8%	-2.7%	-6.9%	2.4%	-3.9%
Anasazi Heritage Center	-1.6%	7.5%	-1.7%	-8.1%	4.6%	6.3%	1.0%	-21.5%	-2.9%
Colorado Welcome Center	4.0%	4.2%	9.3%	-10.9%	-24.3%	15.2%	-8.8%	-1.6%	-13.0%
Durango & Silverton NGRR					-1.6%	-0.8%	-1.6%	0.0%	4.8%

Sources: Montezuma County Economic Development Council, Anasazi Heritage Center, and Colorado Welcome Center data, 1998.
Durango & Silverton NGRR, 1999.

1. NPS = National Park Service

FIGURE 3-5: COMPARISON OF VISITATION AT MESA VERDE AND NON-NPS SITES ¹



Source: BRW Inc, 2000.

1. NPS = National Park Service

VISITOR SURVEY

Survey Methodology

The purpose of the survey was to determine length of stay and other visitor use patterns. Visitor surveys were conducted at the Mesa Verde National Park entrance station on Friday, July 11; Saturday, July 12; and Wednesday, August 20, 1997. The consultant team administered surveys to the drivers of exiting vehicles, excluding busses. (Bus operations and future capacities for bus operations are discussed separately in Chapter 4.) The July surveys were administered between 3:00 p.m. and 7:00 p.m. A total of 309 surveys were completed over the two days in July. In August, Park Service staff administered surveys during the morning hours and a total of 51 surveys were collected at that time. A combined total of 360 surveys were collected. (Survey tabulations appear in Appendix A with a copy of the questionnaire.)

Duration of Visits at Mesa Verde

Three questions were included in the travel survey to assess the duration of visits at Mesa Verde National Park. One question asked when visitors first arrived at Mesa Verde. Of the 360 respondents; 273 (75.8%) said they arrived "today;" 38 (10.6%) arrived "yesterday;" 39 (10.8%) arrived "two days ago;" and 10 (2.8%) arrived "more than two days ago". Based on the survey results, a large majority of visitors experience Mesa Verde in a single day visit with an overall average visitor stay duration of 5.3 hours.

Two survey questions asked visitors whether their visit involved an overnight stay and, if so, where. Of the 360 respondents 238 (66%) stayed overnight; 157 (44%) stayed overnight in the area, but not in the park; and 81 (22%) stayed overnight in the park. The 122 remaining persons (34%), presumably are a combination of people who are driving through the area and do not stay overnight and people who reside in the area.

Of those who stayed overnight in the area, 134 (51%) stayed in Durango; 83 (31%) of the stays were in Cortez, 39 (12%) in a campground; 8 (3%) in unspecified locations; and 7 (3%) in Mancos. (For those visitors staying more than one night, multiple responses were possible, so the sum of the answers is not equal to the 157.) Of those who stayed overnight in Mesa Verde National Park, 59 (76%) reported staying in the Park's campground, and 19 (24%) stayed at the Lodge.

Visitation Patterns

Ticketed Sites. Tickets are required to visit three sites at Mesa Verde: Cliff Palace, Balcony House, and Long House. Based on the survey results, 45% of visitors to Mesa Verde did not visit any of the ticketed sites; 43% visited one of the ticketed sites; 11% visited two of the three ticketed sites; and 1% visited all three. During the survey period, 110 visits (45%) were made to Cliff Palace; 85 (35%) to Balcony House; and 31 (20%) to Long House.

Other Sites. The 360 surveyed visitors were asked about their visits to the non-ticket sites in the park. Most visitors saw three to four of the eight non-ticket sites listed in the survey form. Accounting for the multiple responses allowed on this question, the 360 surveyed visitors made 1,245 person-visits to the eight sites that did not require tickets.

The data indicate that 73% (261 of 360) of the surveyed visitors went to the Museum; 67% to the Spruce Tree House; 59% to Mesa Top Road; and 41% to Far View Visitor Center. Only one third of all surveyed visitors visited Spruce Terrace or Far View Terrace and only one fifth visited Morefield Campground or Wetherill Mesa.

Size of Visiting Party

The last question on the survey asked visitors how many people were traveling in their party. The most frequent response was two people (147 responses or 41.8%); the second most frequent response was four people (94 responses or 26.1%); and the third most frequent was three people (50 responses or 13.9%). Fewer than 3% were traveling in parties of seven or more (see Table 3-4). The overall average was 3.2 persons per party. This is the same factor that the park uses to establish visitor volumes from traffic counts during June through August. For the remainder of the year, the park uses 2.4 persons per party.

TABLE 3-4: SIZE OF VISITING PARTY

Persons in Party	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	12	3.3%	12	3.3%
2	147	40.8%	159	44.1%
3	50	13.9%	209	58.0%
4	94	26.1%	303	84.1%
5	36	10.0%	339	94.1%
6	12	3.3%	351	97.4%
7	4	1.1%	355	98.5%
8	2	0.6%	357	99.1%
9	2	0.6%	359	99.7%
10+	1	0.3%	360	100.0%

Source: TRA, Inc, July 1997; NPS, August 1997

VISITOR USE OBSERVATIONS

Visitor use observations were made during site visits to Mesa Verde conducted in July of 1997. The purpose of these observations was to provide information about the length of stay and other visitor use patterns at specific locations or attractions within Mesa Verde. The duration of activities and travel were estimated from stopwatch measurements taken on the roads and at sites, following the predominant speed of the vehicles or individuals in a given situation. Maximum and minimum times were estimated by observing the relative differences from the predominant speeds. Because these measurements were taken in July 1997, they may not accurately represent travel times during off-peak periods when traffic is light and site visitation rules change. For instance, Spruce Tree House is self-guided during the summer and may be seen in less than 20 minutes, but in the winter, Spruce Tree House tours are made with a park guide and take one hour.

Park Entrance Experience

At the park entrance gate, visitors pay their entrance fees and are given information about the park (verbal and written). Other information may be given out, such as the need to purchase tickets for some sites. Personal contact time at the entrance is limited by the need to quickly process vehicles.

Entrance Vehicle Travel Time. Table 3-5 shows the vehicle travel times along the main park road between the entrance sign for Mesa Verde near Highway 160 and the 4-way intersection. The 4-way intersection is the juncture of roads leading to the Spruce Tree and Chapin Mesa areas. As the table shows, it takes approximately 34.5 minutes to drive from the entrance sign to the 4-way intersection, a total distance of 19.9 miles. (Average of 35 mph.)

TABLE 3-5: VEHICLE TRAVEL TIMES

From	To	Cumulative Time (min:sec)	Cumulative Distance (miles)
Entrance Sign	Morefield Campground	6:53	3.7
Morefield Campground	Knife Edge/Montezuma	10:35	--
Knife Edge/Montezuma	Park Point	17:46	--
Park Point	Geological Trail	22:10	--
Geological Trail	Far View Visitor Center	25:25	14.7
Far View Visitor Center	Far View Ruin	27:49	--
Far View Ruin	Cedar Tree Tower	32:46	--
Cedar Tree Tower	4-way Intersection	34:31	19.9

Source: BRW Inc., 1997

The estimates of visit duration and visitation capacity presented in the following sections are based on informal observations and judgment of the project staff. They should be confirmed through a more formal visitor use inventory. Similar inventories have been conducted at the South Rim of Grand Canyon National Park, at Mt. Rainier National Park, and at Sitka National Historic Park.

Spruce Tree Area Visitor Use

Duration of Visit. Table 3-6 summarizes the approximate duration of visitation at the attractions in the Spruce Tree area. It is estimated that visitors spend between 36 minutes and 2 hours 44 minutes in the area, with an average of about 1 hour 35 minutes.

TABLE 3-6: SPRUCE TREE AREA DURATION OF VISIT

Activity	Actual Time (min:sec)	Estimated Minimum Visit Time (min:sec)	Estimated Maximum Visit Time (min:sec)
Walk from parking lot	2:00	1:00	5:00
Look at store	3:00	0:00	10:00
Use the restroom	2:00	0:00	2:00
Walk to the Museum	2:20	2:00	4:00
Wait for, then view slides ¹	20:00	0:00	30:00
View displays	32:40	10:00	35:00
Walk to Spruce Tree House	7:25	7:00	10:00
View Spruce Tree House	7:30	5:00	18:00
Walk to Museum	7:25	7:00	15:00
View from Ranger Porch	3:00	0:00	10:00
Walk to Terrace	6:00	4:00	10:00
Get drink/food	4:00	0:00	20:00
Walk to car	1:20	1:00	5:00
Total Time	98:40 (1 hr 38:40 min.)	36:00 (0 hrs 36:00 min.)	164:00 (2 hrs 44:00 min.)

Source: BRW, Inc., July 1997

1. Since the observations were taken, the slide show has been extended to 20 minutes in length itself, so the average actual time may be closer to 25 minutes and the maximum, as shown, of 30 minutes.

Trail Volumes to Spruce Tree House and Petroglyph Trail. Observations were made of visitors walking from the Museum to Spruce Tree House during the period from 3:15 p.m. to 3:45 p.m. A total of 271 trips were observed, 156 uphill from Spruce Tree House to the Museum and 115 downhill to the site from the Museum. From visitor observations, and from a walking trip made by a project staff member, it is estimated that the typical duration of a visit to Spruce Tree House is approximately 20 minutes, including the hike down to the site and back up to the Museum. Visitors that wait to enter the kiva at the site would spend a longer time on their visits. It is estimated that visit durations range in time from minimum of 19 minutes to a maximum of 43 minutes.

Based on NPS data, the annual number of visitors using the Petroglyph trail has varied over the period 1994-1996. In 1994, 13,751 visitors used the trail. That number grew to 14,987 visitors in 1995, but dropped to 13,418 in 1996. These statistics may not be accurate because they rely on the voluntary hiker registry in the ranger office. Not all hikers take the time to sign in.

Spruce Canyon Trail Volumes. Spruce Canyon trail use has been much lower than the Petroglyph Trail. Again, based on the visitor registry, the Spruce Canyon Trail had 2,491 visitors in 1994; 3,685 visitors in 1995; and dropped below 3,137 visitors in 1996-- similar to the trend on the Petroglyph Trail.

Spruce Tree Terrace. Spruce Tree Terrace can accommodate approximately 36 diners inside the building and 76 outside, with an additional 30 in the store and 15 in line. It has typical capacity for about 157 people at one time, with a noontime crush capacity approaching 170 at a time. The observed use of the facility was much lower.

Chapin Mesa Museum. The Chapin Mesa Museum can accommodate approximately 220 to 250 people at any given time. Based upon observation, the distribution of visitors at this attraction are determined by the following limitations: 110-120 people at the displays, 60 persons per half hour viewing the slide show, 20-30 persons in the bookstore, 15-20 persons at the information desk, and 15-20 persons on the porch. Actual time spent at the Museum for a typical visitor is estimated to be about 50 minutes.

Mesa Top Loop

Chapin Mesa Vehicle Travel Times. Table 3-7 shows the travel times from the 4-way intersection through the Sun Temple loop and Cliff Palace/Balcony House loop and return, a distance of 12 miles. The total driving time is just under one half hour at a driving speed of approximately 25 mph. Additional time is spent by visitors at activity areas along the driving route.

TABLE 3-7: CHAPIN MESA TRAVEL TIMES

From	To	Cumulative Time (min:sec)	Cumulative Distance (miles)
Ruins Road	4-way Intersection	0:00	0.0
4-way Intersection	3-way Intersection	0:55	0.4
3-way Intersection	Sun Temple Turn-off Entrance	9:00	3.7
Sun Temple Turn-off Entrance	Sun Temple Turn-off Exit	10:40	4.3
Sun Temple Turn-off Exit	3-way Intersection	13:50	5.6
3-way Intersection	Cliff Palace	18:10	7.4
Cliff Palace	Balcony House	22:40	9.0
Balcony House	3-way Intersection	27:45	11.2
3-way Intersection	4-way Intersection	28:35	11.6

Source: BRW, Inc., 1997

Mesa Top Loop Duration of Visit. Table 3-8 summarizes the approximate amount of time it takes for visitors to experience the sights along the west loop (Mesa Top Loop) of the Mesa Loop Roads on Chapin Mesa. Overall, it is estimated that the visitor experience in the area takes between 25 minutes and about 1 hour 20 minutes, with a typical time of about 45 minutes.

TABLE 3-8: MESA TOP LOOP VISITOR USE TIMES

Activity	Actual Time (min:sec)	Estimated Minimum Visit Time (min:sec)	Estimated Maximum Visit Time (min:sec)
Pit House	4:20	2:00	8:00
Navajo Canyon Overlook	2:00	1:00	4:00
Square Tower Overlook	8:40	5:00	10:00
Pit House/Pueblo Sites	8:00	5:00	15:00
Mesa-Top Ruins	8:20	4:00	15:00
Sun Point Pueblo	2:30	2:00	5:00
Sun Point Overlook	4:50	2:00	8:00
Oak Tree House ¹	0:00	0:00	5:00
Fire Temple	2:30	2:00	5:00
Sun Temple	5:15	2:00	8:00
Total Time	45:25	25:00	83:00 (1 hr. 23 min.)

Source: BRW, Inc. July 1997.

1. No Parking

Cliff Palace Loop Duration of Visit. Cliff Palace Loop visitor attractions include Cliff Palace, Balcony House, and Soda Canyon Overlook Trail. Cliff Palace and Balcony House each take one hour to see with the guided tour. Tickets are required for both of these sites and the ticketing process takes approximately half an hour. Depending upon the number of tickets sold, some wait time may be required between the ticket purchase and the beginning of the tour. Based on information from the park about the busy summer season (June through August), visitors arriving between 3-4 p.m. may not be able to get tickets, except during the first two weeks in August when tickets typically sell out between noon and 2 p.m. On the busiest days of the year, tickets have been known to sell out by as early as 11:00 a.m. Refer to Table 3-9. Even though tickets may not be available for the remainder of the day when sell outs occur, it is very rare to have all possible tickets sold on an individual day. This is because tickets for early tours go unused.

TABLE 3-9: TYPICAL SELL OUT TIMES

Attraction	Summer ¹	Peak ²
Balcony House	3pm - 4pm	12 pm - 2pm
Cliff Palace	3pm - 4pm	12 pm - 2pm
Long House	2pm - 4pm	12 pm - 2pm

1. Summer is June - August

2. Peak is a two week period during the month of August

Source: Mesa Verde, 2000.

Balcony House tours are given to groups of up to 50 persons at a time. The tours are available between 9:00 a.m. and 5:00 p.m. Depending upon the time of year, the tours are provided either hourly or every half hour. The ticket availability is almost double during the peak season as compared to early or late season. Table 3-10 presents the operating information for Balcony House. Please note that season dates shown in Table 3-10 reflect the 1997 season. Dates for the 2000 season would correspond to within a few days of the same date ranges.

TABLE 3-10: BALCONY HOUSE OPERATING INFORMATION

Season Dates	Operating Hrs	Frequency	No. Tours per Day	Tickets per Day
May 11-24	9 am - 5 pm	Hourly	9 tours daily	450 tickets/day
May 25-Sept 1	9 am - 5 pm	½ Hourly	17 tours daily	850 tickets/day
Sept 1- Oct 13	9 am - 5 pm	Hourly	9 tours daily	450 tickets/day

Source: Mesa Verde National Park, 1997

Cliff Palace tours are given to groups of up to 60 persons at a time. The tours are available between 9:00 a.m. and 6:00 p.m. during the peak season or other hours as shown below in Table 3-11. Again, the dates shown in Table 3-11 reflect the 1997 season.

TABLE 3-11: CLIFF PALACE OPERATING INFORMATION

Season Dates	Operating Hrs	Frequency	No. Tours per Day	Tickets per Day
Apr 13-May 10	9 am - 5pm	Hourly	9 tours daily	540 tickets/day
May 11-24	9 am - 5 pm	½ Hourly	17 tours daily	1,020 tickets/day
May 25-Sep 1	9 am - 6 pm	½ Hourly	19 tours daily	1,140 tickets/day
Sept 1- Oct 13	9 am - 5 pm	½ Hourly	17 tours daily	1,020 tickets/day
Oct 14-Nov 8	9 am - 4 pm	Hourly	8 tours daily	480 tickets/day

Source: Mesa Verde National Park, 1997

No estimated time of visitor duration is available for the Soda Canyon Overlook.

Wetherill Mesa

The drive between the Far View Visitor Center and the parking area on Wetherill Mesa is 12.8 miles and takes 32 minutes at an average travel speed of 25 mph. The complete visitor experience at the end of Wetherill Mesa (non-ticketed sites) takes approximately 2.5 hours. This includes hiking to Step House, the Pit Houses, and Pueblos; taking the tram to Kodak/Badger House or Long House, and then walking from the loop intersection back to the parking lot.

Long House Tours. Long House tours are available between 10:00 a.m. and 5:00 p.m., leaving every half hour, for a total of 15 tours per day. Visitors leave the parking area and board a mini-tram that takes them to sites along the loop-road at the end of the mesa. Tickets are purchased at the Far View

Visitor Center. Up to 35 visitors are presently accommodated per tour. The tour capacity is constrained by the capacity of the trams that are used to bring visitors to the trailhead for the Long House tours. A total of 525 tickets are available per day, during the peak season (June-August).

VISITOR INFORMATION AND ORIENTATION

Visitor information and orientation at Mesa Verde National Park consists of:

- road signs
- interpretive trail signs
- information signs at facilities
- maps and brochures
- a highway advisory radio system or "Traveler Information System" (TIS)
- the internet
- National Park Service and concessionaire personnel at the visitor center and throughout the park

Visitor information and orientation is intended to maximize each visitor's ability to have an enriching cultural and historic experience. The road and information signs and the park radio most directly affect transportation within the park. Maps, brochures and the Internet web site assist visitors in making strategic decisions regarding what parts of the park to visit and how to plan their trip. The information conveyed by National Park Service personnel and concessionaire employees also can have a significant influence on the ways in which visitors use the park and travel among its activity areas. Entrance station personnel and the park newspaper inform visitors of the need to purchase tickets for special site tours and advise visitors if tickets for a site are available.

Road Signs

The evaluation of the road signs is qualitative in nature, based upon field observation along the roadway and on the observation of visitors' behavior as they drive on park roads. Some of this information was collected in July 1997 (Lee Engineering), and some is based upon a previous study, *Traffic Safety Study, Final Report* (Lee Engineering, April 1996).

Sign Condition. The 1996 study indicated the need for the improvement or replacement of a number of signs. The clarity of the signs during the day and their lack of reflectivity at night were noted as particular problems. While some of the signs have since been improved or replaced, others still need to be modified.

Directional Information. The 1996 study also noted a number of signs that give information to visitors without giving adequate direction. For example, some visitors appear not to know which way to turn at certain intersections and driveways. The study also documented instances where drivers were observed

turning the wrong way into one-way driveways, using informal pullouts for U-turns, and beginning in one direction only to back up or change direction abruptly in the middle of the turn.

At the Wetherill Mesa Road intersection with the Far View Visitor Center Road, drivers were observed making U-turns and three-point turns to correct wrong-way movements into the one-way gas station driveway. Other drivers at this intersection were observed making similar movements in apparent confusion about whether they wanted to go to Wetherill Mesa or not.

There is a lack of conformity among some of the directional and information signs. Some are the traditional park signs with white lettering on a brown background. Other signs have white lettering on a black background. Different lettering styles and arrows were used as well.

Additional problems relating to information signs include inconsistent or inadequate sequencing of advance information along driving routes and the location, size and content of information signs at activity areas. For example, drivers must pass by several parking spaces before seeing any information signs at the activity areas along the Mesa Loop Roads. At Cedar Tree Tower, no advance signs are provided.

Roadway Striping and Markings. Observations made in 1996 and 1997 indicate that many of the roadway markings had deteriorated and might not be visible to drivers. This included pedestrian crosswalk stripes as well as the white road-edge stripes.

Bicycle Information. Bicycle policy in Mesa Verde has changed over time. In the early 1990s, policies in place appeared to support bicycle use within the park. A concession operation rented bicycles at Spruce Tree Terrace. The 1993 *Regional Transportation Plan* identified a 48-mile loop of existing paved and gravel roads for use by bicycles in Mesa Verde National Park. Two routes were reported to be available from the Visitor Center. The 1993 plan also recommended the maintenance of existing trails and encouraged the coordination of trail development in the region. Photos as recent as 1996 show signs warning drivers to be careful of bicyclists (Lee Engineering, *Traffic Safety Study*, April 1996).

Park policy in the middle to late 1990s, in contrast, has been more cautious about bicycle use within Mesa Verde National Park. The bicycle concession was closed for safety concerns arising from the lack of adequate bicycle/auto separation on the roads. Biking is still permitted on some paved park roads, but bicycles are prohibited from the tunnel. Conditions in the tunnel between the entrance gate and Far View Visitor Center have posed safety problems for cyclists. The tunnel provides inadequate width for shared use by bikes and motor vehicles. Tunnel lighting is not provided, resulting in poor visibility of bikes. Two reported accidents involving bicycles have occurred in the tunnel on the main road. The Mesa Verde information (via the Internet page) advises cyclists that lanes on the road are not designated.

Information Availability at Major Facilities

Based on July 1997 observations at the Visitor Center, many visitors were not well-informed about the visitation choices at the park and the ticket system for major park facilities. Park staff asked the fifty-odd people waiting in the queue leading to the Visitor Center entrance if they knew why there were standing in line. Only one or two of the visitors indicated that they knew the reason for the queue. There appeared to be a misunderstanding among some visitors regarding the amount of time necessary to visit the ticketed sites. Two things were unexpected for those visitors: the amount of wait time that might be

required between the purchase of the tickets and the start time of the tour, and the duration of the guided tour itself. The ticket operation has been improved and streamlined in the intervening years, resulting in shorter lines and improved visitor understanding.

The growing number of foreign visitors presents significant challenges in communicating relatively complex and unfamiliar concepts regarding the need for tickets and the time and effort required to visit some features. Visitors need a great deal of information, which is currently conveyed most effectively through in-person contacts with park and concession personnel.

Maps and Brochures

The maps and brochures appear successful in directing visitors to ticket sales or to a particular site. What could be improved, however, is the general understanding of the ticket system; the features of the individual ticketed sites that would influence visitor decisions about which site to visit; and the availability of tickets to ticketed sites and an indication of the amount of time that is required to see/experience the sites. Even though this information may be better communicated through in-person contacts with park and concession personnel, redundant or backup information may still be required.

Frustration was expressed by some visitors completing the exit survey who drove many miles into the park before obtaining the information required to effectively plan their trip. Visitors that take the time to review the printed materials passed out at the entrance station, or listen to the radio program, would find most of the needed information. Possibly those visitors who reported frustration did not find the written materials to be an effective communication medium. The Mesa Verde Museum Association was (and is still) in the process of producing new trail guides that may help eliminate visitor confusion. As of late 1998, the Mesa Top and Far View maps had been updated, with maps of other locations and foreign language maps still to come.

Traveler Information System

A limited-coverage radio station is operated in Mesa Verde National Park to provide supplemental information to park visitors. Called the Traveler Information System (TIS), the radio station provides a description of visitor services and an overview of the major features of the park. It also informs visitors of the need to purchase tickets for tours of Cliff Palace, Balcony House and Long House. No information was gathered in the July or August surveys about the radio station, but future surveys could determine the percent of people who tune in and ask additional questions about its effectiveness.

Internet Websites

Mesa Verde National Park maintains a web page as part of the National Park Service web site (www.nps.gov/meve/). At this web location, visitors are able to obtain information on a variety of subjects, including operating hours and policies, park statistics, the history of the park, and current events. Information is also posted on permits and fees, camping and lodging, accessibility, climate and weather, and links to two related sites.

The Mesa Verde National Park Museum Association maintains a web site (www.mesaverde.org). By connecting to this web site via the Internet, visitors are able to obtain information about materials available at the museum and through the bookstore. The Mesa Verde Museum Association (MVMA), a

non-profit organization, authorized by Congress, and established in 1930, supports various educational, interpretive, and research programs for Mesa Verde National Park.

Although not sponsored or endorsed by the park, a link is available through the park's website to a site maintained by its concessionaire, ARAMARK (www.visitmesaverde.com). This website provides information on the concession-operated facilities such as the campground, the restaurants, the Far View Lodge, and site gift shops. Prices, reservations, and tour packages are available through this site.

FUTURE VISITATION

High volatility in annual Mesa Verde NP visitation since 1970 makes it difficult to project future growth with confidence. Variations in visitation levels reduce the precision with which statistical methods are able to project future trends. Visitation patterns during the period from 1945 to 1962 showed nearly constant annual growth of about 1.5% per year. Visitation increased at even higher annual rates between 1962 and 1970. Since 1970, however, visitation at Mesa Verde has been sporadic and unpredictable with high variations from year to year. Uncertainty and lack of precision require the user of projections made with these data to accommodate a wider range of possibilities in developing alternative transportation strategies. As will be seen below, a single projection of future conditions is not sufficient. Instead a projection bracketed by high and low estimates is required.

While past data create a high level of uncertainty, future plans for the park also introduce possible changes in park visitation and visitor use patterns. Primary among these plans is the Cultural Center, proposed to open by 2006 near the park entrance. This project is described in more detail below.

Effect of the Proposed Cultural Center on Forecasts

The Cultural Center is proposed to be developed at the entrance to Mesa Verde NP. The effect of the cultural center on future visitation will depend upon the visitor services offered and the marketing efforts of the center operators. If the center becomes a well-known regional attraction, it could increase visitation by as much as 10% (BRW estimate). The percentage of visitors attracted to the cultural center that would also make a trip into the park's interior is unknown. Most people currently visit Mesa Verde on a one-day trip. The center could attract visitors who might otherwise bypass the park all together, thereby drawing more people into the park. It also could encourage visitors to stay in the area longer, by exposing more people to the compelling of the people of the region.

Although increases in visitation caused by the Cultural Center are likely to be spread out over several years, we have identified a maximum visitation scenario in which a 10% increment in visitation is experienced in the opening year of the center (2006). A higher base visitation is then carried forward into future years, with incremental growth occurring in each year.

Methodology to Predict Future Visitation

Recognizing the high variability in recent park visitation, a variety of alternative growth projections were tested. Each of the projections was judged as to whether it was reasonable and defensible.

The first premise of "reasonableness" means several things: that the projected growth rate appears to be sustainable over the 20 years of the study horizon, that the growth rate closely relates to or matches some other known trends, and may therefore be explained easily to other audiences. The second premise

of “defensibility” means that statistical methods have been applied to select growth rates in a logical and objective manner.

Various methods were tested, with visitation growth rates ranging from 0.1% per year to 3.6% per year. Growth rates used by other agencies, depending upon the source, varied substantially. The National Park Service Visitor Statistics Unit uses a growth rate of 1.9% per year to forecast future nation-wide visitation, but doesn’t have a growth rate calculated specifically for Mesa Verde. The Colorado Department of Transportation uses a growth rate of 1.3% (CDOT) per year to forecast increased traffic on many of the highways near Mesa Verde. The Colorado State Demographer uses an annualized growth rate of 1.5% to project the population of the county in which Mesa Verde lies, Montezuma County. Montezuma County transportation staff uses a rate of 3.6% per year to project increases in traffic on county roads.

Some growth projections that were tested that relied on simple annual growth in visitors. Other projections relied on independently calculating rates from traffic and visitors both within and outside Mesa Verde. This was done based on the experience of Montezuma County staff that state rates, particularly CDOT growth rates, have tended to underestimate actual growth. On a regional basis, improvements are being made to US 550 between Farmington and Durango, and improvements have been suggested for US 666 between Shiprock and Cortez. Increased accessibility is often associated with increased growth, although a direct correlation to Mesa Verde visitation would be difficult to establish.

Recommended Projection of Mesa Verde’s Future Visitation

The recommended methodology of projecting visitation to Mesa Verde is as follows:

- Present low, moderate, and high estimates to account for the variability in visitation that has been observed since 1970.
- Use a base year of 1997 that corresponds to the majority of the traffic information collected at Mesa Verde.
- Account for the different response rates of visitation to the Cultural Center opening in 2006.

Low Growth. The low growth projection method uses the CDOT average annual growth rate of 1.3% per year. For the low growth projection, no additional increase in visitation is assumed related to the Cultural Center opening.

Moderate Growth. The moderate growth projection method uses the average of the high and low growth rates and equates to 1.6% growth per year. Related to the Cultural Center opening, the moderate growth method assumes an additional increase in visitation of 5% in 2006.

High Growth. Finally, the high growth projection uses the NPS nationwide growth rate of 1.9% per year. Related to the Cultural Center opening, the high growth rate assumes an additional 10% increase in visitation in 2006. By 2020, this high growth projection matches the 2020 projection computed from a linear regression of visitation data between 1945 and 1999.

Table 3-12 and Figure 3-6 present the projections resulting from these three growth estimates. With the high growth projection, the total number of visits to Mesa Verde in 2020 is expected to reach approximately 1.1 million. The moderate growth projection reaches approximately 983,400 annual

visitors in 2020, and the low growth projection estimates approximately 877,000 annual visitors in 2020.

TABLE 3-12: PROJECTED VISITATION TO MESA VERDE NP, 1997 – 2020 ¹

Year	Low Growth	Moderate Growth	High Growth
1997	648,596	648,596	648,596
2005	720,400	737,000	753,900
2006 ²	729,900	786,300	845,200
2010	769,200	838,200	911,200
2015	821,300	907,900	1,001,200
2020	877,000	983,400	1,100,000

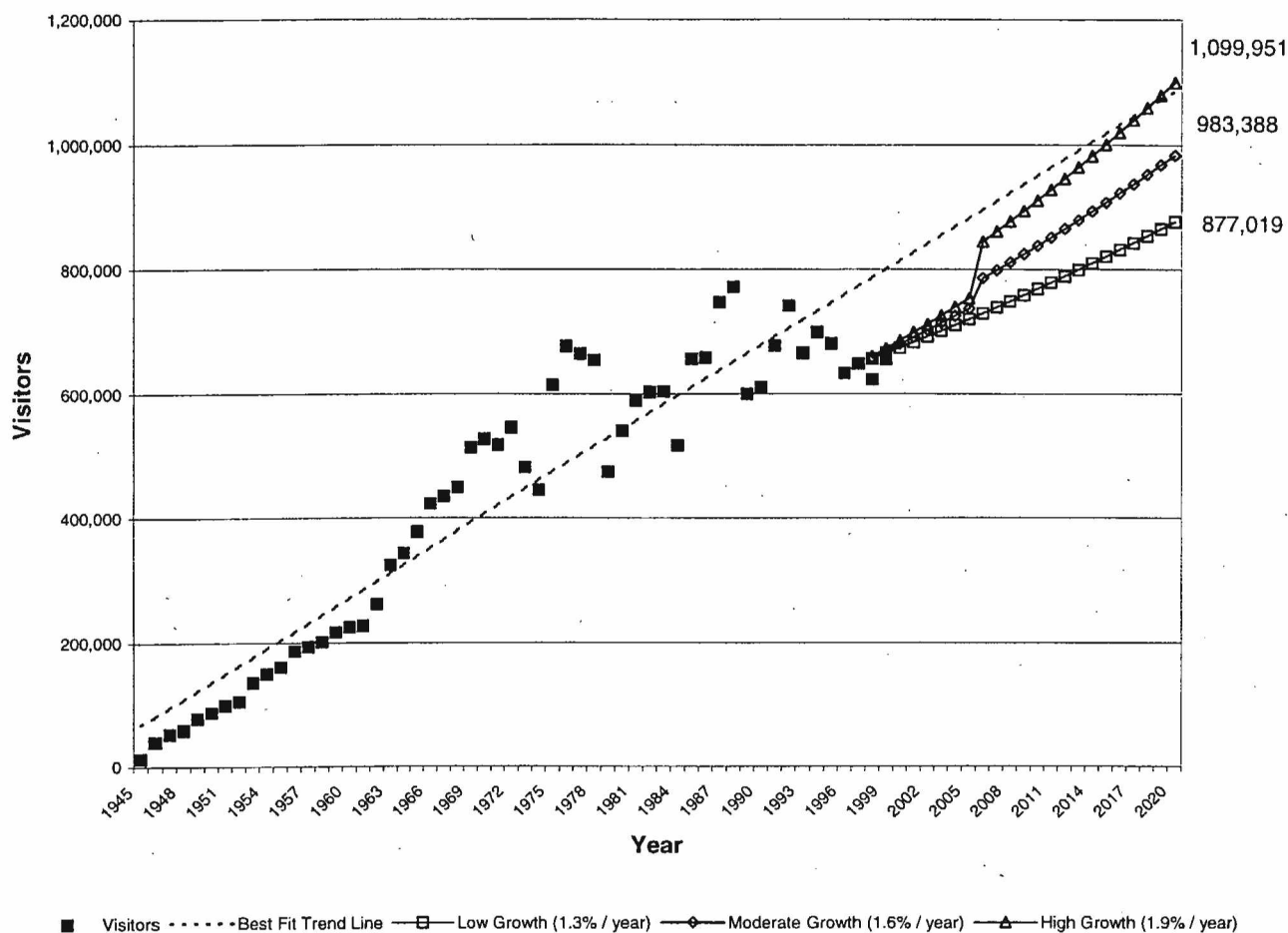
Source: BRW, Inc., 2000.

1. Data rounded to the nearest hundred except 1997, which is actual visitation.

2. Estimated Year of cultural Center Opening.

The moderate growth projection is used throughout the remainder of this report and is applied to traffic growth as well. It is assumed that the ratio used by the park of 3.2 visitors per vehicle will hold constant through to the study horizon of 2020. Future studies of visitor use and transportation should consider the implications of the potential range in future visitation when recommending improvements and management actions.

FIGURE 3-6: PROJECTED VISITATION TO MESA VERDE NP TO THE YEAR 2020



Source: BRW, Inc., 2000

CHAPTER 3 SUMMARY

Based upon the information presented in this chapter, the following summarizes the main findings and conclusions applicable to the remainder of the study:

Visitation Trends

- Since 1970, year-to-year visitation has had significant variability.
- Over the last ten years, 1989 – 1999, visitation has remained between 600,000 and 750,000 per year and does not show a clear trend.
- In the Four Corners area, Mesa Verde draws the largest number of visitors of any attraction.
- The months of June through August are the peak visitation months. An average of 61% of annual visitation occurs June through August. An average of 83% of visitation occurs from May through September.

Visitor Characteristics

Based on visitor surveys conducted in August 1997, the “typical” visitor has the following characteristics:

- Spends one day at Mesa Verde (75%)
- Stays an averages of 5.3 hours in the park
- Arrives at approximately 10:00 a.m. and stays until about 3:00 p.m.
- Arrives in a party containing 2-4 people (81%)
- Stays overnight one night in the surrounding area (66%)

Visitor Use Observations

- From the entrance sign just off of Highway 160 it takes the average visitor 25 minutes to reach the Far View Visitor Center and 35 minutes to reach the Museum/Spruce Tree/Headquarters area.
- From the Museum/Spruce Tree/Headquarters area it takes 20 to 25 minutes to reach one of the ticketed sites on Chapin Mesa (Cliff Palace or Balcony House)
- The typical visitor spends approximately 1 hour and 40 minutes to see the Museum/Spruce Tree/Headquarters area.
- Tickets for all three ticketed sites (Cliff Palace, Balcony House, and Long House) generally sell out between 3 and 4 p.m. in the summer except during the early weeks of August when the

tickets sell out between 12 noon and 2 p.m.. Even though tickets sell out, all available tickets are rarely used.

Visitor Information and Orientation

- Inconsistencies in and the condition of directional and information signs and road markings cause some visitor confusion.
- The maps and brochures appear successful in providing locational directions. Some visitors still appear to have difficulty understanding the ticketing system.

Future Visitation

The recommended methodology of projecting visitation to Mesa Verde is as follows:

- Present low, moderate, and high estimates to account for the variability in visitation that has been observed since 1970.
- Use a base year of 1997 that corresponds to the majority of the traffic information collected at Mesa Verde.
- Account for the different response rates of visitation to the Cultural Center opening in 2006.

The projection used for the remainder of the report assumes 1.6% growth per year with an additional jump in visitation of 5% in 2006.

CHAPTER 4: TRANSPORTATION AND ACTIVITY AREA OPERATIONS AND CAPACITY ANALYSIS

The purpose of this chapter is to analyze transportation conditions and to identify existing capacity constraints at Mesa Verde. The capacity analysis is done in a step-wise fashion, looking at the individual component parts, balancing demand against supply. The front end of this chapter is primarily focused on the transportation system: roads, parking, and public transportation. Later in the chapter, some preliminary estimates are also made for the carrying capacities of the visitor sites themselves. Together, these component parts are synthesized into a discussion of overall capacity of the park and subareas within the park.

This chapter contains five main sections. First is an overview of the capacity analysis procedures. The second section on traffic addresses roadway capacity, intersection capacity, speed studies, and traffic safety concerns. Third is a section on parking capacity. Fourth is a section on the capacity of the public transportation system. Finally, the section on visitor area capacity addresses the carrying capacities of individual sites and concludes with a combination of the individual areas into an initial estimate of overall park capacity based on current management practices. The capacity estimates presented here should be viewed as a starting point for determining the carrying capacity of the park and its features. Little or no consideration of resource conditions or visitor experience has been included in this initial assessment of carrying capacity.

CAPACITY ANALYSIS OVERVIEW

Planning for transportation facilities and services in Mesa Verde balances demand for the facilities against the capacity of those facilities/services. The previous chapter began establishing the "demand-side" of the equation by projecting visitor growth and describing visitation patterns. See Table 4-1 for a listing of demand side and supply side topics. The growth projections are applied in this chapter to counts of vehicles on roadways, at intersections, and in parking lots. Thus vehicular demand is established now and into the future.

The "supply-side" of the equation is established by providing information about the physical and operational constraints of the existing transportation facilities and services. The number of lanes, the number of parking spaces, the traffic control devices, the bus system, and other constraints affecting the "supply-side" are all described.

TABLE 4-1: CAPACITY CONSTRAINT TOPICS

Demand Side	Supply Side
Average Vehicle Occupancy (# of persons/car)	Road Capacity
Distribution of Arrival & Departure Times	Parking Capacity
Duration of Visits at Sites	Public Transportation Capacity
Ticket Sales for Tour Sites	Acceptable Visitor Crowding and Displacement
Distribution of Visitors Among Sites	Resource "Carrying" Capacity of Each Site
	System-wide Capacity

Source: BRW, Inc., 2000.

With both sides of the equation filled out, comparisons can be made and conclusions can be drawn about constraints. There are three time periods for which capacity may be considered: people at one time, people per hour, or people per day. Most of the component parts of the park have capacities that are best expressed as people at one time or people per unit of time (per hour). For example, parking capacity directly determines people at one time in the area served by the parking area. On the other hand, the park road can serve a certain number of vehicles per unit of time, which translates into people per hour. Extending these two examples, in order to estimate the number of people per hour that can use a parking area, we need to know both the size of the parking lot (people at one time) and the amount of time the average user spends parked in the lot. If the length of stay is 30 minutes, then the people per hour served by the lot is twice as many as the people at one time. Once we know how many people per hour can use a parking area or road, we must know how the demand for these facilities varies over the course of a day to estimate how many people per day can use the facilities. Demand is rarely spread evenly over the day and usually peaks for two to three hours during the day. As a result, estimating daily capacity requires factors to convert hourly capacity to daily capacity. The factors can vary by individual site in the park.

TRAFFIC DATA AND ANALYSIS

This traffic data and analysis section begins by discussing two pieces of background information; regional growth in vehicle miles traveled, and travel patterns specific to Mesa Verde. This background information provides the context for the level of service analysis discussions, speed study results, and other traffic safety observations.

Regional Vehicle Miles of Travel

The *Regional Transportation Plan for the Southwest Transportation Planning Region* (1993) reported that the Southwest TPR experienced a high growth in vehicle miles traveled (VMT) between 1987 and 1992. The annual average VMT growth rate at the time was 3.0%, higher than Colorado's 2.2% statewide annual VMT growth rate. The Southwest Colorado 2020 Transportation Plan (1999) forecasts a VMT growth of approximately 2.0% per year between 2000 and 2020, which is a composite of a slightly lower growth rate (1.8% per year) for truck VMT and a slightly higher growth rate (2.1% per year) for passenger cars.

Montezuma County, within which Mesa Verde is located, experienced a growth from 438,160 average VMT per day in 1987 to 523,168 VMT per day in 1992. This translates to an average annual VMT growth of slightly over 3.6% per year. The Southwest Colorado 2020 Transportation Plan provided projections based on functional classification rather than county based projections so no direct comparison is possible. Highway 160 is in the rural primary arterial classification, and that class of roads is projected to grow by 1.5% per year between 1995 and 2020.

Vehicle Movements

Turning movement counts, with vehicle classifications, were taken at three intersections during July 11 and 12, 1997. The results of those counts, in terms of vehicle characteristics are summarized below. Refer to the Turning Movement Counts map.

TURNING MOVEMENT COUNT DATA

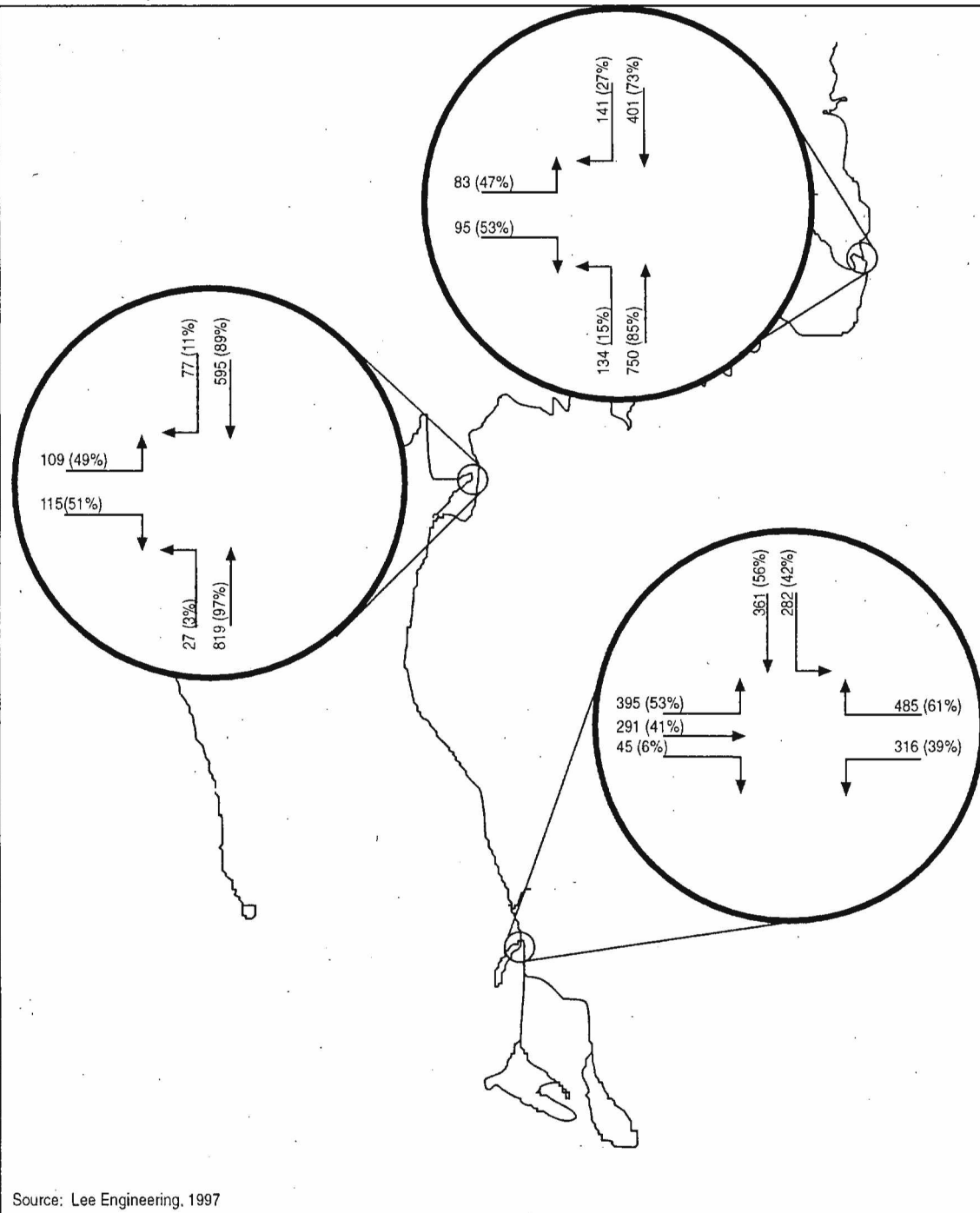


LEGEND

Scale of

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC / DEC 97 / XXXXXX



Source: Lee Engineering, 1997

East Rim Road at Morefield Campground Entrance. The total traffic volume entering the park approaching the Morefield Campground turn-off is composed of 87% cars, 11% recreational vehicles, 1% busses, and 1% trucks. Approximately one-fourth of all the entering autos and motorcycles turn right into the Morefield Campground, while three-fourths continue south into the park. In contrast, 45% of all recreational vehicles turn right into the campground, and 55% continue south into the park.

Vehicles exiting the park, as might be expected, exit in similar proportion to those entering. The one exception is that fewer vehicles turn into the campground. Approximately 15% of autos and motorcycles and 29% of recreational vehicles approaching Morefield from the north turn into the campground area.

Park staff reported perceiving a higher percentage of busses in the shoulder months, particularly in the fall. Park entry data on the number of bus entries to the park are consistent with this observation only in terms of relative proportions. Absolute numbers of busses are highest, like auto traffic, during the summer.

Total monthly bus entries were analyzed between 1993 and 1996. Monthly bus entries tended to be low (less than 30 per month) January through March, more than double in April (60-80 busses), and hit a relatively uniform high of 250-400 entries for May, June, and July. Monthly bus entries drop off somewhat in August and rise again to early summer levels for the month of September. In October the bus entries drop by more than half (to approximately 130) and return to low levels for November and December. While car entries are still growing in May and declining in September, bus entries stay high, making the proportion of busses as a percentage of total entries rise in those months. In no case were bus entries observed to be more than 3/4 of one percent. No further information was available as to the impact of bus entries on vehicle flow, safety, and road condition in these shoulder periods.

Chapin Mesa Road at Wetherill Mesa Road. At this intersection, 11% of vehicles make the southbound to westbound right turn, including 11% of recreational vehicles. The remaining 89% of the approaching traffic continues south. The distribution at this intersection is reflective of lower visitation to Wetherill Mesa as compared to Chapin Mesa. The distribution for recreational vehicles is the same as autos and motorcycles, indicating that visitors in RV's and autos are equally likely to visit Wetherill Mesa. This occurs despite the fact that there is an RV size limitation on Wetherill Mesa Road of 25 feet or less.

In the northbound direction, only 3% of vehicles make the westbound left turn to Wetherill Mesa. This number includes autos, motorcycles, and RV's.

Chapin Mesa Road at Mesa Loop Roads. This intersection, also known as the "4-way", operated like a three way intersection, since during the count period the south leg accommodated only southbound traffic (see Figure 4-1). Southbound traffic from the intersection traveled into the Spruce Tree area and continued around a one-way loop to the west leg of the 4-way intersection. Since the count period, the Spruce Tree Loop Road has been reversed to serve counter-clockwise flow. The distribution of southbound approach traffic was as follows: 56% continued southbound, while 44% made eastbound left turns onto Mesa Top road. The RV traffic movements were proportional to general traffic movements at this intersection.

At the east leg of the intersection, approximately 61% of the traffic made westbound to northbound right turns while 39% made the westbound to southbound left turn. The RV traffic, in contrast, was distributed evenly between these two movements.

At the west leg of the intersection, approximately 53% of the traffic made the eastbound to northbound left turn, 41% continued straight across to Mesa Top Loop, and 6% turned back into the Headquarters/Museum area. The turning characteristics of RV's did not appear to differ significantly from those of autos. The 6% that turned back into the Headquarters/Museum area is considered significant by park staff and may be indicative of the number of visitors who were confused by the current directional signs and information.

Roadway Level of Service (LOS) Analysis

Level of Service Defined. Roadway level of service (LOS) is a measurement of operational conditions within a traffic stream, as well as the perception of those conditions by drivers and/or passengers. LOS on a given road is a composite measure of speed and travel time, the freedom of individual vehicles to maneuver, and the likelihood of traffic interruptions or delays. The comfort, convenience and relative safety of travel are affected by the quality of traffic flow as measured by LOS.

Six levels of service are defined in the *1994 Highway Capacity Manual, Special Report 209* for several types of roadway facilities. The levels of service are given letter designations, from A to F, with LOS A representing the best operating conditions and LOS F the worst. The service levels apply to typical operating conditions. Accidents, weather, road conditions, and other incidents (such as delays from animal viewing) are not addressed by the LOS measures. For these reasons LOS measures need to be considered carefully to make appropriate judgements in park settings. The impacts of incidents or degraded road conditions on traffic flow is greater for the lower LOS ranges of operation (LOS D, E, or F).

The following definitions have been developed for each LOS for continuous roadways such as rural highways and in some more urban settings: (Source: *Highway Capacity Manual, Special Report 209* of the Transportation Research Board, 1994.)

- **Level of Service A represents free flow.** Individual users are virtually unaffected by the presence of others on the road. Nearly all drivers are free to select their desired speeds and to maneuver within the traffic stream. The general level of comfort and convenience provided to the motorist is excellent.
- **Level of Service B represents high quality, stable traffic flow.** The presence of other users in the traffic stream begins to be noticeable to individual drivers. The freedom to select desired speeds is relatively high but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided to individual travelers is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior. On a LOS B road in Mesa Verde National Park, slow-moving vehicles, especially in the uphill direction would delay a few users.
- **Level of Service C marks the beginning of the range of traffic flow in which the travel of individual users becomes significantly affected by other vehicles in the traffic stream.** The selection of speed by most users is affected by the presence of other vehicles. Maneuvering within the traffic stream requires substantial vigilance on the part of the driver. The general level of comfort and convenience declines noticeably at this level. On a LOS C road in Mesa Verde National Park, slow-moving vehicles would delay many drivers.
- **Level of Service D represents the upper end of traffic volumes that can be accommodated while maintaining stable traffic flow.** Vehicle speeds and the freedom to maneuver are severely restricted for nearly all users. Drivers and pedestrians experience a generally poor level of comfort and convenience. Most users on a LOS D road in Mesa Verde National Park would be delayed by other vehicles, and visitors would perceive conditions as crowded.

- **Level of Service E represents operating conditions at or near the capacity of the roadway.** All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is virtually non-existent, and maneuvers require drivers to force vehicles or pedestrians to "give way". Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor disruptions within the traffic stream will cause all traffic to stop.
- **Level of Service F is used to define forced flow.** LOS F occurs when more traffic attempts to use a road segment than the capacity of the segment. Long queues form in the traffic stream. Operations within the queues are characterized by stop-and-go waves, and flow is extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Comfort and convenience are extremely poor and drivers may become frustrated.

Some of the major roads in heavily visited parks in the National Park System experience LOS D or worse during peak visitation periods. For example, the peak traffic flow on the Going to the Sun Road in Glacier National Park was estimated at LOS E from Logan Creek to Rising Sun in 1984. In 1989, the peak summer conditions on the El Portal entrance road in Yosemite National Park were estimated to be LOS E. Most roads in the South Rim area of Grand Canyon National Park were estimated to operate at LOS D during peak periods in 1990. In 1996, the peak summer conditions on the main roads in Yellowstone National Park were estimated at LOS D.

Approach. A LOS analysis was performed on all major roadways within the park (Lee Engineering, July 1997). The *1994 Highway Capacity Manual, Special Report 209* states that the LOS criteria for two-lane rural road segments is based on the average travel speed and the service flow rate provided, given the terrain and availability of passing zones. As traffic volumes increase on a given road, congestion rises, delays increase, and the LOS declines. Several factors can affect roadway LOS:

- vehicular volumes
- number of lanes
- lane widths
- shoulder widths
- roadway grade
- class of vehicles

Traffic flow within the park is affected by a variety of unique factors related to a national park. Long distance viewing of archeological sites and natural vistas attracts motorists to the pullouts. If large numbers of viewers are attracted to a particular pullout, motorists may stop along the roadside, encouraged by the apparently popular view. Furthermore, many visitors will drive well below the speed limits so they won't miss any sights along the road and/or so they can safely navigate an unfamiliar, and in the case of Mesa Verde, difficult road. Park rangers note this situation often causes dozens of vehicles to queue behind a slow-driving vehicle, resulting in almost double the travel time between two

destinations. Rangers and other park employees report driving within the park a frustrating and often dangerous experience. Levels of service in Mesa Verde National Park are lower than a typical two-lane road would be with similar traffic volumes (see Table 4-2). This is also due to the mountainous terrain, the limited number of no passing zones, and the narrow shoulders of the park roads.

Data Collection. Hourly traffic counts were collected in July 1997 (Lee Engineering), at the following locations:

- Morefield Campground/Chapin Mesa Road intersection
- Wetherill Mesa Road/Chapin Mesa Road intersection (Far View)
- Mesa Top Road/Chapin Mesa Road intersection (4-way)
- Wetherill Mesa Road
- Eastbound US 160 off-ramp
- Westbound US 160 off-ramp

Data were also used from traffic counts collected in 1994 and 1995 (NPS and Lee Engineering). These data were then factored to 1997 using a growth rate proportional to the growth rate of other roads in the park. Counts were also factored to represent year 2006 (+21.2% from 1997-2006) and year 2020 (+51.6% from 1997-2020) design hour conditions. This data was factored using the medium Mesa Verde National Park visitation growth rate.

Roads are planned and designed based on a design hour volume of traffic. The design hour does not represent the maximum demand on the road, but is selected to represent typically busy conditions. Because each park is unique in the distribution of visitation over the year and during each day, no NPS standard can be developed to select a design hour for park roadways. For traffic in Mesa Verde National Park, traffic flow on an average peak season day is used to establish the design hour for planning and design purposes. Therefore, counts were factored to represent the peak season of the year, June-August. During the peak season, average daily traffic volumes are nearly 2 ½ times the average annual daily traffic volumes.

Table 4-2 summarizes the results of the roadway level of service (LOS) analyses conducted by Lee Engineering. The table shows the existing (1997) and predicted flow rates (2006 or 2020), the LOS category, and the thresholds for each LOS category on that road segment. Table 4-2 and the discussion below both begin at the US 160 interchange with the road leading to the park and proceed further and further into the park from that location.

TABLE 4-2: SUMMARY OF ROADWAY LEVEL OF SERVICE ANALYSES

Location	1997		2006		2020		LOS Thresholds (Upper Limits)				
	Flow Rate	LOS	Flow Rate	LOS	Flow Rate	LOS	A	B	C	D	E
US 160 to Entrance	492	C	596	C	746	D	85	331	662	1,280	2,430
Entrance to Morefield	353	D	428	D	535	E	26	156	259	480	1,260
Morefield to Far View	413	D	501	E	626	E	26	156	259	480	1,260
Far View to Chapin Mesa	312	C	378	C	473	D	77	249	469	737	1,697
Spruce Tree Loop	183	B	222	B	277	B	171	280	453	701	1,333
Mesa Top Road	418	D	507	D	634	D	46	190	410	661	1,679
3 Way to Cliff Palace Loop	260	C	315	C	394	C	48	198	425	685	1,741
Cliff Palace Loop	162	A	196	B	246	B	171	280	453	701	1,333
3-way to Mesa Top Loop	156	A	189	A	236	A	241	395	638	988	1,877
Mesa Top Loop	114	A	138	A	173	B	171	280	453	701	1,333
Far View to Wetherill Mesa	93	B	113	B	141	C	13	127	203	419	1,203

Source: Lee Engineering HCS Output, BRW, Inc., 2000.

Approach and Entrance Station LOS. The first section of road for which LOS analyses were performed is the two-lane road between the US 160 interchange and the park entrance station. This section of road currently operates at LOS C, and is expected to operate at LOS C in 2006 and LOS D in 2020.

The southbound lane approaching the park entrance tapers out to two lanes as it approaches nears the entrance station. Two entrance lanes and entrance booths, collectively called entrance stations, serve traffic entering the park. Each of the entrance lanes is 170 feet long.

A traffic queuing analysis was performed at entrance station to determine vehicle congestion at this location. The inbound flow volume was obtained from traffic counts collected in July 1997. Based on discussions with Mesa Verde National Park staff, a service rate of 180 vehicles per hour per lane was used in calculating queues and delays. This existing flow rate is also taken as the capacity limit. Using this rate, the average waiting time at the entrance station is currently 20 seconds during the average peak day.

Using an average vehicle length (including spacing between vehicles) of 25 feet, each lane can store roughly seven vehicles. The 95% queue is used to determine the minimum vehicle storage needed for a lane. The 1997 peak hour 95% queue length is seven vehicles. This means that 95% of the time there will be seven or less vehicles in the queue, and 5% of the time there will be more than seven vehicles in the queue. Since the entrance station has two lanes, the vehicles will divide into three or four vehicles per lane. Therefore, there is currently sufficient storage length to handle traffic queues.

By year 2006, however, the peak hour arrival rate of 220 vehicles per hour per lane is projected to exceed the service rate of 180 vehicles per hour per lane. Therefore, a third entrance lane would be required to adequately service traffic into the park, and would result in a peak hour 95% total queue length of eight vehicles (two to three per lane with 3 lanes total).

Traffic leaving the park is not required to stop. Therefore, queuing is not a concern for exiting vehicles.

Park Entrance to Chapin Mesa LOS. Traffic from the park entrance to Far View currently operates at LOS D. The roadway terrain is mountainous, with grades averaging 7% in some areas. This limits the number of passing zones on this stretch of road, resulting in a reduced LOS. The LOS on Chapin Mesa Road improves slightly from Far View to Chapin Mesa (LOS C), as the terrain becomes flatter. However, future operating conditions will be more congested on these roads. By year 2006, the Morefield to Far View segment of the road between the park entrance and Chapin Mesa will operate at LOS E if traffic management measures are not implemented. No segments will exceed absolute capacity and reach LOS F. From the standpoint of urban traffic, this is still acceptable, but in a rural recreational setting this may not be appropriate.

No counts are available for the minor roads that intersect with Chapin Mesa Road, between Far View and the 4-way intersection. However, based on field observations, traffic volumes are relatively low on these roads, and will not pose traffic problems in the future. Based on Chapin Mesa Road traffic, a crossroad on this section of road in year 2020 will operate at LOS C if there are less than 118 left-turning vehicles from the minor road, and LOS D if there are between 118 and 173 left-turning vehicles from the minor road. None of the sites on these roads are expected to generate these volumes of traffic.

No turning movement counts are available at the picnic area in the Spruce Tree Loop. However, based on field observations, traffic volumes into and out of the picnic area are also low. A parking study was performed at this location, and a maximum of 11 vehicles occupied the picnic area at any one time throughout the day (Lee Engineering, July 1997). The picnic area contains 50 parking spaces. The excess parking capacity at this picnic area could be utilized to mitigate parking shortages at the Spruce Tree/Museum lot. A short pedestrian trail would need to be developed to connect the picnic area lot with the Spruce Tree/Museum lot. At full capacity, and assuming an average duration of 30 minutes, the peak hour picnic area traffic would be 200 vehicles (100 vehicles in each direction). This is LOS A for 1997, and would be LOS B for year 2006 and 2020, at this intersection.

3-way to Mesa Top Loop and Cliff Palace Loop LOS. Mesa Top Road is a two-lane roadway that runs between the 4-way and 3-way intersections. This road currently operates at LOS D, and will operate at LOS D through the year 2020. Mesa Top Loop Road is a one way loop that currently operates at LOS A. Cliff Palace Loop Road is a one-way loop that operates at LOS A. These are expected to operate at LOS A and B respectively in 2015.

Far View to Wetherill Mesa Road LOS. Wetherill Mesa Road, a 12-mile road from Far View to the Wetherill Mesa parking area, opens at 9 a.m. and closes at 4:30 p.m. Currently, the road operates at LOS B and is expected to operate at LOS C in 2020. This is due to the extremely low traffic volumes (a 1997 peak hour volume of 66 vehicles). Wetherill Mesa Road is mountainous, with steep grades and sharp curves.

Intersection Level of Service Analysis

Level of Service analyses were also performed at each of the major intersections in the park for the design hour. The LOS criterion for unsignalized, stop-controlled intersections is total delay. According to the *1994 Highway Capacity Manual, Special Report 209*, intersection delay is defined as the total time elapsed from when a vehicle stops at the end of a queue until the vehicle departs from the stop bar at the intersection. For a two-way stop-controlled intersection (TWSC), the critical movement is a left turn from the minor road. The Level of Service criteria for the TWSC intersections is reproduced in Table 4-3.

**TABLE 4-3: LEVEL OF SERVICE CRITERIA FOR
TWSC INTERSECTIONS**

Level of Service	Average Total Delay (sec/veh)
A	≤5
B	>5 and ≤10
C	>10 and ≤20
D	>20 and ≤30
E	>30 and ≤45
F	>45

Source: 1994 Highway Capacity Manual, Table 10-3.

Summary Results for Park Intersections. Table 4-4 summarizes the LOS analyses for the intersections in Mesa Verde in 1997. It is anticipated that all intersections will continue to operate at acceptable levels (LOS C or better) and that intersection capacity will not be a limiting factor to visitor growth.

TABLE 4-4: SUMMARY OF INTERSECTION LOS ANALYSES

Location (N-S Road @ E-W Road)	Critical Movement	LOS (1997)
Chapin Mesa Rd @ Wetherill Rd	EB Shared Through/Right	A
Ruins Rd. @ Balcony House Rd North	WB Right	A
Ruins Rd. @ Balcony House Rd South	WB Left	A
Ruins Rd. @ Balcony House Rd East	EB Right	A
Chapin Mesa Rd @ US 160, North	WB Left	B
Chapin Mesa Rd @ US 160, South	EB Left	A
Chapin Mesa Rd @ Mesa Loop Rds.	WB Shared Right/Left	A
Chapin Mesa Rd @ Morefield Rd.	EB Left	A

Source: Lee Engineering

Speed Studies

The following map shows the existing speed limits on the roadways in Mesa Verde National Park. There are two locations, each of several miles length, where there is a 25-mph speed limit for traffic going to Wetherill Mesa and a 35-mph speed limit for returning traffic. Additionally, along Chapin Mesa Road, through the Tribal lands, there is a 15-mph sign that may not be an official National Park Service sign. The existing speed limit map shows a 15-mph speed limit from the tribal land border to Balcony House.

Vehicle speed measurements were taken at the locations shown in the Speed Study Locations map. The 85th percentile speeds and other sample statistics resulting from these speed studies are shown in Table 4-5. The 85th percentile speed means that 85 percent of drivers travel at or below that speed and only 15 percent travel faster and this speed is often used as a measure of the upper limit of "reasonable" speeds

EXISTING SPEED LIMITS



LEGEND

--- 45 MPH

— 35 MPH

..... 25 MPH

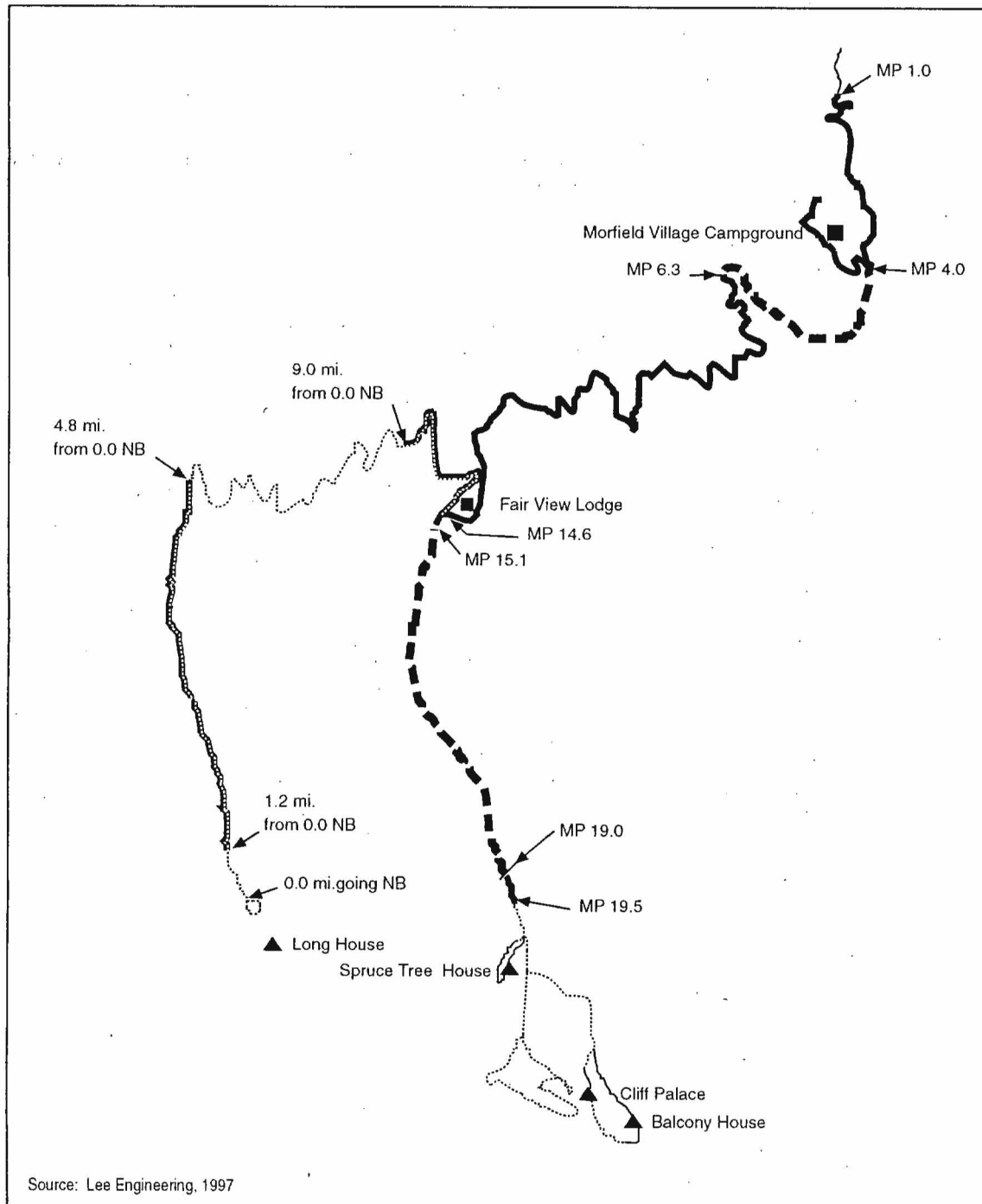
— 15 MPH

▲ MAJOR SITES

■ OTHER POINTS OF INTEREST

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC / DEC 87 / XXXXXX



SPEED STUDY LOCATIONS



LEGEND

- ▲ MAJOR SITES
- OTHER POINTS OF INTEREST
- SPEED STUDY LOCATIONS

MESA VERDE NATIONAL PARK TRANSPORTATION STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC / DEC 97 / XXXXXX

Source: Lee Engineering, 1997

for prevailing conditions. The pace is defined as the 10-mph increment in speeds within which the highest percentage of vehicles travel. The percent within pace measures the degree of dispersion in speeds, with higher values indicating that more people drive close to the same speed and vice versa.

TABLE 4-5: SPOT SPEED STUDY DATA

Location Number (See Map)	85th Percentile NB / SB ¹	Mean NB / SB	Median NB / SB	Pace NB / SB	% within Pace NB / SB
1	42 / 40	38 / 36	37 / 36	34-44 / 30-40	86 / 86
2	57 / 53	52 / 48	51 / 49	45-55 / 43-53	72 / 76
3	44 / 47	41 / 42	41 / 41	36-46 / 37-47	71 / 71
4	44 / 49	40 / 44	41 / 44	35-45 / 38-48	85 / 74
5	43 / 39	38 / 35	38 / 35	33-43 / 29-39	75 / 76
6	46 / 45	39 / 39	38 / 39	36-46 / 35-45	61 / 72

Source: Lee Engineering, 1997.

1. NB/SB = northbound/southbound

Traffic Safety

Accident records were reviewed for the four-year period between 1993 and 1996. During this period there were 199 accidents in the park. There were no fatal accidents; and there were eight injury accidents resulting in 13 injuries. A summary of the conditions and locations of the accidents includes:

- Weather: 157 (79%) accidents occurred in clear weather. The remaining weather conditions included: cloudy 21 (10%); rain 7 (4%); snow 10 (5%); sleet, and other 4 (2%).
- Lighting condition: 167 (84%) accidents occurred during daylight conditions. The remaining conditions were: dawn 2 (1%); dusk 10 (5%); dark 16 (8%); and unknown 4 (2%).
- Surface condition: 167 (84%) accidents occurred under dry road conditions. Other surface conditions reported included: wet 11 (6%); icy/slushy 6 (3%); snowy 7 (3%); and other/unknown 8 (4%).
- Accident class: The largest single accident class was 64 (32%) accidents with another motor vehicle. Other accident classes include: fixed object 31(16%); parked vehicle 36 (18%); animal 48 (24%); and other/unknown 20 (10%).

The STARS (Service-wide Traffic Accident Reporting System) database was sorted by location for accident concentrations. There were five or more accidents at three different locations along the entrance road-- mileposts 7.0, 9.5 and 13.0. There was one serious accident at milepost 3.2. Copies of the accident reports for accidents at these locations were reviewed to determine any common characteristics or patterns. The following describes the notable accident locations:

- Milepost 3.2 near Mancos overlook: The most serious accident occurring in the four-year study period involved a vehicle being struck by a large rock or rocks which became dislodged from the adjacent area. Five injuries resulted from this accident.
- Milepost 7.0: There were five accidents during the four-year study period near milepost 7.0. The only one resulting in injuries was a motorcycle accident where the operator took the curve too fast. Two of the accidents involved vehicles out of control on a curve with snow or ice on the roadway. Another accident involved an out of control vehicle striking a guardrail. The fifth accident was an automobile/deer collision.
- Milepost 9.5: There were six accidents during the four-year study period. Two of the accidents involved injuries. These two injury accidents resulted from two motorcycles traveling together under rainy conditions encountering mud on the roadway and sliding out of control. Three of the accidents involved vehicles going out of control on an icy roadway. The remaining accident was a vehicle going out of control and striking a guardrail.
- Milepost 13.0: There were six single vehicle, run-off-road accidents. Only one of these was an injury accident. Two of the accidents occurred on a slippery road.
- Large animal accidents: Of the 48 animal-related (mostly deer) accidents in the four-year study period, 23 (48%) occurred in the two-mile section between milepost 4.0 and 6.0 on the entrance road. Not surprisingly, the majority of these accidents occurred in the summer months, with 17

(74%) of the 23 accidents occurring in June, July or August. (Park staff report almost daily deaths of smaller animals that do not cause and therefore are not reported in the accident database.)

- Tunnel: There were two accidents involving bicycles in the tunnel during the four-year study period. There is not adequate shoulder width for bicycled in the tunnel, nor is there sufficient light to see a bicyclist.

Other Traffic Safety Observations

Pedestrian traffic near Spruce Tree House: With the heavy parking demand around this area, parking extends north from the parking lot in parallel spaces along the roadway, a one-way loop that previously had been a two-way road. Pedestrians walking from the roadside parking spaces toward Spruce Tree Terrace and the Museum generally walk in the road. This creates an uncomfortable and potentially hazardous condition, although the addition of pavement markings designating parking spaces along the roadway has helped define the roadway edge for pedestrian use. The pedestrian is uncomfortable with traffic approaching from behind. The driver is likewise uncomfortable approaching pedestrians in the roadway with their backs to the traffic.

Overflow parking north of the Visitor Center: When the Visitor Center parking lot was full, vehicles were observed parking on the road to Far View Lodge. Overflow vehicles were observed facing both directions along the road, as well as parking illegally in no parking areas marked with yellow curbs. The Visitor Center parking lots are operating in excess of capacity.

Sign condition: Some signs in Mesa Verde National Park are in need of replacement. Regulatory and warning signs, as well as information signs, are in poor condition. Regulatory signs that have poor visibility can cause safety hazards. At the worst, a STOP sign missing more than one-third of its paint was observed at a pullout (milepost 1.8) along Wetherill Mesa Road. Additionally, there are several CURVE warning signs along Wetherill Mesa Road, which need to be replaced. Also, the reflective sheeting on the ONE WAY sign at the end of the main parking lot on Wetherill Mesa is peeling off.

Curve and turn warning signs: There is some inconsistency in the use of CURVE and TURN warning signs as well as the use of advisory speeds for those signs. There were CURVE warning signs observed with advisory speeds of less than 30 MPH.

Additionally, the curve at milepost 7.0 on the entrance road has a 20-mph advisory speed for uphill (southbound) traffic and a 15-mph advisory speed for downhill (northbound) traffic. The 20-mph advisory speed is preferable. Similarly, the Winding Road Sign (W1-5) at milepost 11.5 on Wetherill Mesa Road has an advisory speed of 25 mph for southbound traffic and 15 mph for northbound traffic. The 25-mph advisory speed is more appropriate although a speed evaluation of the curves was not undertaken. At milepost 0.7 on Wetherill Mesa Road, the advisory speed for southbound traffic is 25 mph and for northbound traffic it is 15 mph. In this case the appropriate advisory speed (without benefit of a speed study) appears to be 15 mph.

PARKING OCCUPANCY

A parking occupancy study was conducted at parking lots and pullouts throughout Mesa Verde National Park in July 1997 (Lee Engineering). Parking occupancy counts of vehicles either present or absent in each space were collected once every hour from 11 a.m. to 5 p.m. at most of the parking areas in the park. Parking data at Park Point and Morefield Amphitheater was not collected because the areas were closed during the study period.

Chapin Mesa Road Parking (Park Entrance to Chapin Mesa)

An inventory of the parking lot and pullout occupancies on Chapin Mesa Road is shown in Table 4-6. Only pullouts which were occupied by vehicles are listed in the table. The capacities of parking areas that do not contain striped spaces were estimated. Morefield Village, located at MP 3.9, contains a general store, amphitheater, and a campground. Parking at the Morefield general store is well below capacity, reaching only 38% of capacity during the study period. Three public parking areas are located at Far View: the Lodge, Visitor Center, and the Terrace.

Two archeological sites are located between Far View and the 4-way intersection: The Far View Complex and Cedar Tree Tower. At the Far View Complex, vehicles can park on the side of the road leading up to the parking area and turnaround. Since this area is on the side of the road, it is not considered a part of the parking lot. Occupancy exceeds capacity at this location.

Spruce Tree Loop contains several parking areas and designated parking spaces are also marked along the roadway north of the Spruce Tree/Museum lot. (See Spruce Tree Loop Parking map.) The Chapin Mesa/Spruce Tree Lot provides a capacity of 90 vehicles. Round Lot and the overflow lot provide an additional 56 and 41 spaces, respectively. At the time of the study, eleven of the 56 spaces at Round Lot were signed for government vehicles only. (These were the only spaces in public lots that were officially designated for government vehicles.) Additional NPS or concession employee vehicles may park in the Round Lot and the main lot, but counts of these vehicles were not made during the study. A picnic area with 50 spaces is also located in the Spruce Tree Loop.

The parking areas with the highest use are the Chapin Mesa parking lots and the Far View Visitor Center. Both areas approach full parking lot capacities during their peak utilization. Chapin Mesa parking occupancy is heaviest during the hours before and after noon. This heavy utilization causes congestion, with vehicles circling the Spruce Tree Loop several times until a desired parking spot opens up. Vehicles may stop in the road or pull over to the side and wait for a parking space to become available in the most desirable lots. The Chapin Mesa/Spruce Tree Lot had two empty spots during its peak time, and both handicapped parking spaces. Round Lot had three empty parking spaces during its peak hour, and they were all reserved spaces for NPS vehicles. In effect, Chapin Mesa/Spruce Tree Lot and Round Lot were at full occupancy. Conversely, the Overflow Lot (just beyond the Round Lot) was less than 50% utilized throughout the day.

The Far View Visitor Center parking lot approaches capacity in the morning, when tickets to Balcony House, Cliff Place, and Long House are sold.

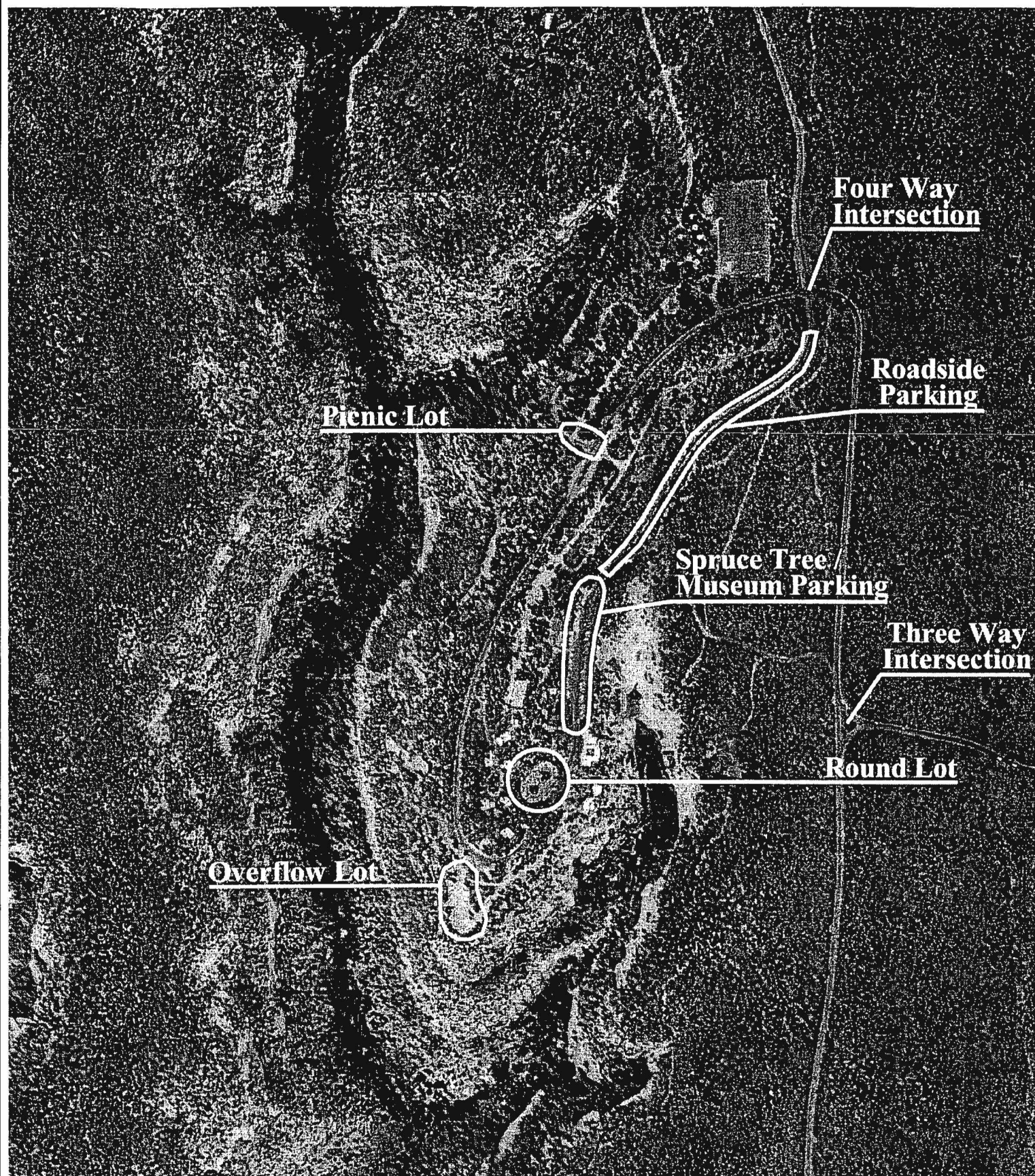
Parking demand was assumed to increase at a rate proportional to the projected park visitation. By 2006, the designated parking lots at Chapin Mesa will not be able to accommodate the projected

demand. By 2020, the future demand at the Far View Visitor Center parking lot will depend on what specific use it will serve after the Cultural Center is built.

TABLE 4-6: CHAPIN MESA ROAD/SPRUCE TREE LOOP PARKING INVENTORY

Location	1997 Occupancy Observed	2006 Projected Occupancy	2020 Projected Occupancy	Capacity
Chapin Mesa Road				
Trailer Parking Lot -prior to entrance (MP 0.6)	20	24	30	30
Mancos Valley Overlook (MP 3.3)	3	4	5	17
Morefield Store (MP 3.9)	20	24	30	80
Pullout (MP 6.4)	6	7	9	12
Pullout (MP 7.4)	1	1	2	4
Pullout (MP 8.6)	1	1	2	4
Pullout (MP 9.1)	1	1	2	4
Pullout @ Park Point exit (MP 10.4)	5	6	8	12
Pullout (MP 10.7)	1	1	2	4
Pullout (MP 12.4)	1	1	2	4
Pullout (MP 12.7)	4	5	6	8
Far View Lodge (MP 14.6)	46	56	70	250
Far View Visitor Center	90	109	136	112
Far View Terrace	44	53	67	109
Far View Archaeological Site	18	22	27	6
Pullout (0.4 mi. south of Far View Ruin)	1	1	2	3
Cedar Tree Tower	3	4	5	4
Pullout (Trail head to Farming Terraces)	2	2	3	4
Chapin Mesa Road Subtotals	267	322	408	667
Spruce Tree Loop				
Spruce Tree Admin. Loop Road	47	57	71	62
Spruce Tree Lot/Museum	88	107	133	90
Round Lot	53	64	80	56
Overflow Lot	18	22	27	41
Roadside Parking	8	10	12	30
Pullout (0.3 mi. past overflow lot)	1	1	2	6
Picnic Area	11	13	17	50
Spruce Tree Loop Subtotals	226	274	342	335
Totals	493	596	750	1,002

Source: Lee Engineering, July 1997; BRW, Inc., 2000.



**SPRUCE TREE
LOOP PARKING**



180 0 180 Feet

A horizontal scale bar with alternating black and white segments, representing a distance of 180 feet.

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Mesa Loop Roads Parking (including Mesa Top Loop and Cliff Palace Loop)

An inventory of the parking lot and pullout occupancies on Mesa Loop Roads is shown in Table 4-7. The parking areas with the highest demand are at Cliff Palace and Balcony House. Both areas approach full parking lot capacities during their maximum occupancy. By 2020, most of the parking areas will be near 100% occupancy.

TABLE 4-7: MESA LOOP ROADS PARKING INVENTORY

Feature	1997 Occupancy Observed	2006 Projected Occupancy	2020 Projected Occupancy	Capacity
Cliff Palace ¹	86	104	130	88
Cliff Palace Parallel Parking ¹	6	7	9	12
Cliff Canyon (mi 2.1)	5	6	8	8
House of Many Windows (mi 2.25)	8	10	12	16
Pullout (mi 2.85)	5	6	8	16
Balcony House (mi 3.3) ¹	60	73	91	94
Soda Canyon Overlook (mi 3.8)	15	18	23	30
Pithouse Ruins (mi 6.6)	10	12	15	24
Navajo Canyon/Square Tower House (mi 6.8-6.9)	15	18	23	60
Pithouse (mi 7.2)	9	11	14	16
Mesa Top Ruins (mi 7.5)	10	12	15	16
Sun Point Pueblo (mi 7.7)	2	2	3	20
SunPoint Ruins (mi 8.0)	13	16	20	20
Oak Tree House (mi 8.1)	2	2	3	4
Fire Temple (mi 8.3)	4	5	6	8
Sun Temple (mi 8.9)	10	12	15	22
Totals	265	315	394	454

Source: Lee Engineering, July 1997; BRW, Inc., 2000.

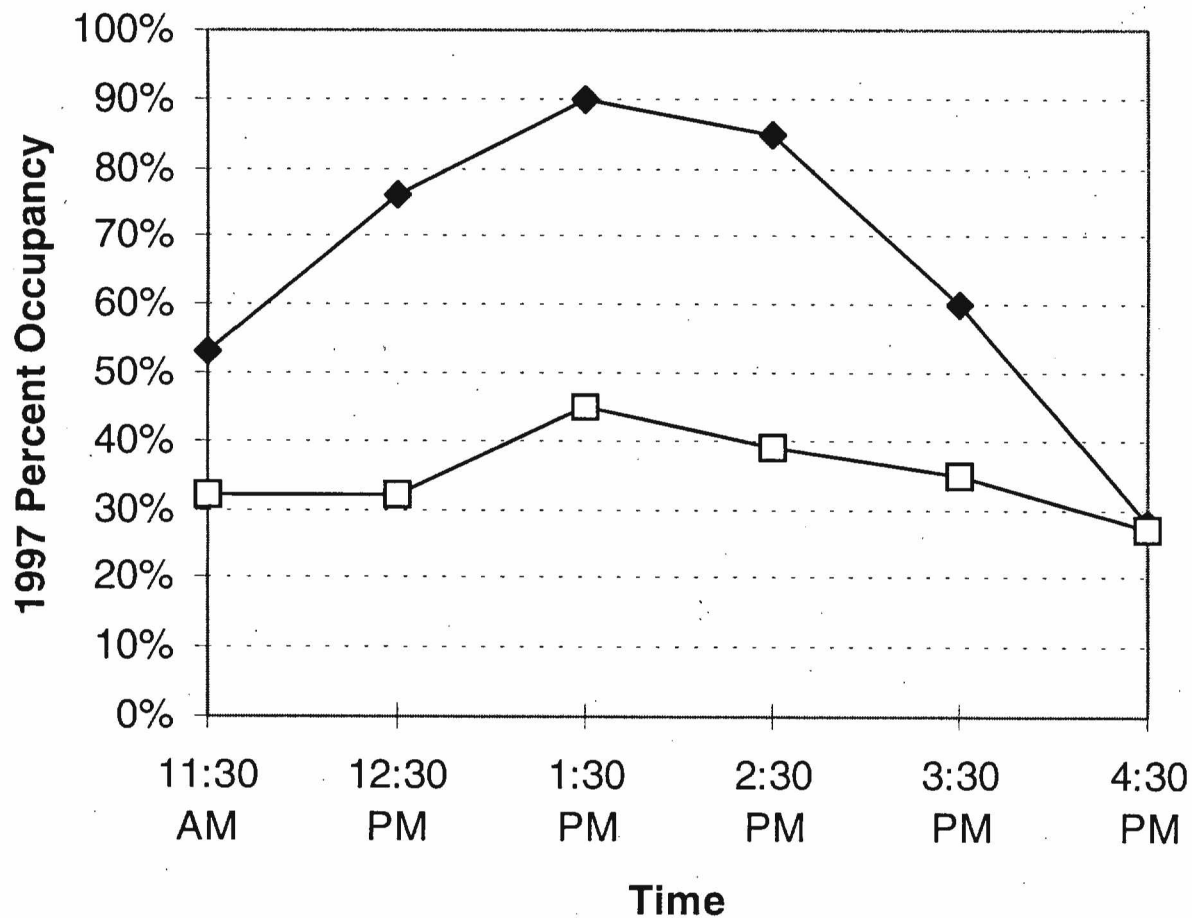
1. Parking demand at ticketed attractions is limited by the availability of tickets.

Wetherill Mesa Parking

There are several pullouts along Wetherill Mesa Road. A maximum of one vehicle was observed at any of the pullouts along the road at any time.

The Wetherill Mesa activity area is served by two parking lots: a main parking lot (63 spaces), and an adjacent overflow parking lot (56 spaces). A license plate study was performed at Wetherill Mesa on July 12, 1997. License plate numbers were collected once every hour, from 11:30 a.m. to 4:30 p.m. on a weekend day, at each parking lot. This was done to determine the occupancy, duration, and turnover of the lots.

The heaviest parking lot occupancies during the study period occurred at 1:30 p.m. At this time of the day, the main lot was 90% occupied, and the overflow lot was 45% occupied. (See Figure 4-1) The average occupancy during the study period was nearly twice as high in the main lot (65%) as in the



Source: Lee Engineering, 1997.

WETHERILL MESA PARKING LOT EXISTING CONDITIONS

LEGEND

- ◆— Main Lot
- Overflow Lot

Figure 4-1

MESA VERDE
NATIONAL PARK

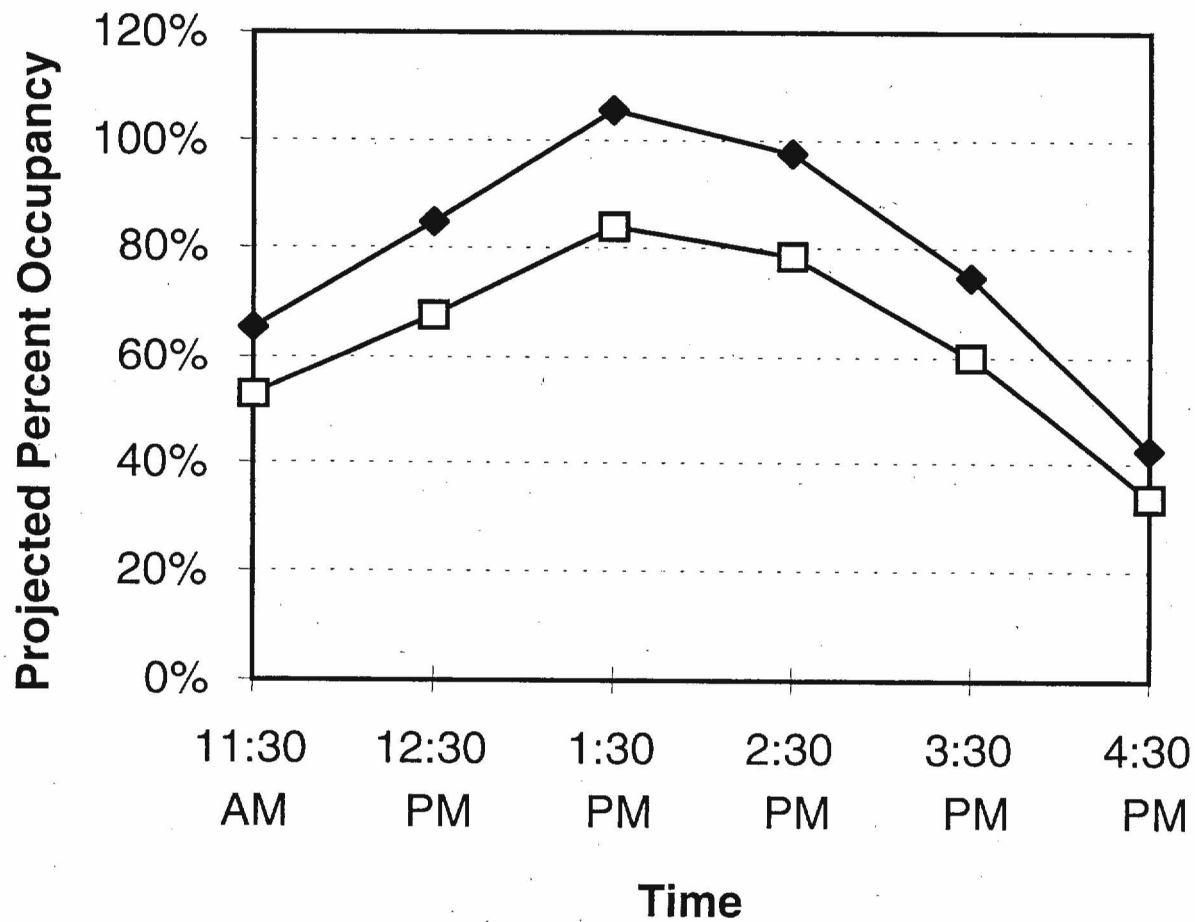
TRANSPORTATION STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC / MAR 2000 /

overflow lot (32%). However, the overflow lot was occupied even when spaces were available in the main lot, as indicated below. This is due to the close proximity of the two lots to each other (the overflow lot is actually closer to the trailheads than the main lot). The overflow lot doesn't actually serve overflow traffic from the main lot, since vehicles will park there even when the main lot has parking vacancies.

The average parking duration time for visitors was about 2 to 3 hours at both lots. These parking durations are attributed to the length of the ranger-guided tours, as well as the long self-guided hikes offered at Wetherill Mesa. Turnover is defined as the number of different vehicles parked in a space during a study period. The average turnover was 1.6 vehicles per 6 hours for the main lot, and 1.0 vehicles per 6 hours for the overflow lot. During the peak parking time, the combined occupancy of the two parking lots was 69%. The existing parking facilities at Wetherill Mesa are more than adequate for the existing demand.

Parking occupancy at Wetherill Mesa was projected for the years 2006 and 2020. The graph below shows the resulting occupancy for both lots combined. (See Figure 4-2.) The existing parking supply will not meet future demand if the demand at Wetherill Mesa grows in proportion to projected parking visitation demand. By 2006, demand will reach about 90% of capacity during the peak time of the day. By 2020, demand will exceed capacity during the peak time of the day.



**WETHERILL MESA
PARKING LOT
PROJECTED CONDITIONS**

LEGEND

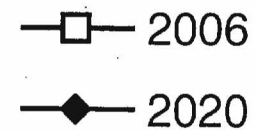


Figure 4-2

MESA VERDE
NATIONAL PARK

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Source: Lee Engineering, 1997.

Parking Capacity Limitations

The analyses of existing and future parking demand indicate that numerous parking lots at Mesa Verde will be near or over capacity by 2006. This includes the trailer parking lot at the entrance to the park, the Far View Visitor Center, nearly all the parking lots in the vicinity of Spruce Tree House and the Wetherill Mesa lots (main and overflow).

Providing additional parking may or may not be appropriate, since the number of visitors that can be accommodated at the activity areas may be limited by resource protection needs and by the capacities of walkways and viewing areas. Adding parking may only exacerbate visitor crowding at locations where the demand is already near the resource and social carrying capacity of sites. Additional carrying capacity studies are needed to determine appropriate transportation and visitor management strategies for the future.

PUBLIC TRANSPORTATION

The concessionaire, Aramark, operates all mass transportation at Mesa Verde National Park. Two types of mass transportation operate within the boundaries of the park. The Wetherill Mesa Tram operates from the parking area at the end of the Wetherill Mesa road. Mesa Verde Company's bus transportation system provides tours for park visitors and transportation for park employees.

Wetherill Mesa Tram

The Wetherill Mesa Tram operates between Memorial Day and Labor Day. It transports approximately 36,000 passengers per year. Of the total annual ridership, an estimated 20 people required wheelchair access. This service is currently operated using three vehicles. Two new trams have recently been purchased, each carrying 46 passengers and with some flip-up seats for wheelchair accessibility. One older tram is also operated.

Employee Transportation

Aramark currently provides transportation for its employees from the concession facility near the park entrance. Employees park or otherwise arrive at the park entrance and are transported to the interior of Mesa Verde. Approximately 120 employees are served per day, resulting in about 240 one-way passenger trips per day. Although differences in work schedules between Aramark employees and NPS employees have made it difficult for NPS employees to use the service in the past, additional shuttle times have been recently added in hopes of attracting NPS employee ridership. Total employee ridership in 1998 and 1999 was estimated at around 25,200. Between park visitors and employees, the Wetherill Tram carries about 60,000 riders each year. The projection that this figure could rise to approximately 72,000 by 2006 (see Table 4-8) would suggest the need for a total of four trams in service as well as the conversion of the existing one-way road to a two-way road to accommodate bi-directional tram traffic.

Sightseeing Tours

Three sightseeing tours are provided each day between mid-April and mid-October, serving Chapin Mesa. These services are operated using two newer 37-passenger busses, two older 48-passenger Bluebird busses and one leased 25-passenger vehicle. Another new vehicle, a 45-passenger bus will be

delivered in June 2000. Aramark officials indicate that the large Bluebird busses are uneconomical to operate and are more difficult to maneuver on the narrow park roads than the smaller vehicles. Aramark has plans to replace one of the Bluebird busses in 2001. The other Bluebird bus has recently been repainted and had the upholstery replaced.

Beginning this year (2000) one sightseeing tour per day will be provided between Memorial Day and Labor Day to Wetherill Mesa. The service will use a 25-passenger vehicle, so sized due to the weight restrictions on Wetherill Mesa Road.

Transit Demand Forecasts

Based upon the growth in visitation, the following forecasts have been made for each of the transit services for which data were available (See Table 4-8). Like the visitor projections, these forecasts reflect increasing demand to park sites. Some of that demand may not be appropriate to serve due to need to protect the cultural and archaeological resources. These numbers represent the demand for mass transportation assuming the park were to continue to accept as many visitors as wanted to see the park sites and that the existing mass transit services serve the same functions as they do today.

TABLE 4-8: TRANSIT DEMAND PROJECTIONS

Transit Service	1999 Ridership	2006 Ridership	2020 Ridership
Wetherill Mesa Tram	36,100	42,380	53,010
Employee Transportation	25,200	29,580	37,010
Sightseeing Tours	<u>10,300</u>	<u>12,090</u>	<u>15,130</u>
Totals	71,600	84,050	105,150

Source: NPS, BRW, Inc., 2000

VISITOR AREA CARRYING CAPACITY

Visitor area capacity is the number of recreational visitors at one time, per hour, or per day, that a specific visitor area can sustain without permanent harm to the natural and cultural resources of the attraction or significantly degraded visitor experience due to crowding and delay. The visitation capacity estimates presented in this report represent preliminary values based on observed visitor use and on the supply of parking at minor sites. More in-depth visitor use studies using the Visitor Experience Resource Protection (VERP) process or other procedures are needed to refine the estimates presented here.

Methodology

Calculation of visitor area and park capacity requires an understanding of park operations, facility constraints and visitation patterns inside the park. At Mesa Verde, visitor attractions can be grouped into two primary categories:

1. Minor Attraction - visitor attractions that are isolated from larger complexes. Generally it is not possible to walk from a minor site to any other visitor area. Sites classified in this group include

various Mesa Top Road sites, Wetherill Mesa sites other than Long House, the Visitor Center, Cedar Tree Tower, Far View, and other small sites.

2. Major Attractions - visitor areas in which multiple individual attractions can be viewed at one time or that are located within a short walk of each other. Major attractions include the Spruce Tree House/Museum Complex, Cliff Palace, Balcony House, and Long House. Capacities for all major attractions are limited by ticketing except the Spruce Tree House/Museum Complex.

Minor Area Visitor Capacity

Visitor area capacity at the various minor sites was estimated from the availability of parking at the site. This estimation technique is predicated on the assumption that parking availability at the sites has been adjusted over time to match the number of visitors the site can accommodate. This assumption may not be valid. The number of parking spaces is converted to visitors and this number is factored by an estimate of the amount of time spent at each area to derive an hourly visitation capacity. Daily capacity is simply the hourly flow multiplied by the number of hours in the day the attraction is open. The estimate of daily capacity may be overstated because demand for visitor use varies over the course of the day. Table 4-9 presents the calculations for each of the minor areas considered. For simplicity, some of the numbers in the table have been rounded.

TABLE 4-9: MINOR AREA VISITOR CAPACITY

Attraction	Parking	Length of Stay (Hours)	People at One Time	Hourly Capacity	Daily Capacity
Mesa Top Roads – other sites	260	1.0	832	832	7,488
Wetherill Mesa (excluding Long House)	220	2.0	141	71	639
Visitor Center	358	0.5	358	716	6,444
Cedar Tree Tower, Far View, other areas	200	1.0	221	22	1,989
Subtotals			1,552	1,840	16,650
Adjust for Visitors Seeing Multiple Areas				n/a ¹	n/a ¹
Total Minor Area Visitor Capacity				n/a ¹	n/a ¹

Source: BRW, Inc., 1997.

1. It is not possible to determine total hourly or daily capacities for the combined sites because of the varying lengths of stay and because many visitors visit multiple sites in an hour or in a day.

Major Area Visitor Capacity

Spruce Tree House/Museum Complex. Visitor area capacities at Spruce Tree House and the other activity areas near the museum were estimated from observations of visitor behavior, estimates of the area available for visitor use, and initial observations of the time spent by visitors in each area. The daily capacity is estimated by multiplying the hourly capacity by nine hours. This probably overstates the daily capacity because it assumes demand stays at the maximum level for the entire nine-hour period. Table 4-10 presents estimated capacities for the Spruce Tree area. For simplicity, some of the numbers in the table have been rounded.

TABLE 4-10: SPRUCE TREE HOUSE/MUSEUM COMPLEX VISITOR CAPACITY

Attraction	People at One Time	Typical Stay	Hourly Capacity	Daily Capacity
Spruce Tree Terrace	170	-	-	-
Walkways	50	-	-	-
Parking Area	20	-	-	-
Museum	250	-	-	-
Spruce Tree House	100	-	-	-
Trail	60	-	-	-
Total	650	1 hr. 40 min.	390	3,510 (9 hrs)

Source: BRW, Inc., 1997

Ticketed Visitor Areas. Visitation at ticketed attractions is controlled by the size and frequency of tours provided at the attraction. The initial opinion of the park staff is that the size and frequency of tours at each site is optimal for balancing resource preservation and visitor experience needs. It is felt that larger tour groups and/or more frequent tours would both overwhelm the archeological resources of the attraction and severely diminish the individual visitor's experience. These assumptions could be tested through more in-depth research. Table 4-11 illustrates the capacity of each of the three ticketed areas.

TABLE 4-11: TICKETED AREA VISITOR CAPACITY

Attraction	Persons per Tour	Tours per Hour ²	Tours per Day	People at One Time	Hourly Capacity	Daily Capacity
Balcony House	50	2	17	150	100	850
Cliff Palace	60	2	19	180	120	1,140
Long House ¹	35	2	15	140	70	525
Adjust for Visitors Seeing Multiple Sites						<u><552></u>
Total				570	290	1,963

Source: BRW, Inc., 1997.

1. Capacity at Long House assumes expansion of the existing shuttle system.

2. Tours at each area last 60 minutes and are started every 30 minutes, i.e. two tours per hour.

Combined Visitor Area Capacity

Determining the overall capacity of Mesa Verde National Park requires knowledge of the carrying capacities of individual areas in the park plus an understanding of how visitors are distributed in the park at any one time, during a time period of interest, or over the entire day. This information is only partially available at present. Carrying capacities represent the physical limitations of the park. Visitor expectations and distribution determine the practical capacity.

From the information available it is not possible to determine the degree to which congestion is caused by inefficient distribution of visitors. In an ideal situation with perfect distribution, all visitors would rotate through sites at the same pace, evenly distributed throughout the day, and with equal preference for each site. With perfect distribution, crowding would only occur if too many people were let into the park (demand exceeded capacity). With imperfect distribution it is possible for crowding to occur even with fewer visitors than the maximum.

The data in this study show that the ticketed sites are the main attractions and that most visitors see the park between late morning and early afternoon. Tickets to these main attractions typically sell out by mid afternoon on the average summer day and by noon or early afternoon during the peak weeks of summer. Sellouts mean that some visitors do not have the experience they wished to have in the park. As many as 45 percent of visitors do not see any of the three ticketed sites. By collecting additional information, it may be possible to estimate the proportion of visitors whose expectations are not being met and therefore determine the practical capacity of the park, given current management direction and the features that are presently open for visitor use.

For example, if 55% of the visitors to the park wish to visit a ticketed site, and ticketed sites are presently utilized to their maximum capacity, then the park is currently at capacity. The only way that capacity could be increased would be to add new sites. On the other hand, if overall visitor satisfaction can be maintained by redirecting visitors from ticketed sites to other locations, such as Step House on Wetherill Mesa, the overall capacity of the park could be higher than current use levels. Conversely, if some of the 45% of visitors who don't visit a ticketed site are unsatisfied because they did not get to go to Cliff Palace, Balcony House or Long House, visitor levels may be higher than the desirable carrying capacity.

A conclusion from this discussion is that large-scale transportation facility investment decisions can not be made independent of the desired visitor experience and visitor distribution mechanisms within the park. Transportation facility decisions made independent of these considerations could have unintended negative consequences or treat only the symptoms of a larger problem.

CHAPTER 4 SUMMARY

The following summarizes the more important capacity-related conclusions drawn in this chapter. As with the chapter, the summary reflects these main areas of analysis: traffic, parking, public transportation, visitor area capacity, and park capacity.

Traffic Analysis

- Of the total volume of vehicles entering the park, 87% are cars, 11% are recreational vehicles, 1% are busses, and 1% are trucks.
- Monthly bus entries tend to be low (<30 per month) November through March, more than double in April (60-80) and October (130) and hit a relatively uniform high of 250-400 busses per month May through September.

- Upon entering the park, approximately 25% of cars go to Morefield Campground and 75% continue into the park; for recreational vehicles 45% go to Morefield Campground and 55% continue into the park.
- Once inside the park there is an approximate 90%/10% distributional split in traffic favoring Chapin Mesa over Wetherill Mesa.
- No roads in the park will hit their absolute capacity limit (LOS F) before 2020.
- Of all road segments in the park only the entrance road (between the entry gate and Far View Visitor Center) will experience significant congestion into the future. From an urban standpoint the level of congestion (LOS E) might be acceptable, but for a rural recreational setting may be less than desirable.
- It is anticipated that all intersections will continue to operate at acceptable levels (LOS C or better) and that intersection capacity will not be a limiting factor to visitor growth.
- Approximately 80% of all traffic accidents in the park occurred in clear weather, during the daytime, and on dry pavement. This suggests possible consideration of operations/signage or geometric improvements.
- Three possible locations were identified as possible candidates for future consideration of geometric improvements to the entrance road.
- Of the 48 large animal accidents in the study period, almost half occurred in a two-mile section on the entrance road (milepost 4.0 to 6.0).
- A number of observations indicated inconsistencies in signage types as well as sign maintenance issues.

Parking Analysis

- The parking areas with the highest use are the Chapin Mesa parking lots near the Museum & Spruce Tree House, and the Far View Visitor Center. Both areas currently are at or near their capacities, especially during the middle of the day.
- At Chapin Mesa the nearby picnic parking areas are underutilized and could be considered for overflow parking.
- At Wetherill Mesa, the parking areas will reach capacity before 2020.
- Despite the fact that some lots are already at capacity or will reach capacity in the near future, providing additional parking needs to be balanced against the visitor and carrying capacities of the sites they serve.

Public Transportation

- Aramark is the contract transit provider for Mesa Verde, providing Wetherill circulator services, tours, and employee transportation.
- With a fleet of 9 mid-sized to large vehicles, Aramark currently provides approximately 71,000 passenger trips between March and October.

Visitor Area Capacity

- The capacity analysis considered two site types: minor and major.
- Minor attractions are ones that are isolated from other sites. This category of sites includes Mesa Top Road sites, Wetherill Mesa sites other than Long House, the Visitor Center, and others. The composite capacity of all the minor attractions is estimated at 1,840 per hour. Daily capacity depends on multiple use of sites and the relative attractiveness of each site. Without further information the practical daily capacity of these sites as a group cannot be determined.
- Major attractions are sites where multiple individual attractions can be viewed at one time or where tickets are used to manage access. Major attractions include the Spruce Tree House/Museum Complex, Cliff Palace, Balcony House, and Long House. Capacities for all major attractions are limited by ticketing except the Spruce Tree House/Museum Complex. The composite capacity of all the major attractions is estimated at 680 visitors per hour or 5,473 visitors per day.
- On an hourly basis the park can sustain approximately one visitor on the roadway for every visitor at a ticketed attraction.
- Determining the overall capacity of Mesa Verde National Park requires knowledge of the carrying capacities of individual areas in the park plus an understanding of how visitors are distributed in for a given period of time. This information is only partially available at present.
- A conclusion from this discussion is that large-scale transportation facility investment decisions can not be made independent of the desired visitor experience and visitor distribution mechanisms within the park. Transportation facility decisions made independent of these considerations could have unintended negative consequences or treat only the symptoms of a larger problem. More information on visitor use patterns and visitor expectations is required to support further planning.

CHAPTER 5: IDENTIFICATION OF NEEDS AND CONSTRAINTS

This chapter interprets the findings of the previous chapters and arrives at a statement of purpose and need for transportation and visitor management improvements in Mesa Verde. Based upon this statement, the chapter briefly discusses the range of alternatives that could address the statement of purpose and need. Recommendations are made for future data collection efforts that would be required to complete a more definitive analysis of this alternative range.

SHORT-TERM NEEDS AND CONSTRAINTS

Based on the analysis of the previous chapters, Mesa Verde National Park has some very real and pressing needs in the near future. Response to these needs in the near future must also reflect consistency with a longer-term vision of the park. Near term needs include the following:

- Improve visitor information and orientation by providing expanded information services near the entrance and by improving directional and information signs.
- Mitigate parking shortages and the resulting traffic congestion at specific locations, especially during peak visitation times to continue providing a park experience without urban levels of congestion. The Spruce Tree loop area has the greatest problems with parking shortages and vehicular congestion.
- Provide additional trip-planning services to visitors entering the park in order to better familiarize them with the ticketing system and optimize their experience within the park.
- Increase the capacity of the Wetherill Mesa Tram (and therefore the capacity of the Long House tours) by completing the replacement of older tram vehicles.

LONG-TERM NEEDS AND CONSTRAINTS

Roadway Capacity

The most constraining point in the park roadway system is the steep section of road leading from the park entrance to Morefield campground. A range of roadway capacities has been estimated for this segment of road, with a minimum of 370 entering vehicles per hour and a maximum of 970 entering vehicles per hour. The Federal Highway Administration recommends a design capacity of 555 inbound vehicles per hour for the park road. Taking vehicle occupancy (3.2 persons/vehicle) and non-recreational travel (97.6%) into account results in a capacity of approximately 1,770 people per hour entering the park. The estimated road capacity compares to existing use levels of about 220 vehicles per hour and about 700 visitors per hour entering the park during peak hours. The road capacity, considered alone, would allow peak hour visitation to the park to more than double. From this information it is evident that road capacity is not a constraint to future visitation growth.

Visitor Area Capacity

As identified in Chapter 4, a determination of the combined capacity of all visitor areas cannot be made at this time. However, we have concluded that the visitation capacity of the sites that are currently open to visitors is likely to be a significant constraint to future visitation growth. Visitor surveys conducted in 1995 indicate that only 55 % of visitors visited one of the ticketed sites, while tickets typically sold out in the early to mid-afternoon during the peak season. Increased visitation in the future would result in a smaller percentage of visitors being able to visit the ticketed sites, which are considered to be the icon features of Mesa Verde. Depending on visitor expectations regarding their visits to the park, current use levels on peak days may be close to the park's capacity. Additional information is needed to determine if new or modified visitor experiences would meet visitor expectations for a quality park experience while allowing more people to visit.

Parking Capacity

Chapin Mesa (Entrance) Road. Parking demand on Chapin Mesa is expected to increase at a rate proportional to the projected park visitation. By 2006, parking at various sites along the entrance road will not be able to accommodate the projected demand. Parking lots that will need to be considered are the following: Trailer Parking Lot prior to the Entrance, Far View Visitor Center, Far View Archaeological Site, and Cedar Tree Tower. Of these sites, only Far View Archaeological Site will exceed capacity by 2006, but all four will meet or exceed capacity by 2020.

Spruce Tree Loop. There are three key lots along Spruce Tree Loop that will need further consideration by 2006. Spruce Tree Loop Road parking, Spruce Tree Lot/Museum Lot, and Round Lot will be near or over capacity. Together these three lots will be more than 40% over capacity by 2020.

Mesa Top Loop Roads and Cliff Palace Loop. The demand for parking in this area will be near or exceed total capacity for most lots by 2020. Parking at the Cliff Palace Lot is at its practical capacity today. Ticket sales for Cliff Palace and Balcony House will limit the growth in parking demand at the lots serving these features. It is possible, however, that with increasing numbers of visitors in the park, some pressure could be put on the adjacent lots along this loop by non-ticketed visitors parking there to catch a glimpse of those major sites.

Wetherill Mesa. During the peak parking time, the Wetherill Mesa lots, combined, are at 69% of capacity. By 2006, the demand for both lots will be approximately 90% of capacity and in 2020 the demand will exceed capacity during the peak time of the day.

RANGE OF POSSIBLE ALTERNATIVES

The following discussion presents conceptual ideas to be considered in future studies of visitor distribution and transportation improvements. None of these ideas has been evaluated.

Baseline Alternatives

In support of any and all possible future environmental compliance actions, at least one baseline alternative would need to be considered: No Action. The No Action alternative would define the

problems in a forecast year (i.e. 2020) that would occur if no actions were taken to improve visitor distribution or transportation systems.

A Transportation and Visitor Management alternative could consider management actions and minor investments to improve visitor experience and enhance visitation capacity. Actions in this alternative could include, but would not necessarily be limited to the following:

- Consideration of expanded pedestrian and bicycle opportunities, particularly at the most crowded sites.
- Expansion of the ticketing program to other existing sites.
- Increase visitor management via additional advance reservation requirements or limits on multiple site visits.
- Implementation of comprehensive visitor tour packages that would focus and channel visitor flows. For example the tour package would have an overall duration in the park with planned intervals at a given number of sites. Ticketed sites now use this approach, and it could be applied park-wide.
- Closed-gate policy. One management option might include closing the park when its capacity is reached, requiring overflow visitors to wait to enter the park until conditions are less crowded. The parking at the Cultural Center could be used to hold visitors while providing interpretation of park themes and resources.
- Minor expansions of problem parking lots.
- Expansion of the Wetherill Mesa Tram system.
- Implementation of advanced visitor information systems: variable message signs, trip planning services at information kiosks, and wait-time/reservations information.

Bus Transit System Alternatives

Bus transit system alternatives might include:

- On-site bus alternatives for *portions* of Mesa Verde National Park. Examples include (1) re-establishing the Wetherill Mesa tram to its original design, (2) establishing a similar tram for crowded portions of Chapin Mesa.
- Comprehensive *park-wide* bus alternatives. Such a concept might focus visitor parking and staging at a less-sensitive location such as the park entrance, Morefield Campground, or Far View. From one of these staging areas all visitor distribution could occur, eliminating the need to expand other parking areas within the park. Such a concept could operate seasonally or year round. Another option would be to consider open (i.e. no limits) to managed (i.e. tours) use of a park-wide shuttle.

- Off-Site to Park bus alternatives. This concept would focus on intercepting visitors prior to arrival at the park. Staging might occur in gateway towns of Cortez and Mancos. Tour-type arrangements might be made and coordinated from Durango or other nearby cities.

Existing Roadway System Modifications

Modifications to the existing roadway system are another consideration. Moderate to major reconstruction of the park roads may be considered to be able to safely and efficiently meet future demand and prevent catastrophic failure of the existing roads. Possible modifications to the existing roadway system might include, but are not limited to the following:

- Repair, resurface, and/or widen Wetherill Mesa Road
- Reconstruct portions of the entrance road, potentially including additional turnouts for passing.
- Re-align portions of the entrance road or otherwise make geometric changes to higher-accident locations.
- Construct new connector road segments between existing parking areas (i.e. between the picnic area and the main lots along Spruce Tree Loop).

New Transportation Infrastructure

As also documented in this report, one of the major underpinnings of the existing transportation system has been to serve sites at the southern end of the park from a northern road access point to the park. It may be possible and warranted to consider other access points as well as other access and distribution systems. Given that moderate to major modifications of the existing roadway system may be considered it is possible other technologies might serve the same purposes at a similar cost. The following is a range of such transportation infrastructure considerations:

Possible Access Options:

- Roadway access from the west, east, or south side of the park.
- Abandon the existing entrance road in favor of a new entrance road.
- Provide a non-roadway access option, possibly including such options as:
 - an aerial cableway system (chairlift, gondola, or aerial tram)
 - a ground cableway system (i.e. funicular)
 - a railway system (i.e. cog rail or other rail adapted to higher incline approaches)

Possible Distribution Options:

The access and distribution components of the transportation system could be considered independently. Mesa-top distribution systems might include any of the above-mentioned technologies in addition to the following:

- New distribution roads
- Guideway transit (non-bus) distribution system, possibly including such options as:
 - aerial cableway systems (as above: chair, gondola, or tram)
 - ground cableway systems (funicular or moving-cable shuttle)
 - railway systems (narrow gauge, conventional, light rail, monorail, or other)
 - expanded bus service in combination with bus or fixed guideway access options.

Open Additional Sites to the Public

For the level of investment possibly required by the transportation alternatives above, large non-transportation alternatives are also potentially feasible. Consideration of opening additional sites (including those that have already been hardened) to the public may be warranted based on these two points:

- The mission of the park to protect and preserve cultural, natural, and historic resources for the enjoyment of this and future generations. Providing more site capacity may be a means of meeting visitor expectations.
- Some of the transportation alternatives, particularly the aerial cableway systems, open the opportunity of viewing and experiencing the sites without directly impacting the resources themselves.

RECOMMENDED DATA COLLECTION EFFORTS

Alternatives of the magnitude described above require a detailed level of knowledge upon which good evaluations and decisions can be based. This section documents the categories of information, not now available, which may be required to support this decision process.

Visitor Distribution Studies

From the previous chapter, it was noted that determining the overall capacity of Mesa Verde National Park requires knowledge of the carrying capacities of individual areas as well as the distribution between them. Further it was noted that this information is only partially available at present. The following studies are recommended to be able to complete that information:

- Exit surveys to update overall length of stay information presented in this report.
- Travel diaries or other similar technique to understand how visitors move through the park.
- Parking lot occupancy and length of stay studies to better understand accumulation patterns.
- Vehicular accumulation studies via traffic counts of entries and exits for specific areas.
- Visitor distribution/accumulation studies via people counts for specific areas. This would include counts of some trailheads in addition to the number of people at specific sites or buildings.

Visitor Experience Studies

Visitor distribution above helps to establish the factors needed to gauge current utilization of the park relative to a physical capacity. Visitor experience studies are the other part of the equation to determine overall park capacity. Such studies will examine the following:

- Preferred levels of visitor crowding.
- Expected or ideal experience compared to actual experience.
- Estimated duration of stay absent crowding.

Visitor Carrying Capacity Determination

The final step in this series of studies is to revisit the visitation projections against the data collected above and arrive an estimate of overall park capacity. This visitor carrying capacity would be estimated by season, according to the current operating schedules. With this information, the effects or consequences of a No Action alternative can be established. This baseline can then serve as the basis for evaluating other alternatives.

APPENDIX A: VISITOR SURVEY



TRAFFIC RESEARCH & ANALYSIS, INC.

Specializing in Traffic Data Collection

MESA VERDE NATIONAL PARK

DATA COLLECTED BY TRA JULY 11/12, 1997

3012 North 16th Street ~ Phoenix, Arizona 85016
(602) 266-1514 ~ Fax (602) 266-1103

Date: _____(1)

Travel Survey - Mesa Verde National Park

Time interview taken: _____ AM _____ PM (2)

The National Park Service is taking a survey of visitor travel in Mesa Verde. We would like to ask you a few questions.

1. What day did you first arrive at Mesa Verde? (3)

- 0 _____ today
- 1 _____ yesterday
- 2 _____ two days ago
- 3 _____ three days ago
- 4 _____ four days ago
- 5 _____ five or more days ago

2. What time of day did you arrive today? (4) _____ AM _____ PM

3. Did you visit any of the following areas today? (5)

- | | | | |
|-----|-------|-------------------|---|
| Y,N | _____ | (a) Cliff Palace | 1 |
| Y,N | _____ | (b) Balcony House | 2 |
| Y,N | _____ | (c) Long House | 3 |

If yes to any of the above ask:

(d) What time did you receive your ticket(s)? _____ AM _____ PM

(e) What time did your tour start? _____ AM _____ PM

If no, go on to 4.

4. Did you visit any of the following areas today? (6)

- | | | | |
|-----|-------|--|--------------------|
| Y,N | _____ | (a) West Ruins Road (Square Tower House, Sun Temple, etc.) | 4 |
| Y,N | _____ | (b) Spruce Tree House | 5 |
| Y,N | _____ | (c) Museum | 6 |
| Y,N | _____ | (d) Wetheril Mesa | 7 |
| Y,N | _____ | (e) Far View Archeological Sites | 8 |
| Y,N | _____ | (f) Spruce Tree Terrace | 5 |
| Y,N | _____ | (g) Far View Terrace | Near Lodge |
| Y,N | _____ | (e) Morefield Campground Area | Black Rect. on map |

5. Did you stay overnight in Mesa Verde on this visit? (7) Y,N _____

If yes. Did you stay in the (a) Lodge Y,N _____

or (b) The campground Y,N _____

6. Did you or will you stay overnight near Mesa Verde? (8) Y,N _____

If yes. Did you (will you) stay in any of the following places?

(a) Cortez _____ Y,N

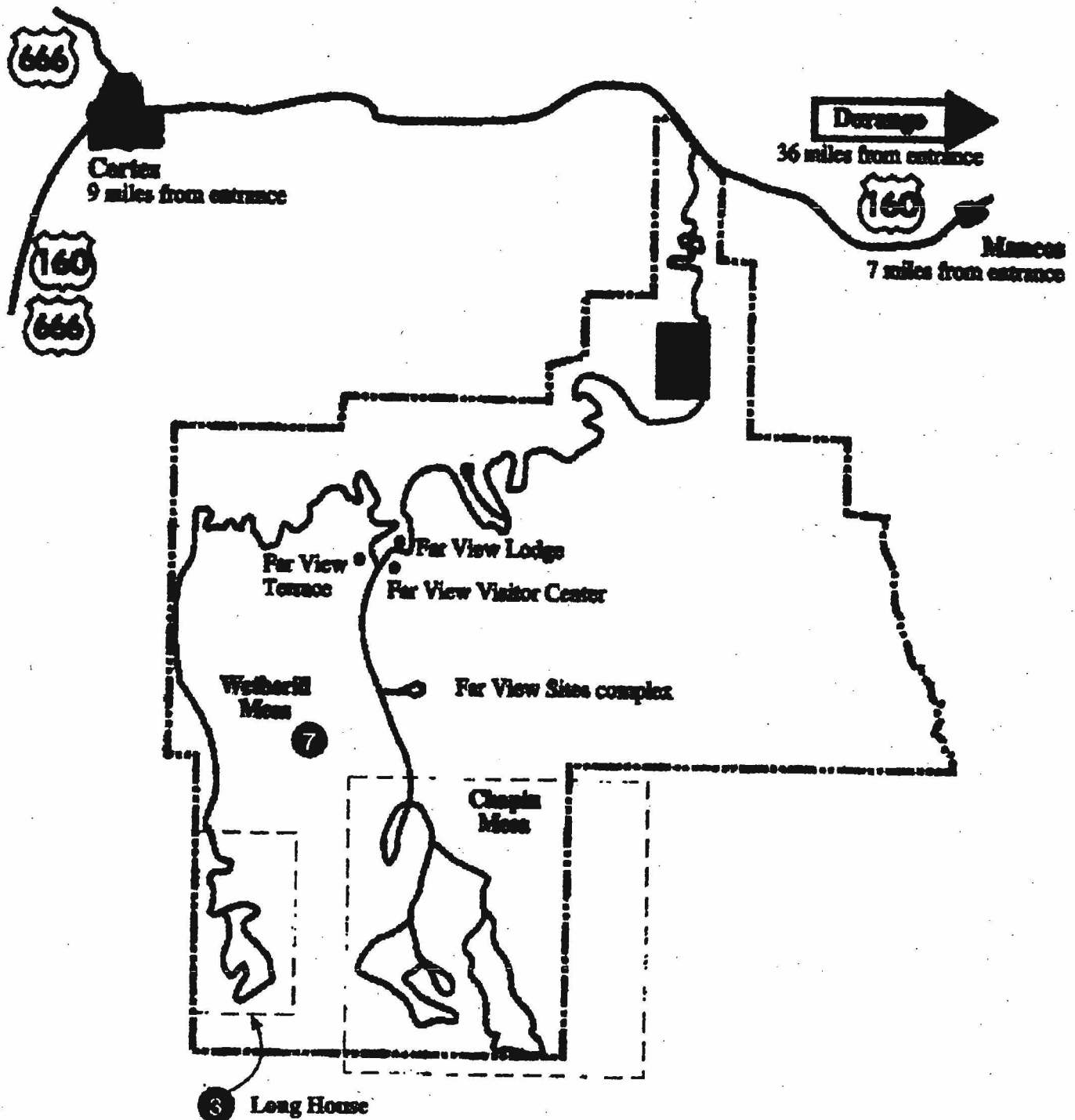
(b) Mancos _____ Y,N

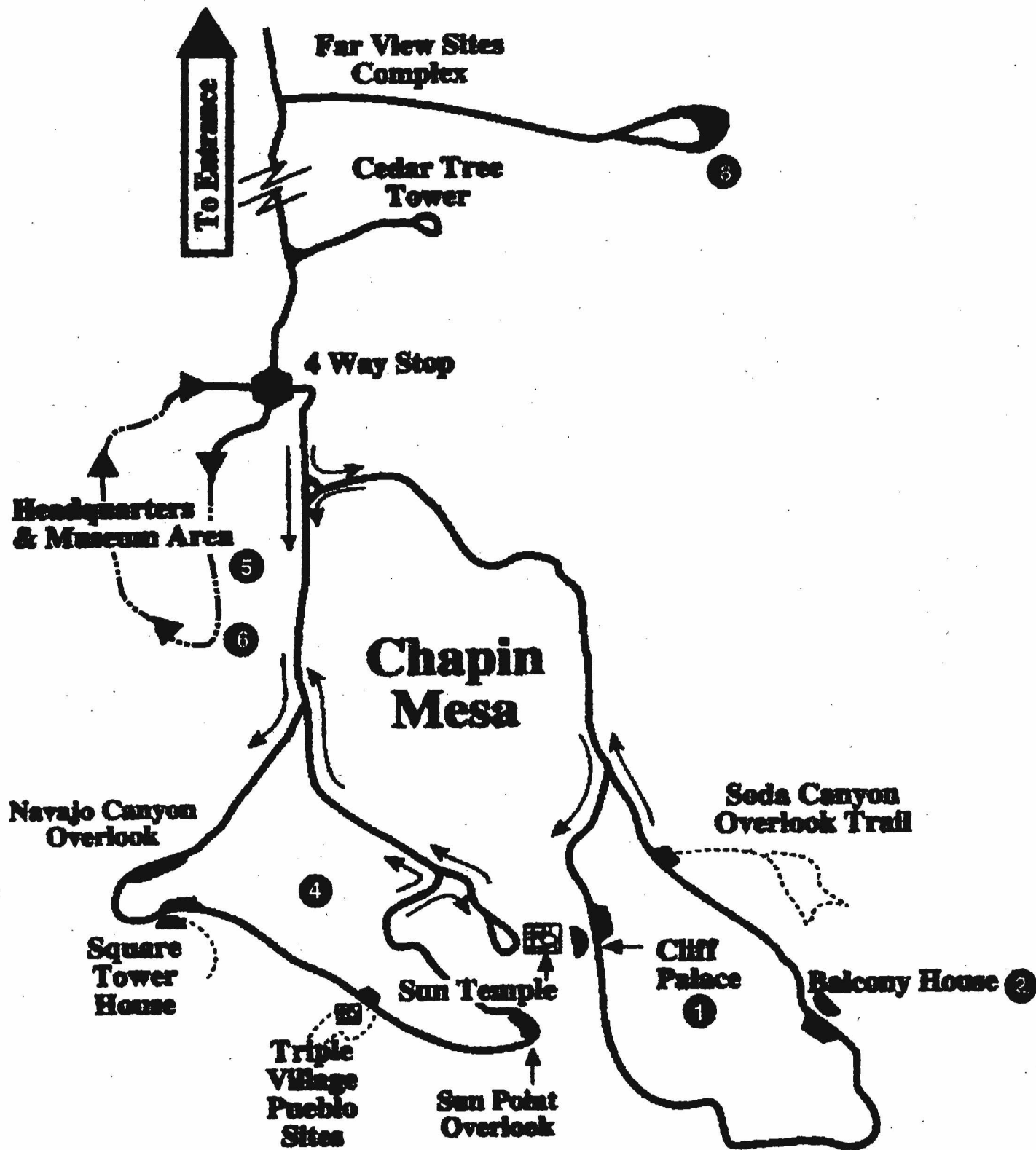
(c) Durango _____ Y,N

(d) A campground _____ Y,N

7. How many people are traveling with you today? (9) _____

MESA VERDE NATIONAL PARK





Day of Arrival at Mesa Verde
(July 11/12, 1997)

Day of Arrival	% of Respondents	# of Respondents
Today	87.7%	271
Yesterday	7.4%	23
2 Days Ago	3.2%	10
3 Days Ago	0.7%	2
4 Days Ago	0.0%	0
5 or More Days Ago	1.0%	3
Total	100.0%	309

Source: Traffic Research and Analysis, Inc., 1997

Time of Arrival on Day Surveyed (July 11/12, 1997)

Time of Arrival*	% of Respondents	# of Respondents**
7:30 - 8:29	4.0%	12
8:30 - 9:29	8.3%	25
9:30 - 10:29	19.0%	57
10:30 - 11:29	17.3%	52
11:30 - 12:29	17.3%	52
12:30 - 13:29	13.6%	41
13:30 - 14:29	6.3%	19
14:30 - 15:29	6.7%	20
15:30 - 16:29	4.0%	12
16:30 - 17:29	1.0%	3
17:30 - 18:29	0.3%	1
18:30 - 19:29	1.0%	3
19:30 - 20:29	0.3%	1
20:30 - 21:29	0.3%	1
21:30 - 22:29	0.3%	1
22:30 - 23:29	0.0%	0
23:30 - 00:29	0.3%	1
Total	100.0%	301

* Times were recorded on the half hour and hour

** No response from 8 people

Source: Traffic Research and Analysis, Inc., 1997

Visitation to Ticket Attractions (July 11/12, 1997)

Visitation of Attraction	# of Respondents	# of Visited Sites	% of Visits
Visited Attractions *	163	189	52.8% (visited one or more sites)
Did Not Visit Attractions	146	0	47.2% (visited 0 sites)
Total	309 people	189 sites	100.0%

* 163 people made 189 visits to attractions (multiple responses were possible)

Attraction Visited *	# of Visits	% of Visits
Cliff Palace	91	48.1%
Balcony House	67	35.5%
Long House	31	16.4%
Total	189	100.0%

* Multiple site visits possible

Source: Traffic Research and Analysis, Inc., 1997

Time Attraction Ticket Was Purchased **(July 11/12, 1997)**

Ticket Time*	% of Respondents	# of Respondents**
7:30 - 8:29	5.2%	8
8:30 - 8:29	6.5%	10
9:30 - 9:29	16.3%	25
10:30 - 10:29	23.5%	36
11:30 - 11:29	19.6%	30
12:30 - 12:29	15.0%	23
13:30 - 13:29	9.2%	14
14:30 - 14:29	3.3%	5
15:30 - 15:29	0.7%	1
16:30 - 16:29	0.7%	1
Total	100.0%	153

* Times were recorded on the half hour and hour

** No response from 36 people

Source: Traffic Research and Analysis, Inc., 1997

Tour Start Time **(July 11/12, 1997)**

Time Tour*	% of Respondents	# of Respondents**
8:30 - 9:29	0.8%	1
9:30 - 10:29	3.2%	4
10:30 - 11:29	10.5%	13
11:30 - 12:29	20.2%	25
12:30 - 13:29	21.8%	27
13:30 - 14:29	16.9%	21
14:30 - 15:29	14.5%	18
15:30 - 16:29	12.1%	15
Total	100.0%	124

* Times were recorded on the half hour and hour

** No response from 65 people

Source: Traffic Research and Analysis, Inc., 1997

Visitation to Non-Ticket Attractions (July 11/12, 1997)

Visitation of Attraction	# of Respondents	# of Visited Sites	% of Visits
Visited Attractions *	296	1,001	95.8% (visited one or more sites)
Did Not Visit Attractions	13	0	4.2% (visited 0 sites)
Total	309 people	1,001 sites	100.0%

* 296 people made 1,001 visits to attractions (multiple responses were possible)

Attraction *	# of Visits	% of Visits
West Ruins Road	178	17.8%
Spruce Tree House	206	20.6%
Museum	220	22.0%
Wetheril Mesa	48	4.8%
Far View Arch. Sites	120	12.0%
Spruce Tree Terrace	101	10.0%
Far View Terrace	90	9.0%
Morefield Campground	38	3.8%
Total	1,001	100.0%

* Note: multiple site visits possible

Source: Traffic Research and Analysis, Inc., 1997

Overnight Stays in Mesa Verde (July 11/12, 1997)

Overnight Stay*	% of Respondents	# of Respondents
Stayed Overnight	9.4%	29
Lodge	17.2%	5
Campground	72.4%	21
No Location Given	10.4%	3
Total	100.0%	29

* Although possible, there were no multiple responses to this question.

Source: Traffic Research and Analysis, Inc., 1997

Location of Overnight Stay (July 11/12, 1997)

Overnight Stay	# of Respondents	# of Locations	% Stayed/Did Not Stay
Stayed Overnight*	159	258	51.5% (stayed at one or more locations)
Did Not Stay Overnight	150	0	48.5% (stayed at 0 locations)
Total	309 people	258 locations	100.0%

* 159 people stayed at 258 different locations (multiple responses were possible)

Overnight Location*	# of Respondents	% Who Stayed
Cortez	82	31.8%
Mancos	7	2.7%
Durango	130	50.4%
Campground	38	14.7%
No Location Given	1	0.4%
Total	258	100.0%

* Multiple overnight locations possible

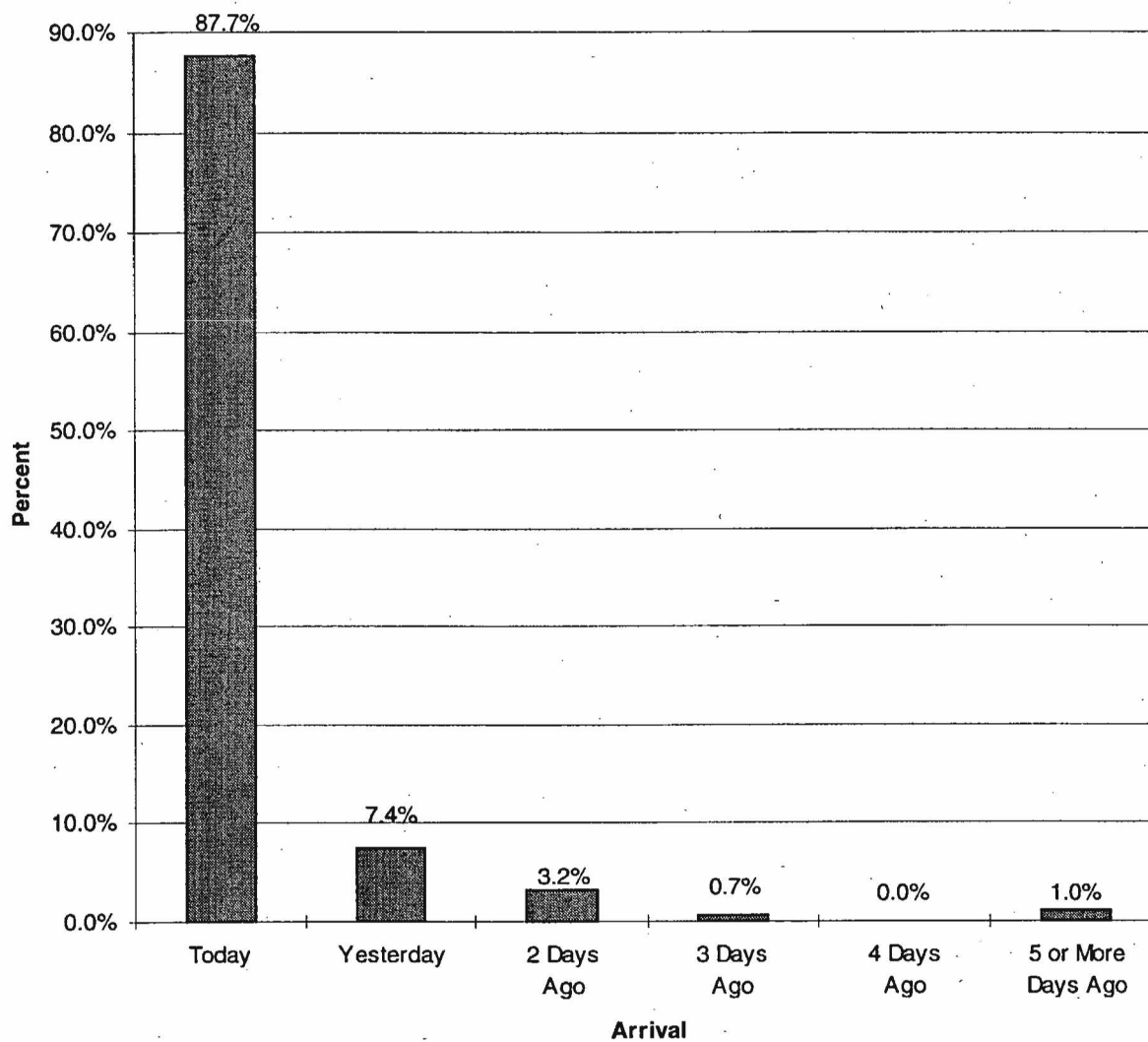
Source: Traffic Research and Analysis, Inc., 1997

Number of Persons Traveling in Party (July 11/12, 1997)

Number of Persons	% of Respondents	# of Respondents
One	3.2%	10
Two	40.5%	125
Three	13.9%	43
Four	26.9%	83
Five	9.1%	28
Six	3.6%	11
Seven	1.3%	4
Eight	0.6%	2
Nine	0.6%	2
10 or More	0.3%	1
Total	100.0%	309

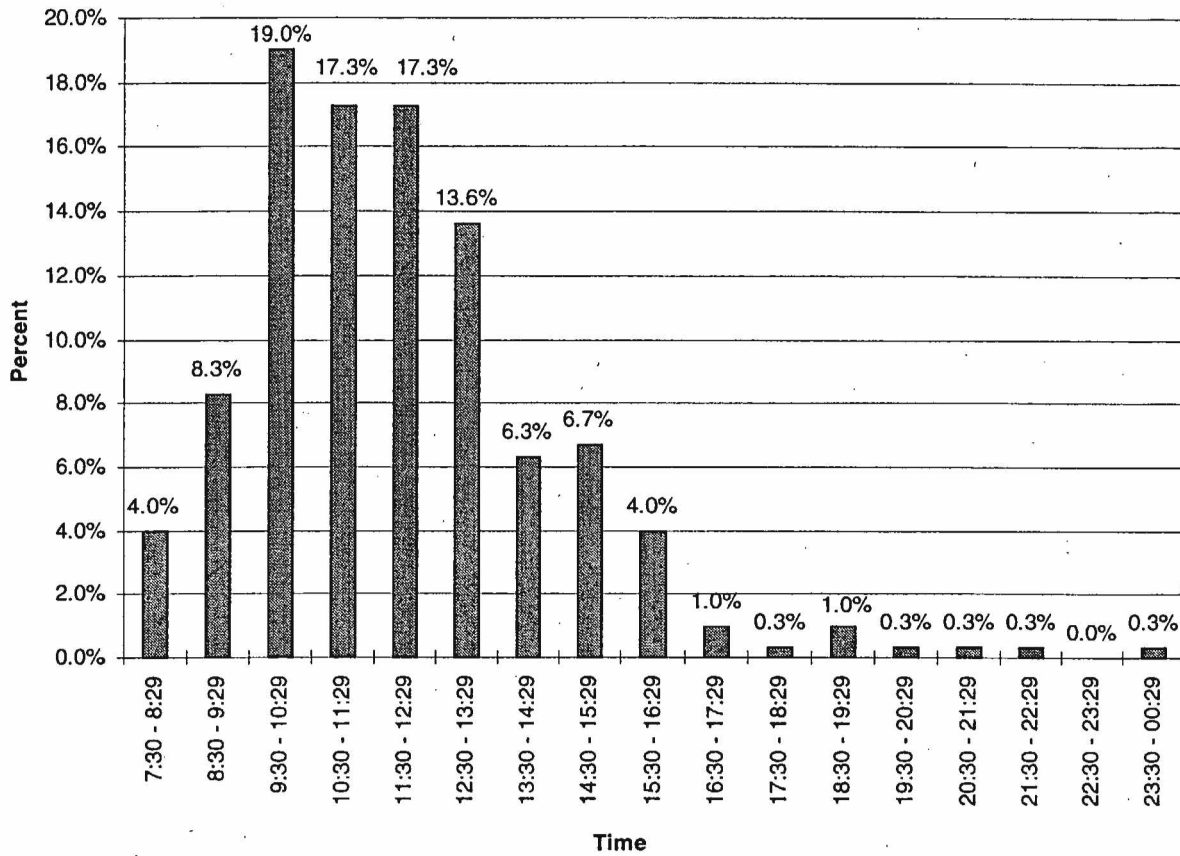
Source: Traffic Research and Analysis, Inc., 1997

Day of Arrival at Mesa Verde (July 11/12, 1997)



Source: Traffic Research and Analysis, Inc., 1997

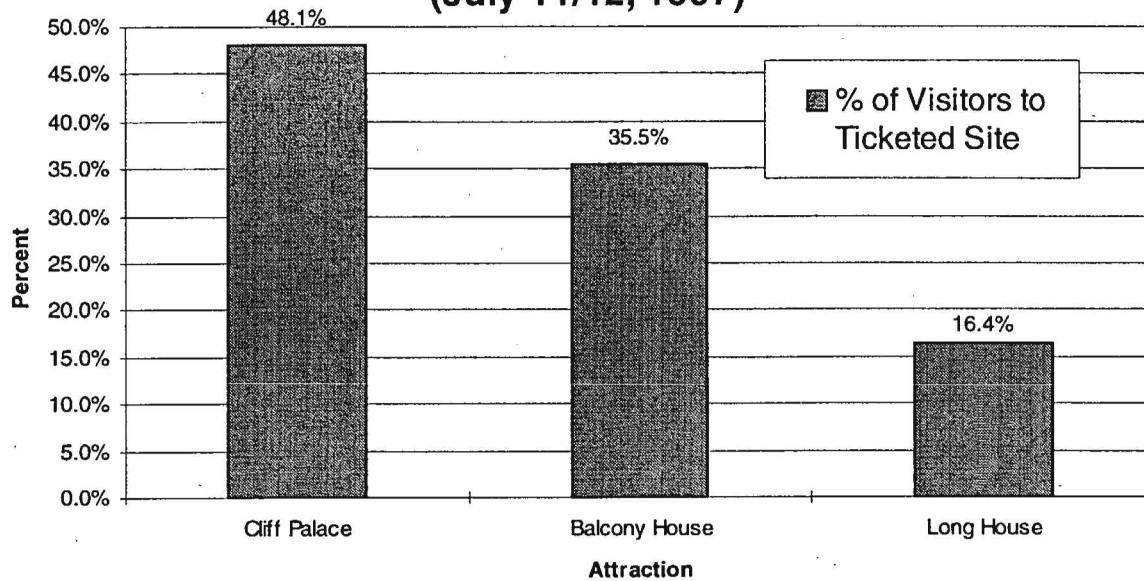
Time of Arrival on Day Surveyed (July 11/12, 1997)



* Times were recorded on the half hour and hour.

Source: Traffic Research and Analysis, Inc., 1997

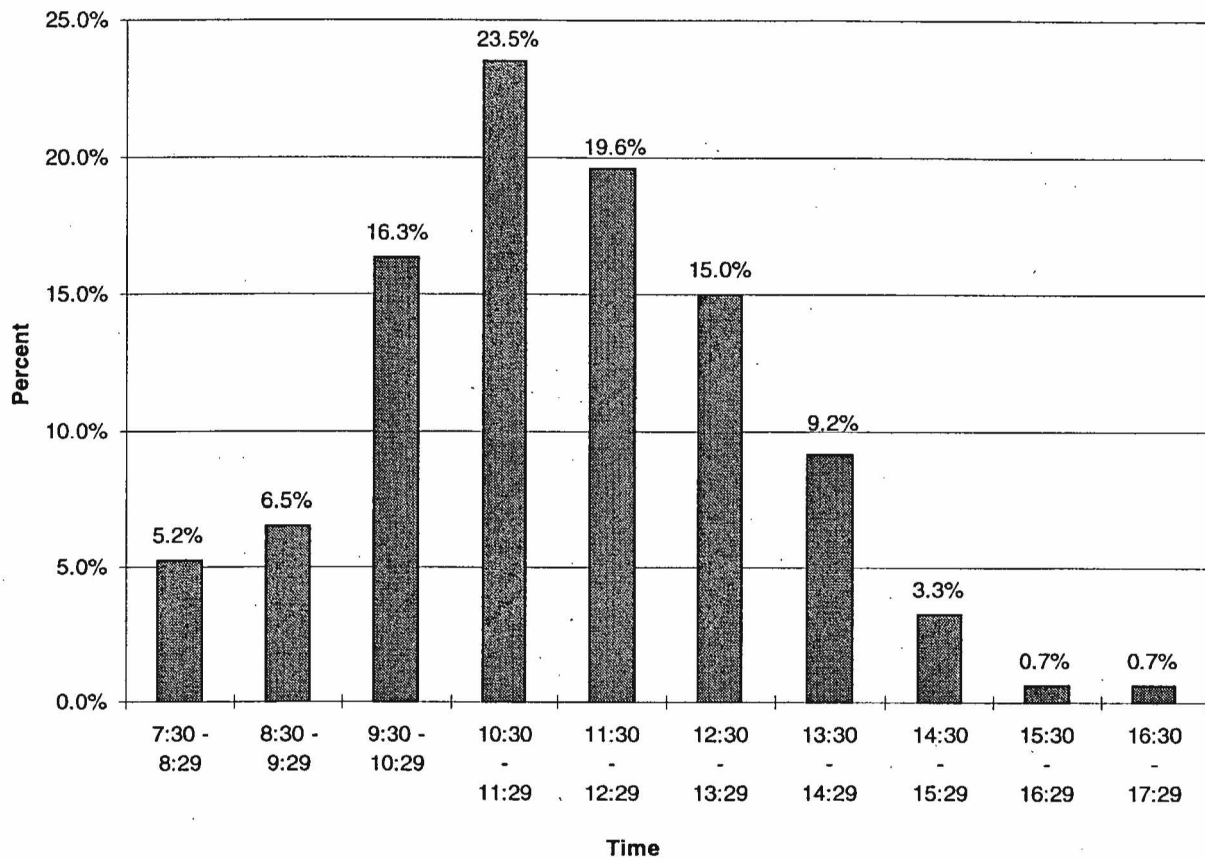
Visitation to Ticket Attractions (July 11/12, 1997)



Note: 163 people made 189 visits to attractions (multiple responses were possible)

Source: Traffic Research and Analysis, Inc., 1997

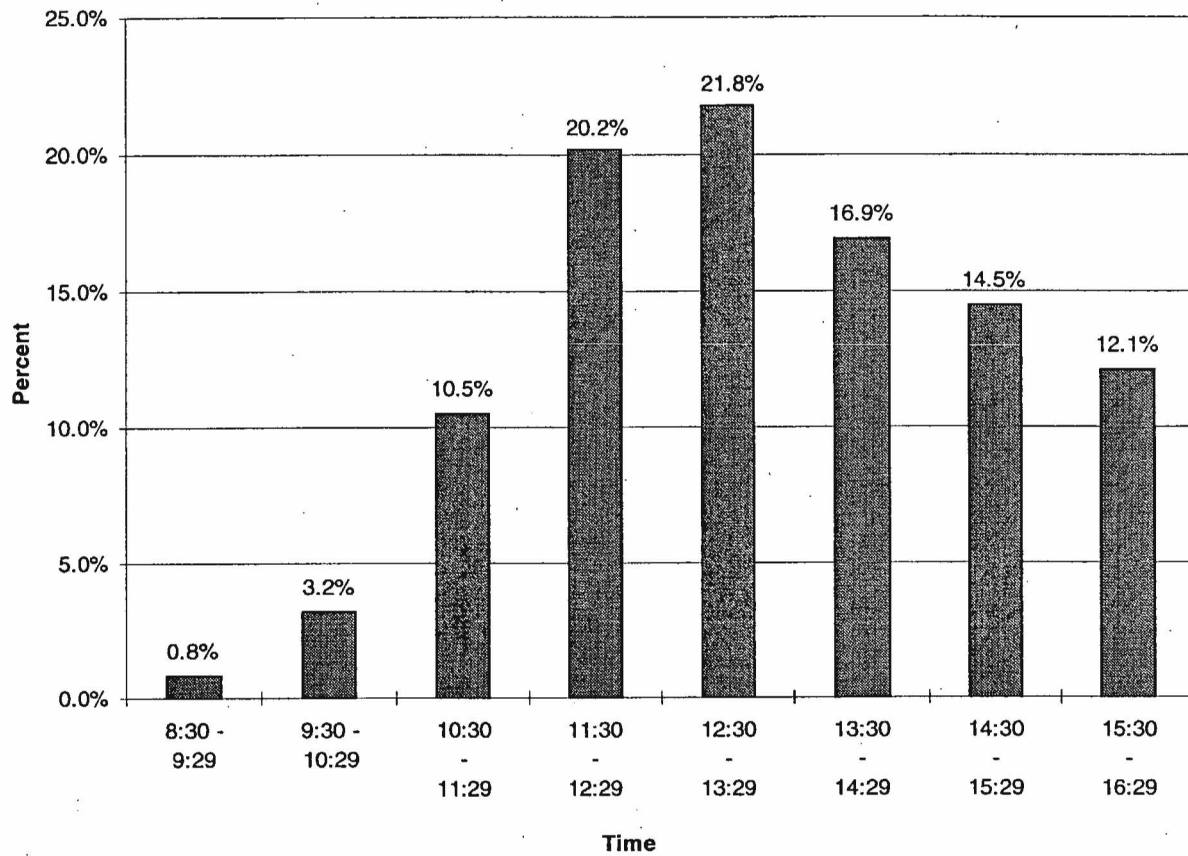
**Time Attraction Ticket Was Purchased
(July 11/12, 1997)**



* Times were recorded on the half hour and hour.

Source: Traffic Research and Analysis, Inc., 1997

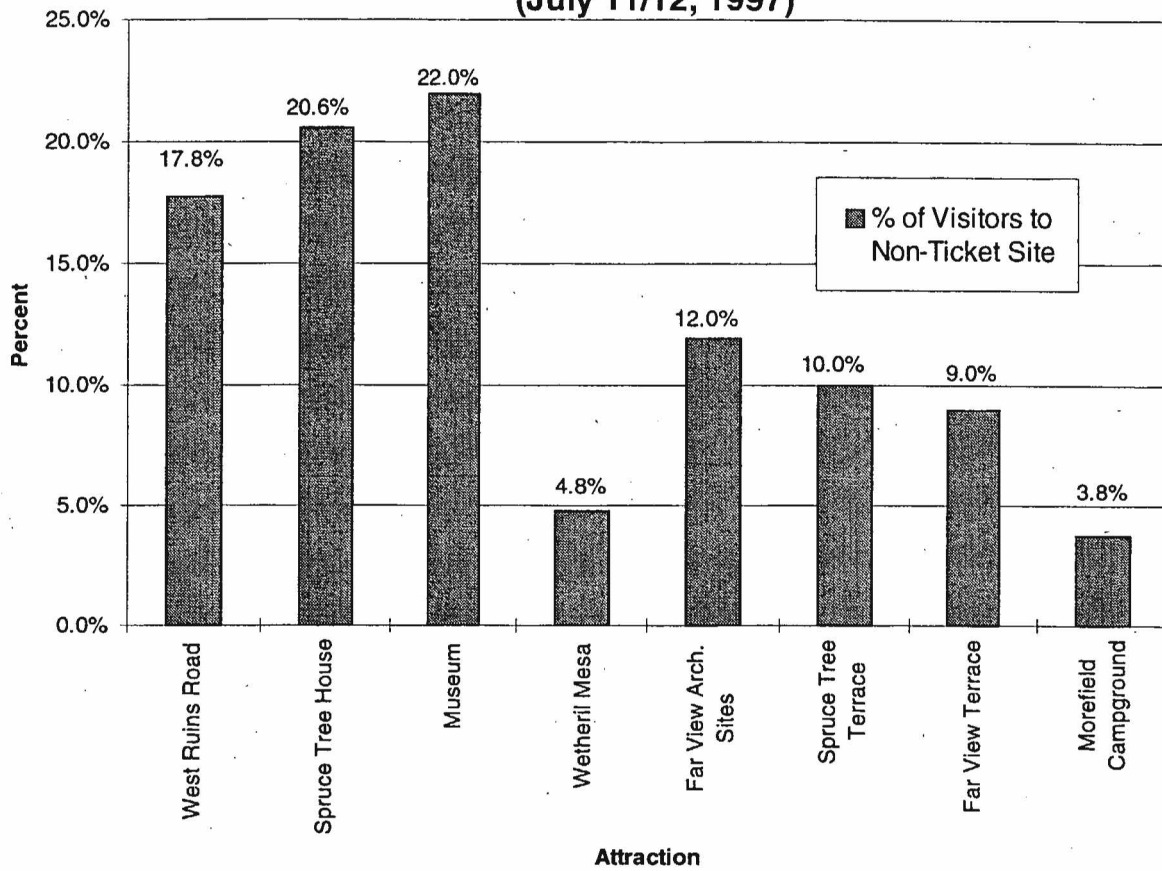
Tour Start Time (July 11/12, 1997)



* Times were recorded on the half hour and hour.

Source: Traffic Research and Analysis, Inc., 1997

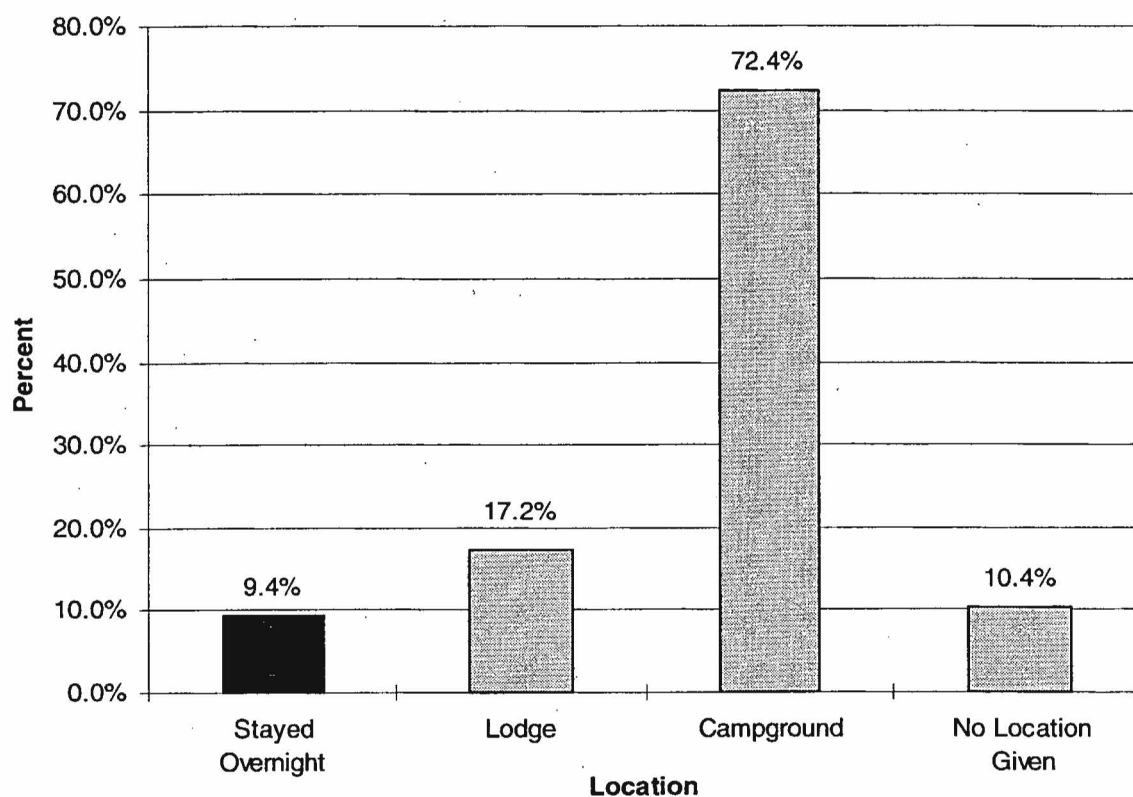
**Visitation to Non-Ticket Attractions
(July 11/12, 1997)**



Note: 296 people made 1,001 visits to non-ticket attractions (multiple responses were possible)

Source: Traffic Research and Analysis, Inc., 1997

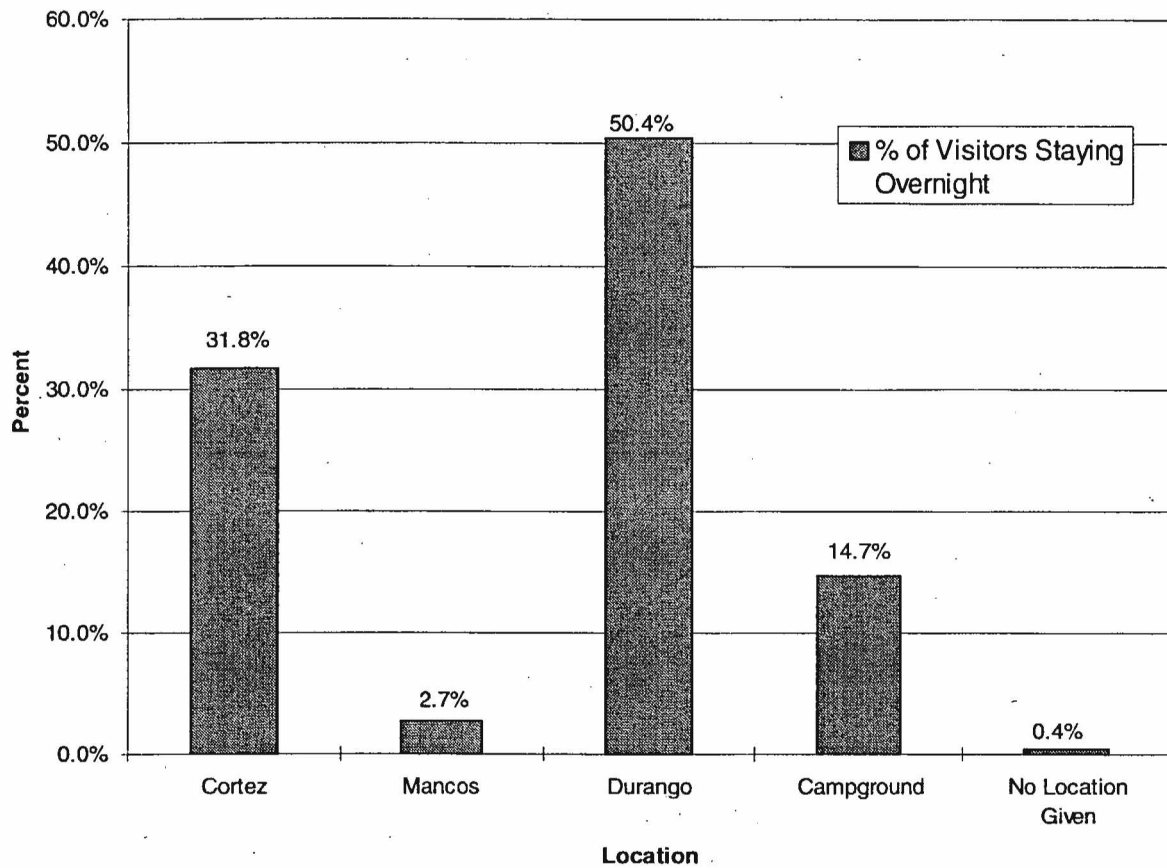
Overnight Stays in Mesa Verde (July 11/12, 1997)



Note: Although possible, there were no multiple responses for this question.

Source: Traffic Research and Analysis, Inc., 1997

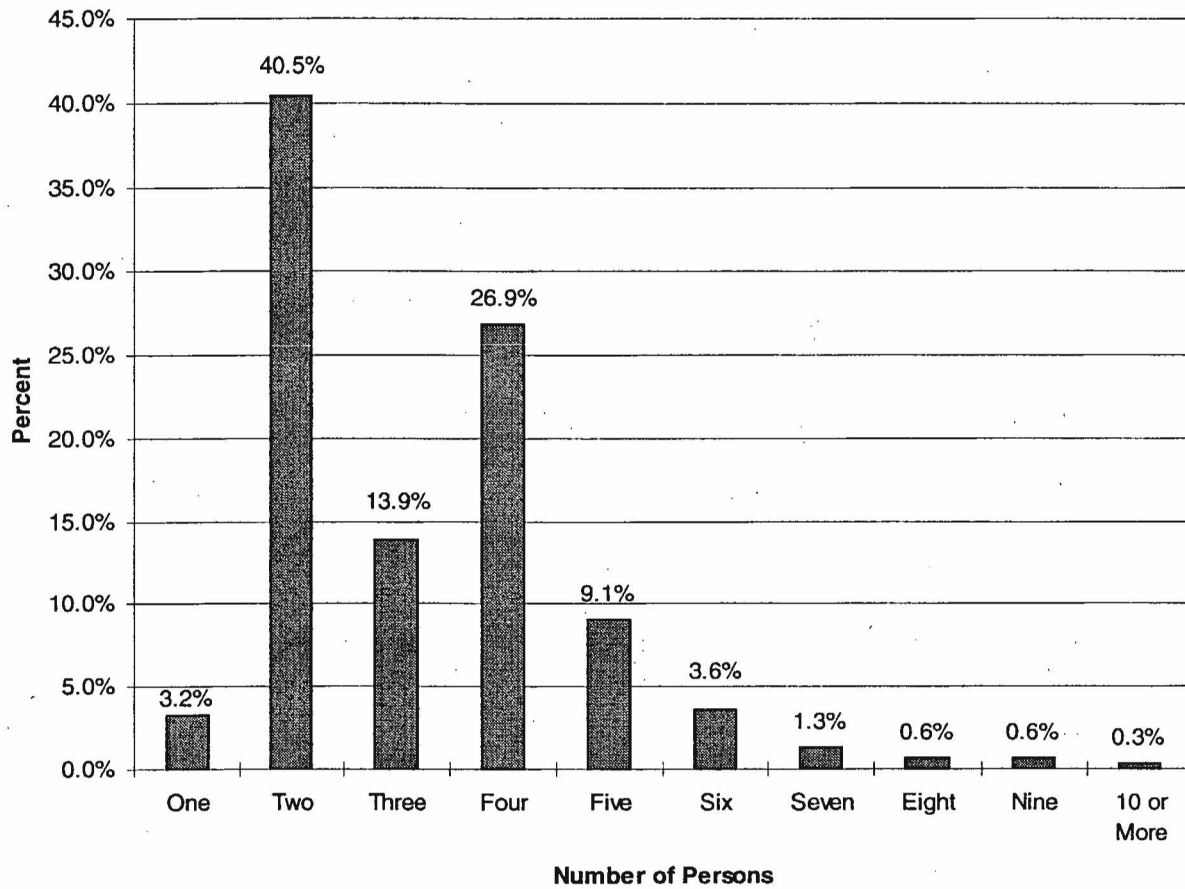
Location of Overnight Stay (July 11/12, 1997)



Note: 159 people stayed 258 nights at different locations (multiple responses were possible)

Source: Traffic Research and Analysis, Inc., 1997

Number of Persons Traveling in Party (July 11/12, 1997)



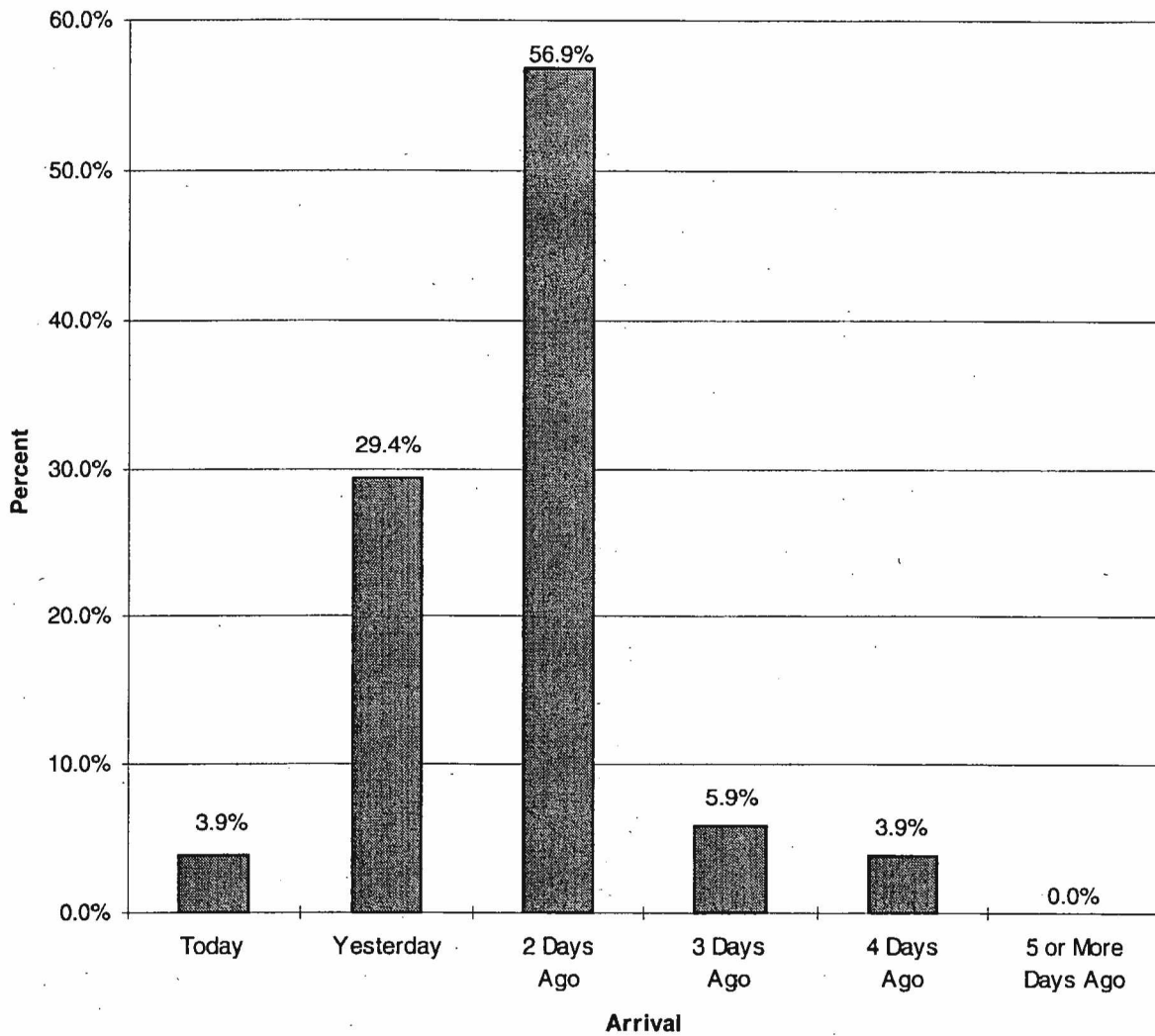
Source: Traffic Research and Analysis, Inc., 1997

**Day of Arrival at Mesa Verde
(August 20, 1997)**

Day of Arrival	% of Respondents	# of Respondents
Today	3.9%	2
Yesterday	29.4%	15
2 Days Ago	56.9%	29
3 Days Ago	5.9%	3
4 Days Ago	3.9%	2
5 or More Days Ago	0.0%	0
Total	100.0%	51

Source: Traffic Research and Analysis, Inc., 1997

Day of Arrival at Mesa Verde (August 20, 1997)



Source: Traffic Research and Analysis, Inc., 1997

Time of Arrival on Day Surveyed **(August 20, 1997)**

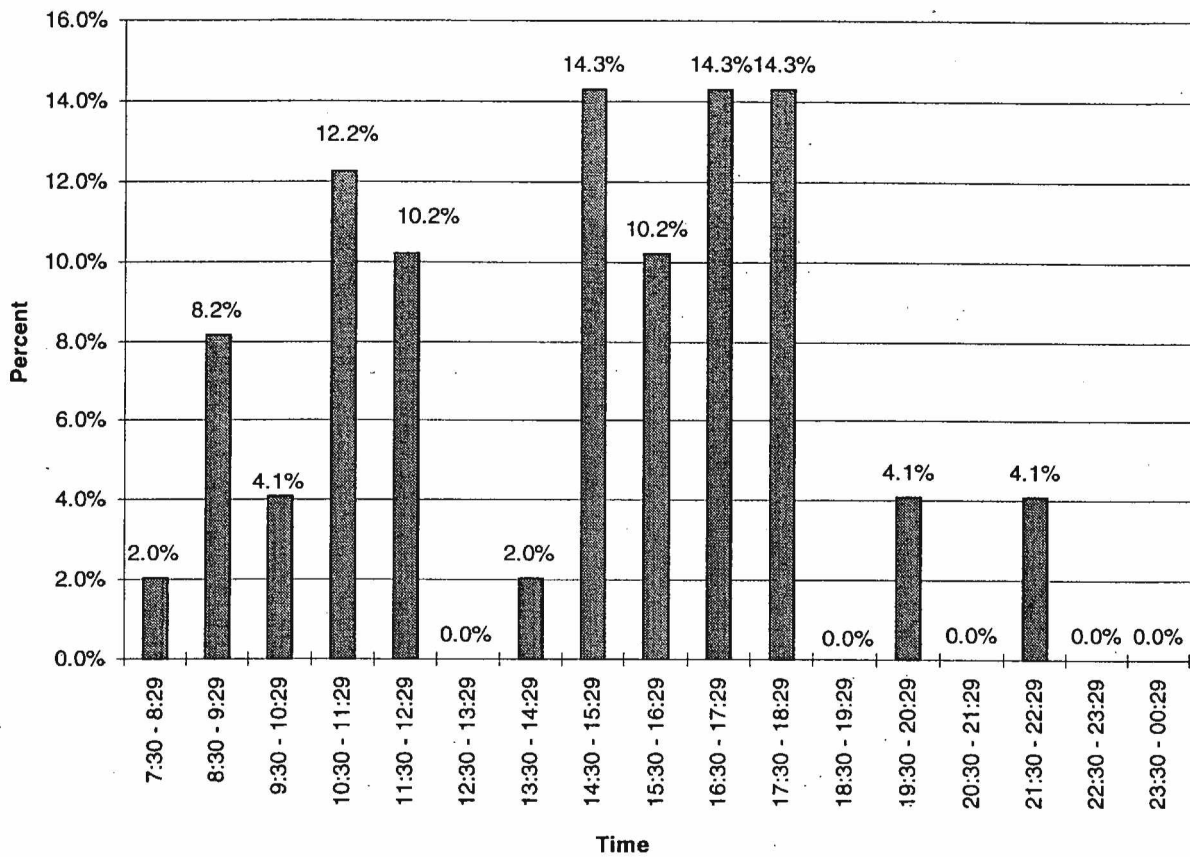
Time of Arrival*	% of Respondents	# of Respondents**
7:30 - 8:29	2.0%	1
8:30 - 9:29	8.2%	4
9:30 - 10:29	4.1%	2
10:30 - 11:29	12.2%	6
11:30 - 12:29	10.2%	5
12:30 - 13:29	0.0%	0
13:30 - 14:29	2.0%	1
14:30 - 15:29	14.3%	7
15:30 - 16:29	10.2%	5
16:30 - 17:29	14.3%	7
17:30 - 18:29	14.3%	7
18:30 - 19:29	0.0%	0
19:30 - 20:29	4.1%	2
20:30 - 21:29	0.0%	0
21:30 - 22:29	4.1%	2
22:30 - 23:29	0.0%	0
23:30 - 00:29	0.0%	0
Total	100.0%	49

* Times were recorded on the half hour and hour

** No response from 2 people

Source: Traffic Research and Analysis, Inc., 1997

Time of Arrival on Day Surveyed (August 20, 1997)



* Times were recorded on the half hour and hour.

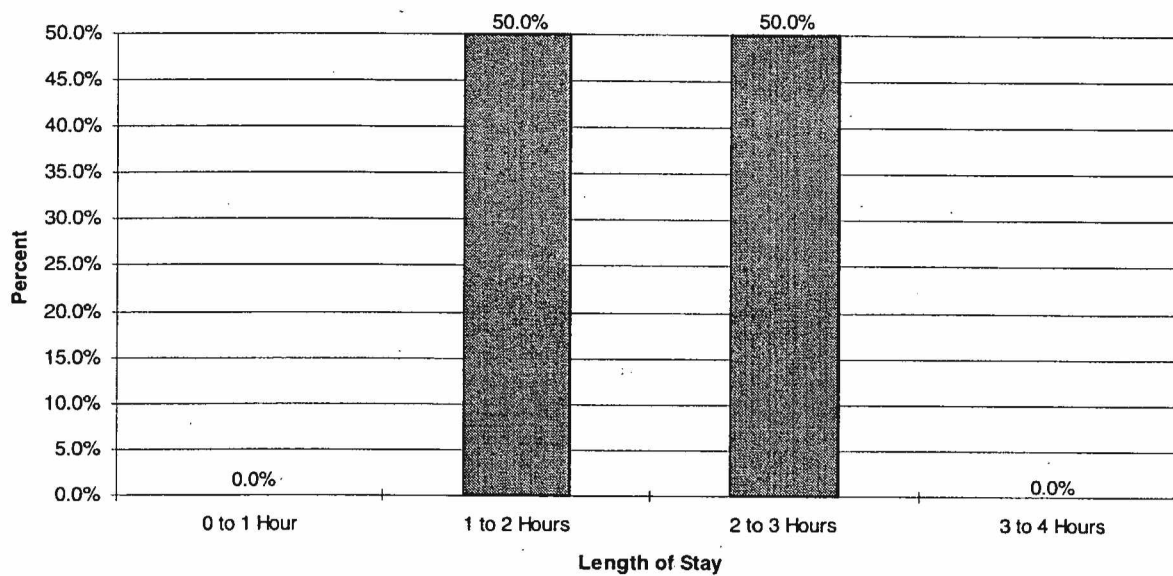
Source: Traffic Research and Analysis, Inc., 1997

Length of One Day Stay **(August 20, 1997)**

Length of One Day Stay	% of Respondents	# of Respondents*
0 to 1 Hour	0.0%	0
1 to 2 Hours	50.0%	1
2 to 3 Hours	50.0%	1
3 to 4 Hours	0.0%	0
Total	100.0%	2

Source: Traffic Research and Analysis, Inc., 1997

**Length of One Day Stay
(August 20, 1997)**



Source: Traffic Research and Analysis, Inc., 1997

Visitation to Ticket Attractions (August 20, 1997)

Visitation of Attraction	# of Respondents	# of Visited Sites	% of Visits
Visited Attractions *	33	54	64.7% (visited one or more sites)
Did Not Visit Attractions	18	0	35.3% (visited 0 sites)
Total	51 people	54 sites	100.0%

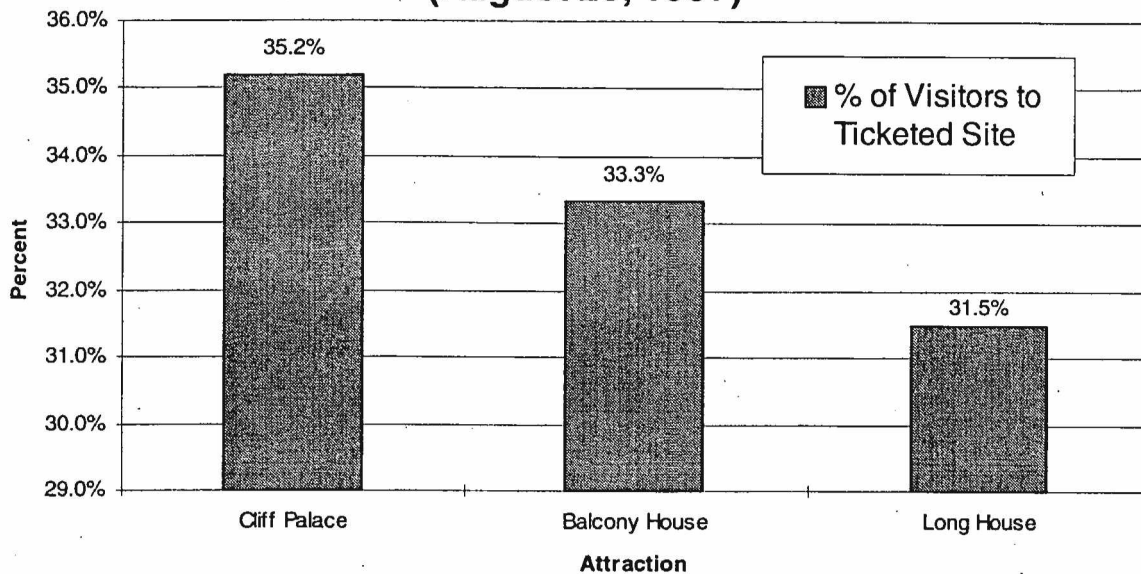
* 33 people made 54 visits to attractions (multiple responses were possible)

Attraction Visited *	# of Visits	% of Visits
Cliff Palace	19	35.2%
Balcony House	18	33.3%
Long House	17	31.5%
Total	54	100.0%

* Multiple site visits possible

Source: Traffic Research and Analysis, Inc., 1997

Visitation to Ticket Attractions (August 20, 1997)



Note: 33 people made 54 visits to attractions (multiple responses were possible)

Source: Traffic Research and Analysis, Inc., 1997

Time Attraction Ticket Was Purchased (August 20, 1997)

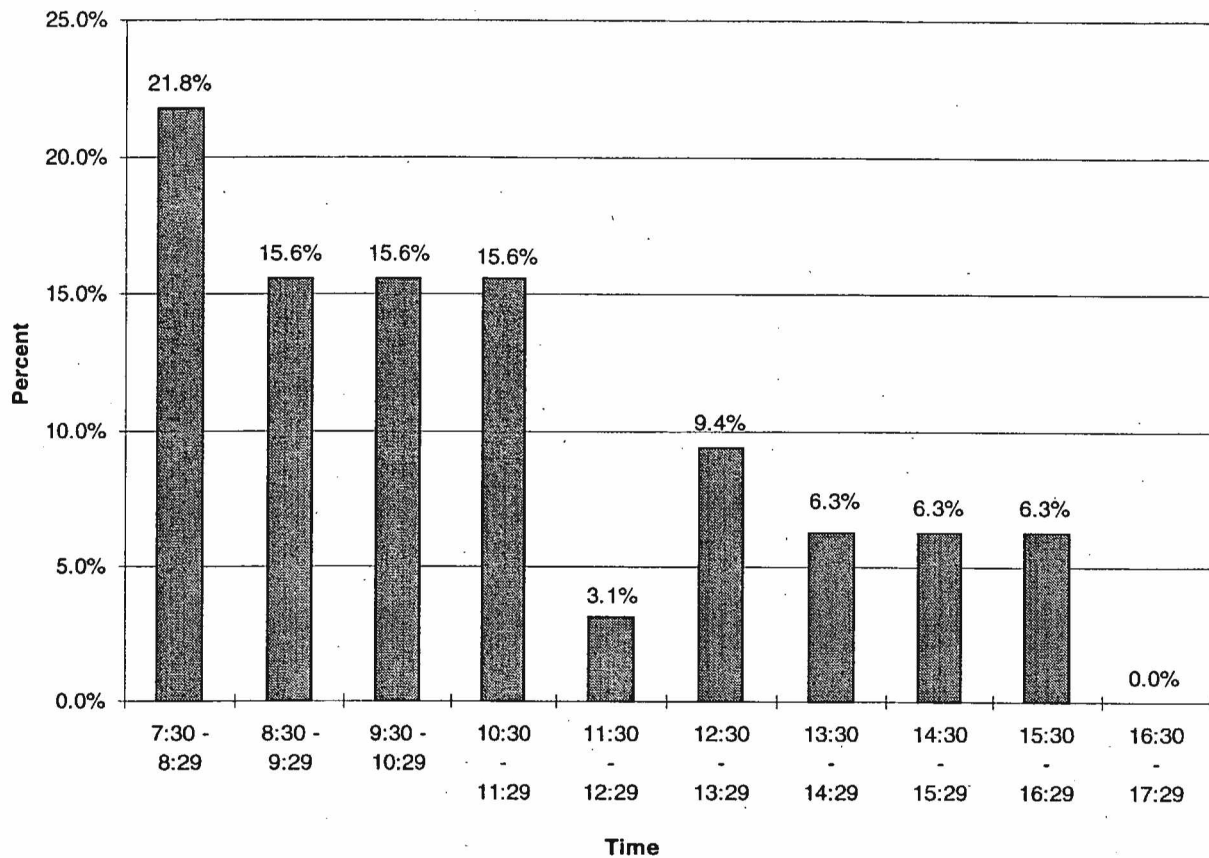
Ticket Time*	% of Respondents	# of Respondents**
7:30 - 8:29	21.8%	7
8:30 - 9:29	15.6%	5
9:30 - 10:29	15.6%	5
10:30 - 11:29	15.6%	5
11:30 - 12:29	3.1%	1
12:30 - 13:29	9.4%	3
13:30 - 14:29	6.3%	2
14:30 - 15:29	6.3%	2
15:30 - 16:29	6.3%	2
16:30 - 17:29	0.0%	0
Total	100.0%	32

* Times were recorded on the half hour and hour

** No response from 1 person

Source: Traffic Research and Analysis, Inc., 1997

Time Attraction Ticket Was Purchased (August 20, 1997)



* Times were recorded on the half hour and hour.

Source: Traffic Research and Analysis, Inc., 1997

Tour Start Time (August 20, 1997)

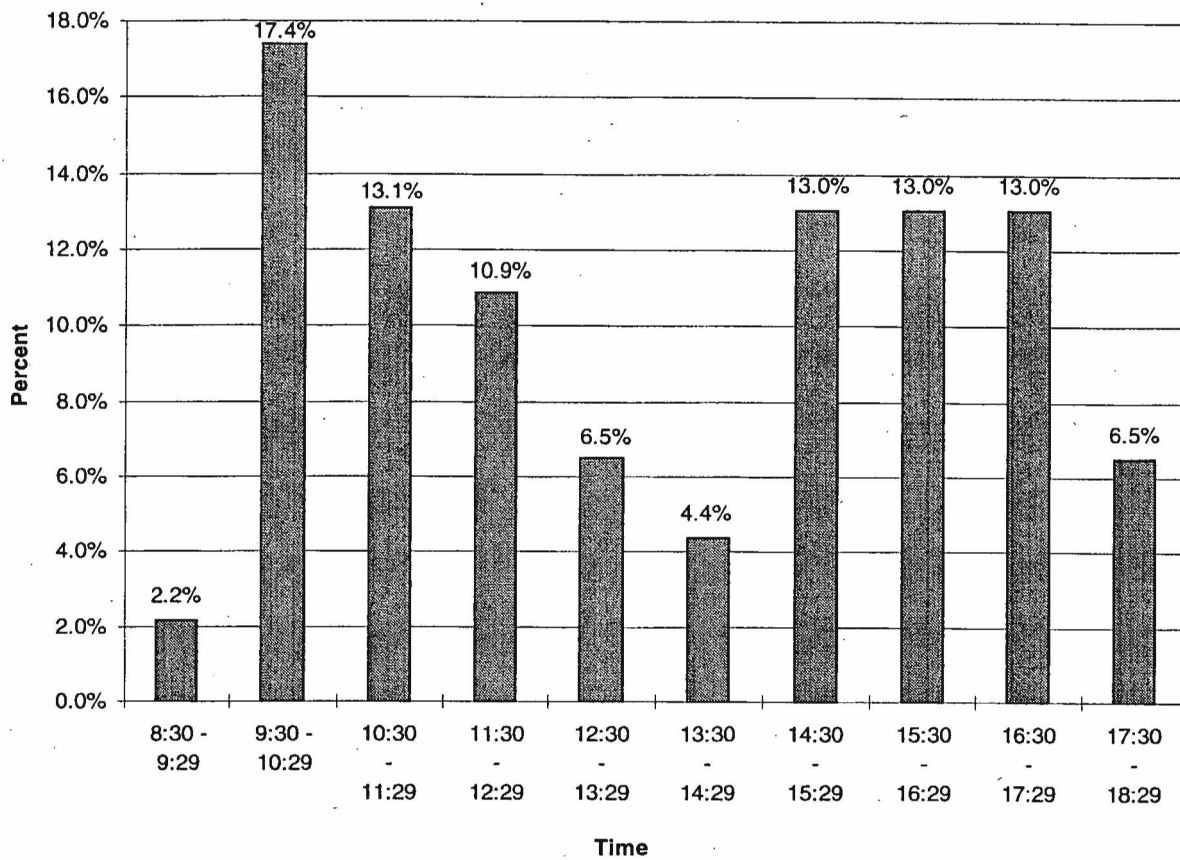
Time Tour*	First Tour		Second Tour		Third Tour		All Tours	
	Percent	Number	Percent	Number	Percent	Number	Percent	Number
8:30 - 9:29	3.5%	1	0.0%	0	0.0%	0	2.2%	1
9:30 - 10:29	20.7%	6	14.3%	2	0.0%	0	17.4%	8
10:30 - 11:29	20.7%	6	0.0%	0	0.0%	0	13.1%	6
11:30 - 12:29	17.2%	5	0.0%	0	0.0%	0	10.9%	5
12:30 - 13:29	3.4%	1	14.3%	2	0.0%	0	6.5%	3
13:30 - 14:29	3.4%	1	7.1%	1	0.0%	0	4.4%	2
14:30 - 15:29	10.4%	3	21.4%	3	0.0%	0	13.0%	6
15:30 - 16:29	3.4%	1	21.4%	3	66.7%	2	13.0%	6
16:30 - 17:29	10.4%	3	14.3%	2	33.3%	1	13.0%	6
17:30 - 18:29	6.9%	2	7.1%	1	0.0%	0	6.5%	3
Total	100.0%	29	99.9%	14	100.0%	3	100.0%	46

* Times were recorded on the half hour and hour

** No response from 8 people

Source: Traffic Research and Analysis, Inc., 1997

Tour Start Time (August 20, 1997)



* Times were recorded on the half hour and hour.

Source: Traffic Research and Analysis, Inc., 1997

Visitation to Non-Ticket Attractions (August 20, 1997)

Visitation of Attraction	# of Respondents	# of Visited Sites	% of Visits
Visited Attractions *	50	244	98.0% (visited one or more sites)
Did Not Visit Attractions	1	0	2.0% (visited 0 sites)
Total	51 people	244 sites	100.0%

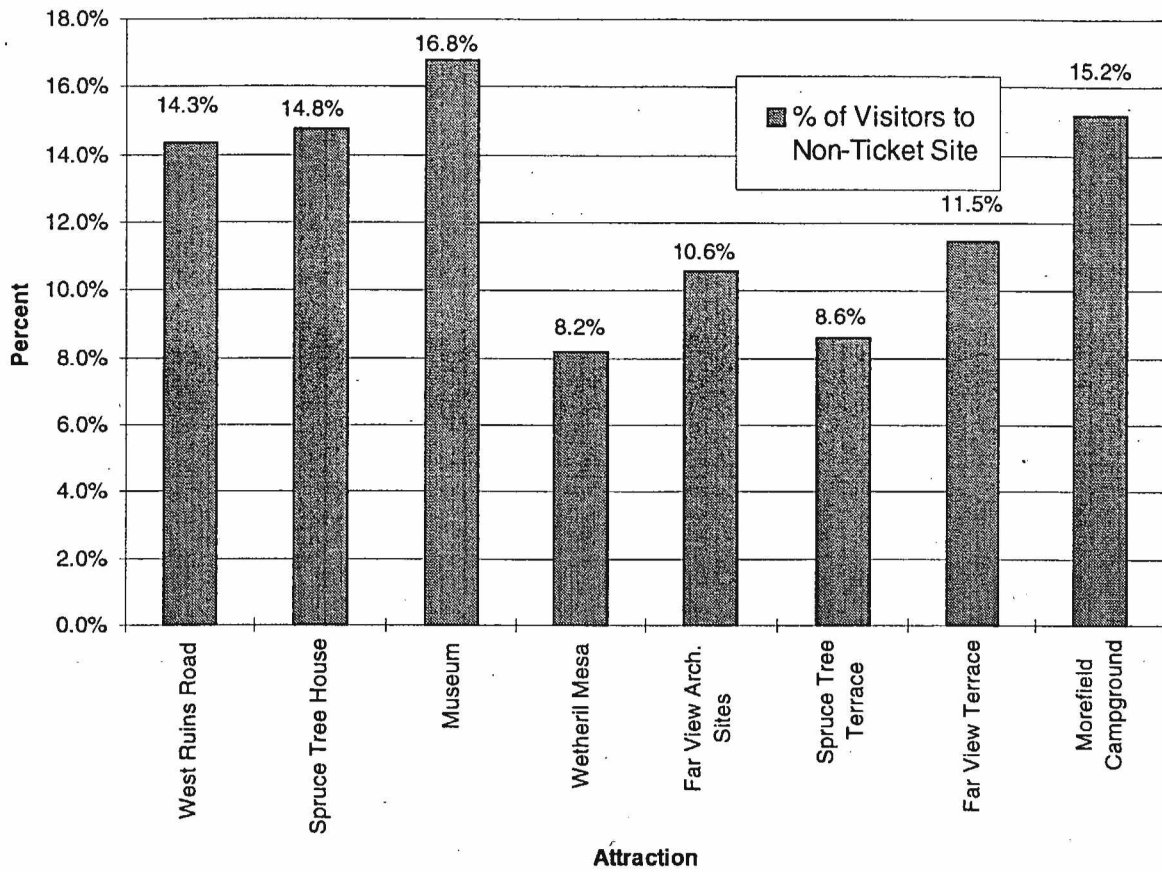
* 50 people made 244 visits to attractions (multiple responses were possible)

Attraction *	# of Visits	% of Visits
West Ruins Road	35	14.3%
Spruce Tree House	36	14.8%
Museum	41	16.8%
Wetheril Mesa	20	8.2%
Far View Arch. Sites	26	10.6%
Spruce Tree Terrace	21	8.6%
Far View Terrace	28	11.5%
Morefield Campground	37	15.2%
Total	244	100.0%

* Note: multiple site visits possible

Source: Traffic Research and Analysis, Inc., 1997

Visitation to Non-Ticket Attractions (August 20, 1997)



Note: 50 people made 244 visits to non-ticket attractions (multiple responses were possible)

Source: Traffic Research and Analysis, Inc., 1997

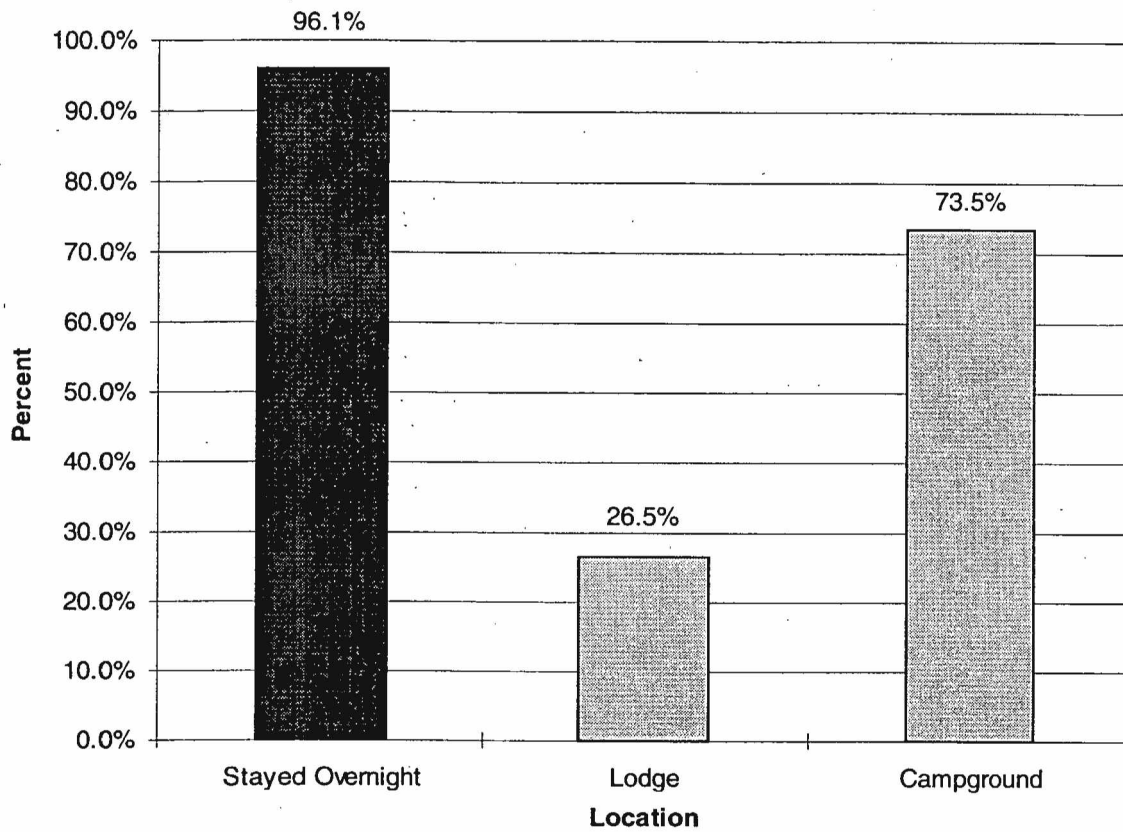
Overnight Stays in Mesa Verde (August 20, 1997)

Overnight Stay*	% of Respondents	# of Respondents
Stayed Overnight	96.1%	49
Lodge	26.5%	13
Campground	73.5%	36
Total	100.0%	49

* Although possible, there were no multiple responses to this question.

Source: Traffic Research and Analysis, Inc., 1997

Overnight Stays in Mesa Verde (August 20, 1997)



Note: Although possible, there were no multiple responses for this question.

Source: Traffic Research and Analysis, Inc., 1997

Location of Overnight Stay (August 20, 1997)

Overnight Stay	# of Respondents	# of Locations	% Stayed/Did Not Stay
Stayed Overnight*	11	14	21.6% (stayed at one or more locations)
Did Not Stay Overnight	40	0	78.4% (stayed at 0 locations)
Total	51 people	14 locations	100.0%

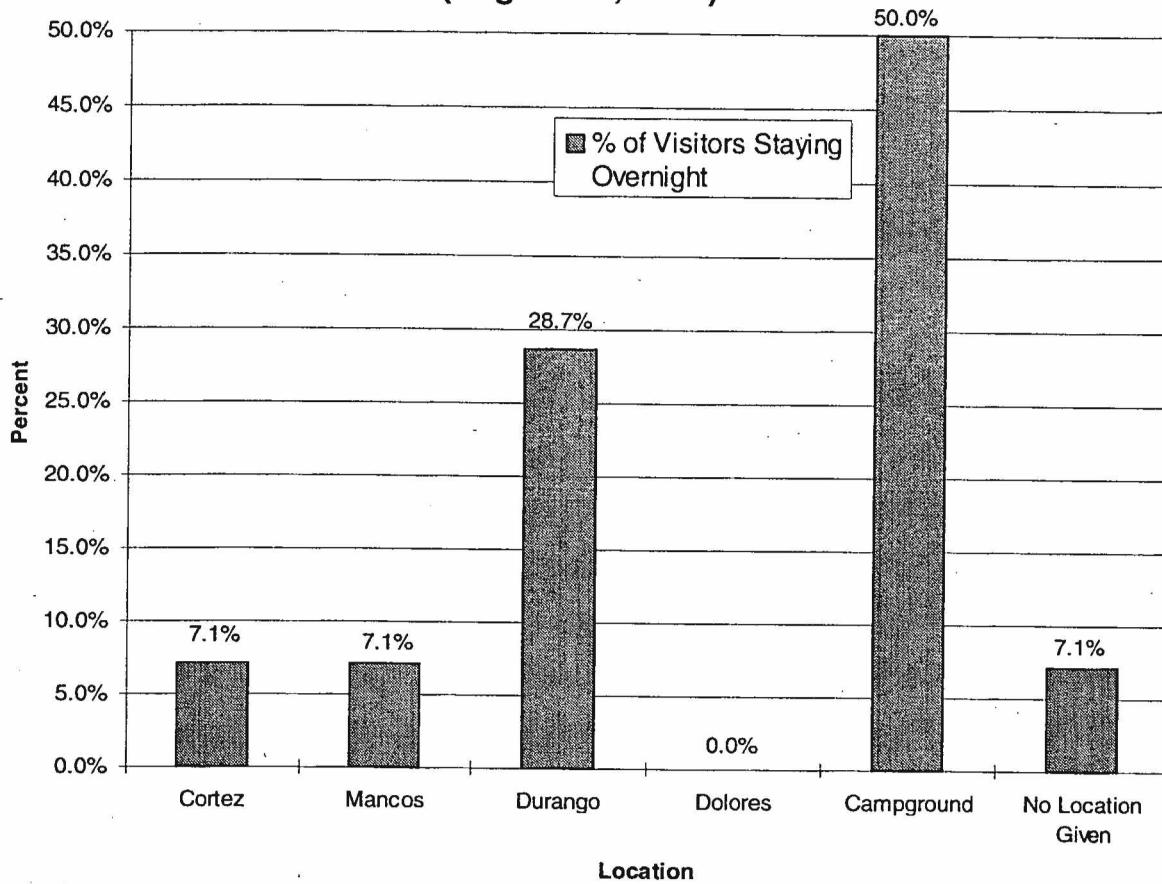
* 11 people stayed at 14 different locations (multiple responses were possible)

Overnight Location*	# of Respondents	% Who Stayed
Cortez	1	7.1%
Mancos	1	7.1%
Durango	4	28.7%
Dolores	0	0.0%
Campground	7	50.0%
No Location Given	1	7.1%
Total	14	100.0%

* Multiple overnight locations possible

Source: Traffic Research and Analysis, Inc., 1997

Location of Overnight Stay (August 20, 1997)



Note: 11 people stayed 14 nights at different locations (multiple responses were possible)

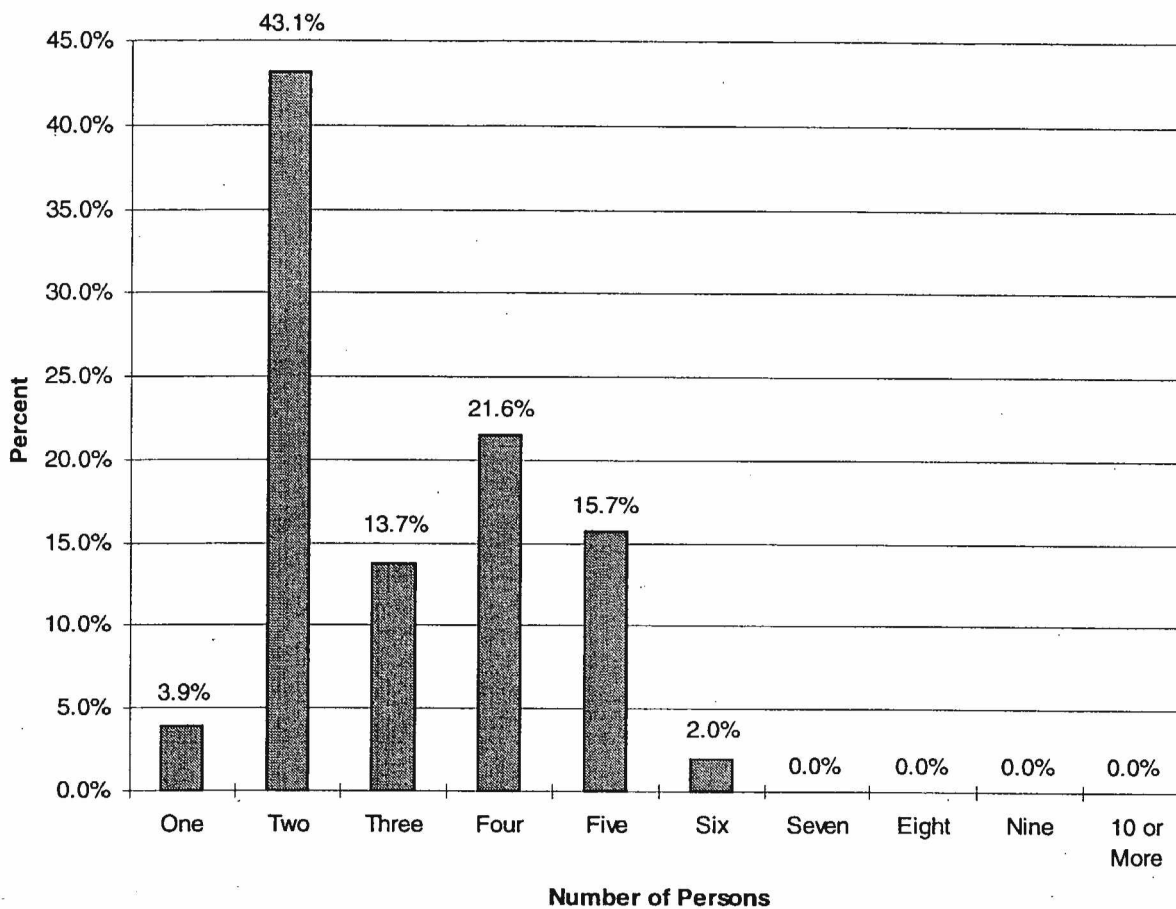
Source: Traffic Research and Analysis, Inc., 1997

Number of Persons Traveling in Party (August 20, 1997)

Number of Persons	% of Respondents	# of Respondents
One	3.9%	2
Two	43.1%	22
Three	13.7%	7
Four	21.6%	11
Five	15.7%	8
Six	2.0%	1
Seven	0.0%	0
Eight	0.0%	0
Nine	0.0%	0
10 or More	0.0%	0
Total	100.0%	51

Source: Traffic Research and Analysis, Inc., 1997

Number of Persons Traveling in Party (August 20, 1997)



Source: Traffic Research and Analysis, Inc., 1997

