

# Build It and They Will Come: Implementing Parking Improvements at Grand Canyon National Park

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## Abstract

As part of the Grand Canyon National Park Transportation Plan, many improvements were initiated in 2009 through 2011 surrounding Mather Point and the Grand Canyon Visitor Center on the Grand Canyon's South Rim. These improvements included construction of nearly 865 parking spaces convenient to the main park visitor center and Mather Point and realignment of the main park access road away from the canyon rim to allow pedestrians to move between the new parking area, the visitor center and the rim without crossing through traffic. Several additional improvements, including improved bus service, were also initiated.

On November 22, 2009, 597 new parking spaces were opened. Four days later, on November 26, these parking lots filled to overflowing. This was a "Field of Dreams"-like moment that confirmed the voice that said, "Build it and they will come."

Both the Park Service staff and the consultants who planned the transportation improvements were taken by surprise. There was far more parking demand than anticipated. What was going on, and why was parking demand so much greater than predicted by parking demand models?

This presentation will describe the many transportation improvements in the South Rim Visitor Transportation Plan and explore the explanations for high parking demand. The Transportation Plan serves a park that has 4.4 million visitors each year.

## Introduction

The Grand Canyon, one of the seven natural wonders of the world, is located in northern Arizona and much of the canyon is protected for the enjoyment of future generations as Grand Canyon National Park. Although the Park is quite large, extending 277 miles along the course of the Colorado River, and encompassing 1904 square miles, about 90 percent of visitors to the Grand Canyon come to the "South Rim". And, of those visitors who



come to the South Rim, nearly all come to Grand Canyon Village. A major attraction in this area is Mather Point. For visitors arriving through the South Entrance to the Park – which is 80 percent of the visitors coming to the South Rim – Mather Point is their first opportunity to view the Grand Canyon. Thus, large numbers of visitors descend on Mather Point – perhaps 15,000 on a busy summer day.

Put in annual terms, over 4.4 million visitors arrive at Grand Canyon National Park each year, making it the second most visited National Park. About four million of these visitors will pass through Grand Canyon Village and most will, at some time during their visit, go to Mather Point.

### **History**

A railroad first arrived at the South Rim 1901 and the first automobile arrived in 1902. The railroad was instrumental in bringing large numbers of tourists to the Grand Canyon. Grand Canyon National Park was established in 1919 and by 1926 the numbers of visitors arriving by automobile surpassed the number arriving by rail.

Mather Point was made much more accessible in 1954 when a new roadway was built serving this portion of the canyon rim. Along with the new roadway, a parking lot was built at Mather Point with 110 parking spaces. In a traffic survey report published in 1955 it was reported that in the previous year (1954 – the year the parking lot was opened) there were days when the parking lot was overflowing. It is ironic that no additional parking was built in this area until 2009; sometimes the wheels of government turn slowly.

### **New Visitor Center near Mather Point in 2000**

Until the year 2000 the main visitor center on the South Rim was located in Grand Canyon Village, about two miles to the west of Mather Point. In 2000 a new visitor center – to replace the previous facility – was built adjacent to Mather Point. This facility now goes by the formal name of Grand Canyon Visitor Center.



**Grand Canyon Visitor Center**

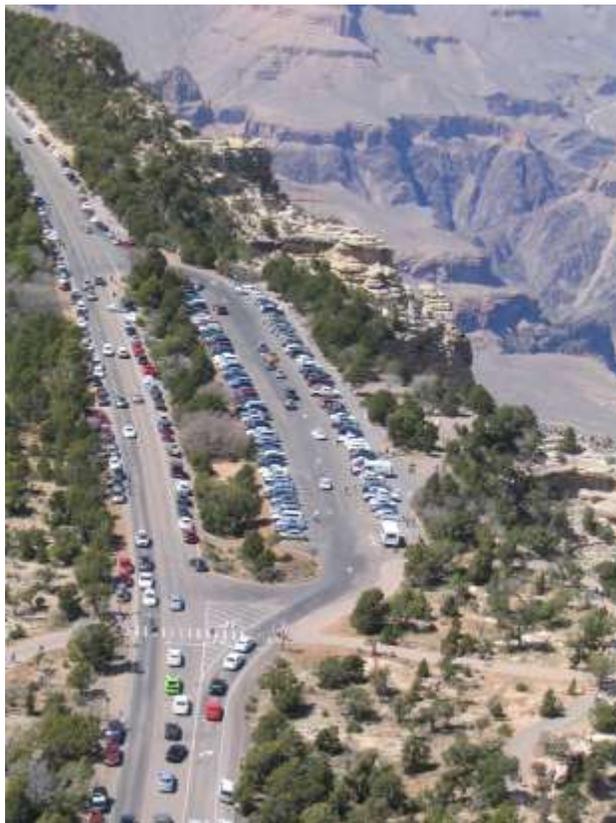
The very unusual feature of this visitor center is that it was built with no parking to serve the visitor center. This would seem to be very unusual, but at the time the visitor center was designed there was a good reason not to include parking. From the mid-1980s to the mid-1990s, visitation in the Park skyrocketed. A General Management Plan for the Park produced in 1995 sought to plan for continued increases in growth. By the late 1990s the Park had plans to build a light rail line from the gateway community of Tusayan, located just outside the Park's south entrance, to the new visitor center. Under the concept, visitors would be encouraged to park their personal

vehicles in the gateway community and use light rail to enter the Park. Thus, visitors would be “delivered” to the new visitor center and there would be no need for parking. Shuttle bus transit would then take visitors to other points in the Grand Canyon Village area.

Plans for the light rail system eventually succumbed to high costs and politics. It is reported that the cost of the system reached \$200 million and that the National Park Service was directed by Congress to not build a light rail system because of the high cost. Thus, a new visitor center opened in the year 2000 with no parking of its own.

The lack of parking created several issues. Traffic and parking congestion along the roadway past Mather Point was severe. In 2007 and 2008 as many as 464 vehicles were counted parked along the shoulder of the roadway near Mather Point. Under these conditions vehicles were parked continuously, on both sides of the road, for a distance of 1 mile. These conditions provided a poor visitor experience, unsafe conditions for vehicles and pedestrians, and caused damage to Park resources, such as the trampling of vegetation.

In addition, the nearby new visitor center was difficult for visitors to find and less than half of Park visitors went to the visitor center.



**Traffic and Parking Congestion at Mather Point - 2006**

### **Development of Transportation Plan**

When Congress directed the Park to not build a light rail system, Congress also requested that the National Park Service submit a report to Congress on other ways to provide transportation services. A report was completed in 2004 and the Park subsequently embarked on a planning process to develop a new transportation plan. The transportation planning process was begun in 2006 and completed in 2008. By 2011 most of the elements of the transportation plan had been implemented by the Park. Those elements included: major improvements at the South Entrance Station to reduce congestion and long waiting times; a realignment of the roadway near Mather Point to eliminate vehicle-pedestrian conflicts and improve visitor experience, the construction of parking areas at Grand Canyon Visitor Center; and construction of a formal shuttle bus station at Grand Canyon Visitor Center. As a result of implementing these improvements, most of the major transportation problems that previously existed have now been resolved.

### **Sizing Parking Facilities at Grand Canyon Visitor Center**

In order to select a number of parking spaces to build surrounding the Grand Canyon Visitor Center, a parking demand model was developed for the Transportation Plan. That model assumed that, on the average, vehicles will be parked at the visitor center for 1 hour 50 minutes once a future theater, bike rental facility, and food service facility were in place in the visitor center area. It is worth noting that this value of 1 hour 50 minutes is considerably longer than an average parking duration of 1 hour three minutes observed at Mather Point on July 22, 2006.

The parking demand model also assumed that some visitors will park at the visitor center and then ride shuttle buses to other destinations (167 vehicles per day with an average parking duration of 5 hours 45 minutes) and that other visitors will park at the Plaza and then travel via their personal vehicle to other destinations (3,025 vehicles per day for 1 hour 45 minutes). These assumptions appeared to be very reasonable at the time the parking demand model was developed. This model, supported by data on numbers of vehicles entering the Park on a “design day”, led to the decision to build 597 parking spaces at Grand Canyon Visitor Center.

### **Completion and Opening of new Parking Facilities**

Three new parking areas with parking spaces for 597 private vehicles opened at the Grand Canyon Visitor Center on Monday, November 23, 2009. Just four days later, on the afternoon of Friday, November 27, the day after Thanksgiving, all three parking lots filled to capacity. Because November 27 actually had 9 percent fewer visitors than an average summer day, the experience on November 27 suggested that full parking areas at Grand Canyon Visitor Center might be a common occurrence in the summer of 2010.



**Parking Lot 2 – November 27, 2009**

Both the Park Service staff and the consultants who planned the transportation improvements were taken by surprise, for three reasons. First, the Transportation Plan anticipated that 597 parking spaces at Grand Canyon Visitor Center would accommodate demand equivalent to a 2005 Design Day. Second, November 27, 2009 actually had 15.8 percent fewer visitors than a 2005 Design Day. Third, 597 parking spaces was more than the highest number of parked vehicles ever previously observed at the former Mather Point parking lot and on the roadside near Mather Point. There was far more parking demand than anticipated. What was going on, and why was parking demand so much greater than predicted by parking demand models? Furthermore, what ramifications did this have? Should the Park build more parking?



### **New Facilities at Grand Canyon Visitor Center and Mather Point - 2011**

#### **Additional Data Collection and Analysis – Parking Duration**

A possible explanation for the high parking demand is that visitors were now parking at Grand Canyon Visitor Center for longer periods of time than anticipated by the parking demand model.

On July 22, 2006 data was collected that showed an average parking duration of 1 hour 3 minutes at the then Mather Point parking lot and for Mather roadside parking. This duration served as a starting point for developing the parking demand model.

In retrospect, the 2006 data, and how it was used in the parking demand model, had shortcomings. There was a small sample size of only 22 parking spaces. In addition, duration data on July 22, 2006 was collected from 6:00 a.m. to 8:00 p.m. The average parking duration of 1 hour 3 minutes was an average for the entire 14 hour time period. More recent observation of the raw data showed that both early morning (sunrise) and late evening (sunset) parking durations were much shorter than the average of 1 hour 3 minutes. Early to mid-afternoon parking durations – the time of day when peak parking accumulation occurs - were much longer than 1 hour 3 minutes. Thus, the 1 hour 3 minute average duration was a poor value to use as an input to the parking demand model.



## Parking Lot 2

The following illustrates the large variations in average durations at different times of day at Mather Point in July, 2006.

Arrivals between 6:00 and 7:00 a.m. – 33 minutes (sunrise was at 5:28 a.m.)

Arrivals between 12:00 noon and 3:00 p.m. – 1 hour 52 minutes

Arrivals between 7:00 and 8:00 p.m. – 14 minutes (sunset was at 7:41 p.m.)

As a result of this observation, the collection of parking duration at the new parking lots on June 18, 2010 focused on duration from mid-morning to late afternoon and, in particular, looked at parking duration as a function of arrival time at the parking lot.

As is true on most days, Parking Lot 2 filled up first. Parking Lot 2 observations were made from 8:45 a.m. to 6:10 p.m. on June 18. For that entire time period the average parking duration was 2 hours 20 minutes. Inspection of the duration on an hour-by-hour basis, as a function of arrival time, showed that parking duration did vary depending on the time of day. Vehicles that arrived between 8:45 and 11:59 a.m. parked for a significantly longer period of time (2 hours 59 minutes) than the overall average. Many of the vehicles that arrived between 8:45 and 11:59 were still parked there during early and mid-afternoon and thus were contributing to the day's peak parking occupancy. It is also of interest to note that very little short term parking occurred in Lot 2. Only 13 percent of the vehicles parked in this lot stayed for 30 minutes or less.

Parking Lot 3 has usually filled up last each day. Parking Lot 3 observations were made from 8:59 a.m. to 6:00 p.m. The average parking duration during this nine hour period was 1 hour 22 minutes. Again, duration varied depending upon arrival time; vehicles arriving between 9:00 and noon stayed longer than average. Visitors arriving in this lot likely have shorter periods of time available for their visit than those who arrived earlier in the day.



**Aerial View of Grand Canyon Visitor Center and Mather Point**

A comparison of the duration values for June 18, 2010 versus July 22, 2006 revealed that the overall average durations of 2 hours 20 minutes (Lot 2) and 1 hour 22 minutes (Lot 3) are significantly longer than the 1 hour 3 minutes observed in 2006. This is partly due to the 2006 data including early morning and late evening (generally shorter duration) parking.

Peak parking demand occurred during the early afternoon hours. Average parking duration during these hours of the day plays an important role in determining that peak parking demand. What was the average parking duration during these hours for all three parking lots at Grand Canyon Visitor Center? A reasonable estimate for all three lots combined – during peak parking demand - is in the range of 2 hours 15 minutes to 2 hours 30 minutes. This was significantly longer than the 1 hour 50 minutes used in the parking demand model. Thus, long parking duration is one of the explanations for increased parking demand.

While already longer than assumed in the parking demand model, parking duration is likely to further increase within the one to two years after the 2010 data was collected. A theater at the Grand Canyon Visitor Center opened in Spring, 2011 showing a film of about 20 minutes. A sizable percentage of visitors will likely choose to watch the film and this will increase the length of stay. New exhibits were installed at Grand Canyon Visitor Center in Spring, 2012 which will also attract interest and extend length of stay in the visitor center area. Simple “grab and go” food service was also initiated in June, 2012. Each of these services has likely increased average parking duration and, in turn, increased peak parking demand.

The parking demand model used an average parking duration of 1 hour 50 minutes. Current parking duration is estimated in the range of 2 hours 15 minutes to 2 hours 30 minutes. With the

installation of additional services, parking duration will increase. In retrospect, it appears that too short a value for parking duration was probably used in the model of parking demand.

### **Additional Data Collection and Analysis – Visitors Parking and Riding Shuttle Buses**

The parking demand model assumed that some visitors will park at the Grand Canyon Visitor Center and then ride shuttle buses to other destinations (167 vehicles per day with an average parking duration of 5 hours 45 minutes) and that other visitors will park at the Plaza and then travel via their personal vehicle to other destinations (3,025 vehicles per day for 1 hour 45 minutes).

Thus, the parking demand model assumes a very small percentage (five percent) of visitors park at the visitor center and then ride shuttle buses to other destinations. As a result, average parking duration in both the model and the real world is very sensitive to the proportion of visitors who actually do choose to park at the visitor center and ride a shuttle bus. One possible explanation for the higher than expected average parking duration observed on November 27, 2009, and the filling of the parking lots, is that visitors may have been parking and boarding shuttle buses in larger numbers than assumed by the parking demand model.

For the above reason, it was judged to be very useful to understand the actual percentage of visitor center parkers who used the shuttle bus to travel from the visitor center to other destinations. As visitors returned to their vehicles, they were surveyed and asked whether they had ridden a shuttle bus.

Based on this survey information, it appears that at least one-fourth of the visitors park their vehicles and then ride on a shuttle bus to some other location. Those who ride on a shuttle bus have a much longer parking duration. For example, in Lot 2 those who rode a shuttle bus had an average parking duration of 4 hours 44 minutes while those who did not ride a shuttle bus had an average parking duration of 1 hour 43 minutes.

Arrival time influenced the visitor's decision on whether to travel elsewhere on a shuttle bus. Of those arriving before 11 a.m., 78 percent rode on a shuttle bus. After 11 a.m., 59 percent reported riding on a shuttle bus.

The data collected on June 18, 2010 show that a much, much higher proportion of visitors are choosing to park their vehicles and then ride on a shuttle bus than was assumed by the parking demand model. While the model assumed about five percent would do so, it appears that at least one-fourth of visitors parking at the visitor center are then riding shuttle buses. This contributes greatly to increased parking demand.

The above observations of parking duration and percentage of visitors who park and ride a shuttle bus show that visitor behavior has changed considerably compared to previous conditions.

### **More Parking Built in 2010**

Because the 597 parking spaces filled to capacity several times in the spring of 2010, park management made the decision to build 265 more parking spaces at Grand Canyon Visitor Center. These parking spaces were opened in the fall of 2010.

In the spring of 2011, parking occupancy was observed on three days known to be very high days of visitation. On one of those days the 862 parking spaces filled to capacity.

In the spring of 2012, parking occupancy was observed on the Tuesday before Easter – a day that is often the highest visitation day during the “spring break” season. On that day the number of vehicles in the four parking lots exceeded the number of parking spaces by more than 100. The opening of the movie theater and the opening of new exhibits between the spring of 2011 and the spring of 2012 may account for increased parking demand.

### **Conclusion**

Grand Canyon National Park has made excellent progress in implementing the most important elements of the Transportation Plan to meet current needs, including the provision of more parking at Grand Canyon Visitor Center. .

The Park should continue to monitor parking conditions so that it can make informed decisions about implementing additional elements of the Transportation Plan. The recent completion of the theater and additional exhibits, and initiation of simple food service at Grand Canyon Visitor Center will likely increase parking demand. There may also be changes in the level of park visitation. For these reasons, continued monitoring of parking conditions will be important.

The Park can and should become more proactive in parking management, especially for days of very high visitation. Parking management measures can allow for more efficient use of existing parking facilities.



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