Garden of the Gods Shuttle Study

Visitation Trends and Service Planning

Cyclist at Balanced Rock, Garden of the Gods. Source: Volpe

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This study for the City of Colorado Springs Parks, Recreation and Cultural Services Department, provides a preliminary analysis and set of recommendations to support the city's work moving forward to implement a shuttle system at Garden of the Gods, which experiences heavy congestion. This report provides an analysis on recent visitation trends, visitor survey responses, and a presentation of shuttle concepts for consideration. Concepts include a vehicle recommendation and preliminary cost estimates. The report concludes with considerations and proposed next steps. Three addendums are included that include 1) a detailed recommendation for a pilot Gateway Road Circulator shuttle route; 2) a description and findings from a March 2018 public meeting about the shuttle study and pilot shuttle concepts; and 3) an analysis of ridership data for the 2018 pilot shuttle season.

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Overview

Located within Colorado Springs, CO, Garden of the Gods (GoG) Park is owned and managed by the City of Colorado Springs (City) with support from the GoG Foundation. GoG was designated a National Natural Landmark by the National Park Service in 1971 and is characterized by vertical red rock geological formations of different shapes, sizes, and colors. Visitors coming to the park frequent its many attractions and services, including the GoG Visitor and Nature Center, the Trading Post, or a variety of tours and excursions offered with Adventures Out West and other providers. Attracting upward to six million visitors each year, it is the region's most popular destination.

In recent years, as visitation has risen, the City has witnessed high congestion, particularly on summer weekends. This congestion has led to vehicle queueing outside the entrance gate to the main parking lot, a distance of about one mile. Concerned about safety and visitor experience, the City is interested in managing the rising congestion by exploring the feasibility of implementing a shuttle system during the peak season.

The City's Parks, Recreation, and Cultural Services Department requested the assistance of the U.S. Department of Transportation Volpe Center (Volpe) to develop preliminary concepts for a shuttle system to be implemented as early as 2018. Between July 12 and 13, 2017, Volpe traveled to Colorado Springs to conduct a site visit of GoG and meet with a core project team and key stakeholders to gather important information on visitation, congestion issues, and priorities for developing a shuttle system and managing parking. Volpe had periodic meetings with both groups over the ensuing five months as it developed this report.

This report provides an analysis on visitation trends followed by a presentation of three shuttle concepts for consideration, including a vehicle recommendation and preliminary cost estimates. This report is the deliverable for Task 1 of 3 outlined in the Statement of Work for this project.

Existing Conditions

Visitation Trends

At the Visitor Center, visitation throughout the 2000s remained fairly constant at around 600,000 visitors/year, but visitation jumped beginning in 2014. Between 2013 and 2016, in fact, visitation rose by 82 percent, from 560,000 to 1,018,000 people;[1] this high degree of growth is a trend throughout the state, including at nearby Pikes Peak.[2] Because visitation recorded at the Visitor Center is a fraction of the number of people exploring the sites within the park, it is likely that total park visitation exceeded the City's estimation of two million. Figure 1: *GoG Visitor Center Visitor Counts by Year, 1999 to 2017* illustrates this trend, including a comparison of monthly counts within this timeframe. All months generally follow the same pattern from year to year, but 2017 is on pace to be a record year, with some monthly counts nearly doubling the 18-year average.

[1] Visitation data was collected from the GoG Visitor and Nature Center

[2] Visitation data collected from the City of Colorado Springs shows that visitation at Pikes Peak rose 20 percent each year between 2013 to 2015. Source: https://ntl.bts.gov/lib/59000/59100/59125/DOT-VNTSC-USDA-16-02.pdf

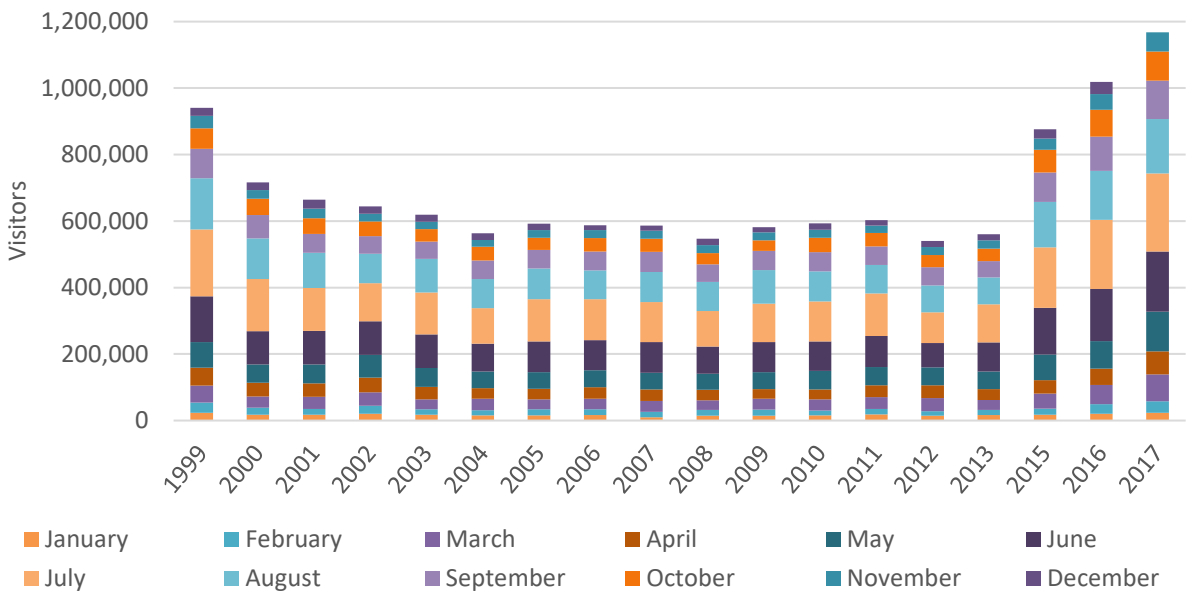


Figure 1: GoG Visitor Center Visitor Counts by Year, 1999 to 2017[3]

The City does not have historic visitation data for the park itself (i.e., roads, trails). This is partially due to the fact that the roads running through GoG provide multiple access points that can be used for local traffic, therefore making it difficult to understand true visitation to the park. However, beginning in January 2017, the City installed car counters at each of the four park entrances to count daily vehicle traffic coming into the park; accordingly, pedestrian data on the park's busiest trail is available back through mid-2016 and reflects overall trends (see Figure 2: *Monthly GoG Jaycee Plaza Pedestrian Counts, June 2016 to November 2017*).

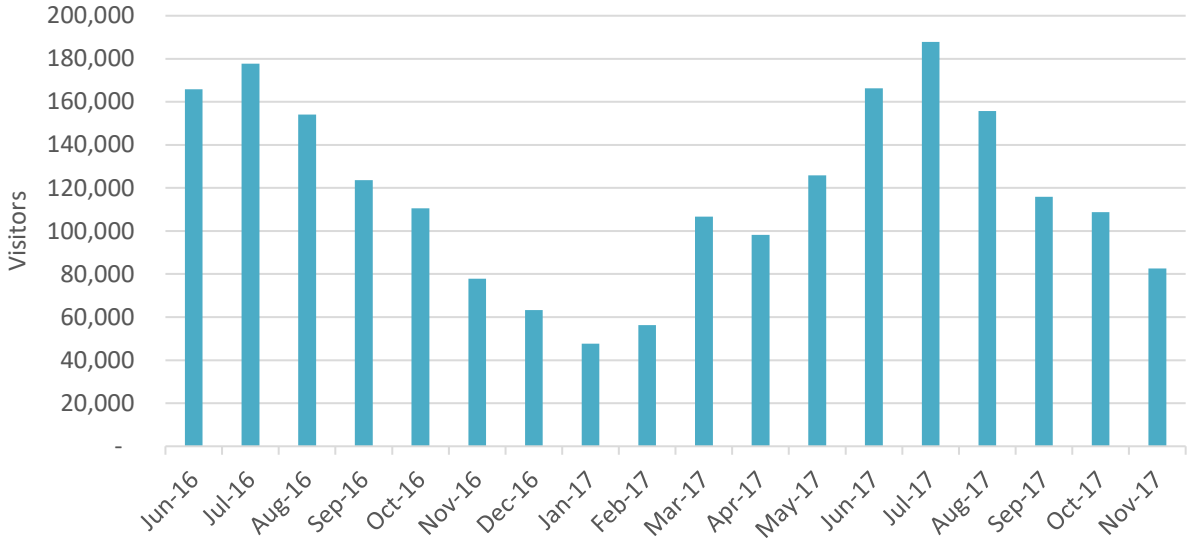


Figure 2: Monthly GoG Jaycee Plaza Pedestrian Counts, June 2016 to November 2017

[3] 2014 data was not included because the Visitor Center was closed for 117 days due to construction.

Unsurprisingly, data in Figure 3: *Weekly GoG Entrance Vehicle Counts, January 20 to July 19, 2017*, shows an increase in visitation between January and July 2017 based on vehicle counts placed at each of the park's four unique entrances. Except for a spike in March, likely caused by Spring Break travelers, visitation steadily increased throughout this timeframe. This growth is consistent with other attractions in the area that experience peak visitation during the summer months, beginning in late May and lasting through the summer.

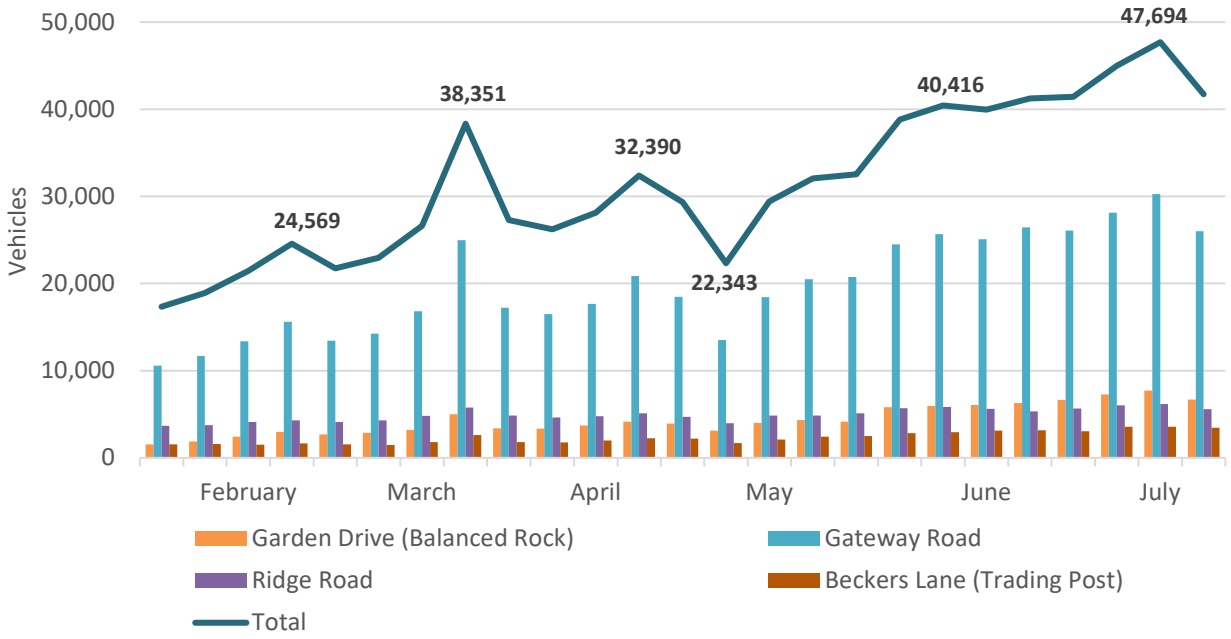


Figure 3: Weekly GoG Entrance Vehicle Counts, January 20 to July 19, 2017

Figure 4: *Average Vehicle Counts by Day of Week, January 20 to July 19, 2017* shows similar trends in daily visitation as seen at neighboring Pikes Peak. Of the weekdays, Mondays and Fridays are the highest, dipping slightly Tuesday through Thursday, and spiking on Saturdays and Sundays with an average of around 5,700 vehicles each weekend day. During the summer months, daily visitation is 25 to 40 percent higher than average, with the highest days seeing between 7,000 and 8,000 vehicles. If estimating about 2.5 persons per vehicle, this translates to about 17,500 to 20,000 visitors in one day.

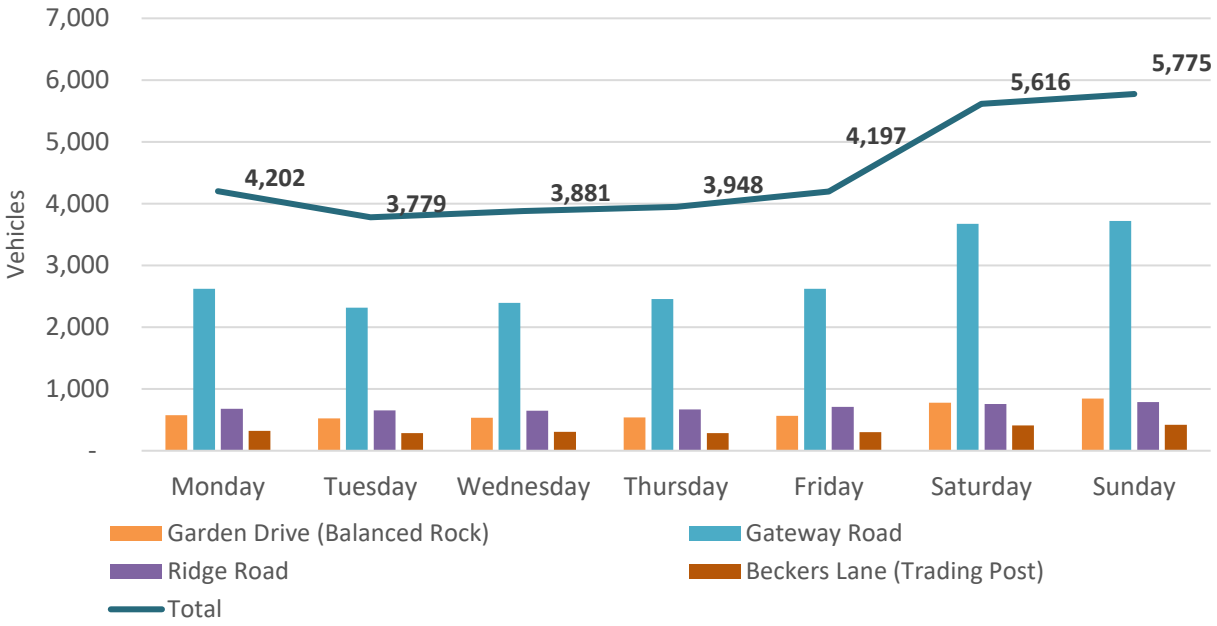


Figure 4: Average Vehicle Counts by Day of Week, January 20 to July 19, 2017

Looking at an average day, Figure 5: *Average Vehicle Counts by Hour of Day, January 20 to July 19, 2017* shows that peak visitation occurs between 11:00am and 3:00pm, with vehicle counts ranging from 420 to 460 per hour. During a summer weekend day, however, peak visitation can rise to over 650 vehicles per hour, quickly causing congestion along the park's roads, parking areas, and popular sites and creating a strain on the park's unique ecology, as well as the overall visitor experience. Using the estimate of about 2.5 persons per vehicle, this translates to about 1,625 visitors per hour on a peak weekend. Volpe used summer 2017 data to design a shuttle system that can manage peak visitation.

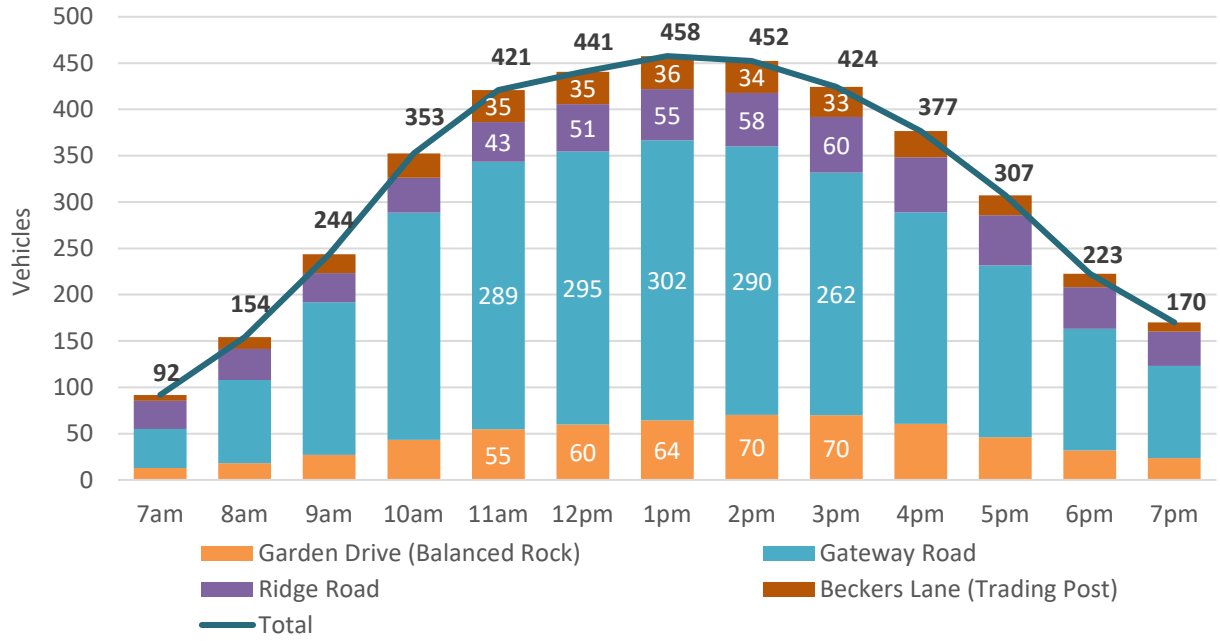


Figure 5: Average Vehicle Counts by Hour of Day, January 20 to July 19, 2017

The main entrance to the park is across from the Visitor Center, at 30th Street and Gateway Road, and sees four to eight times more traffic than the other three entrances. Vehicles commonly stop illegally at the entrance to the park to take photos with the GoG Park sign; this causes congestion to escalate, particularly during peak visitation times, and has raised concerns of public safety. Not only are pedestrians competing with vehicles at the entrance of the park, which is oftentimes a bottleneck, but many pedestrians and cyclists use Gateway Road to access the Central Garden, the park's main attraction. Further, outfitters regularly lead guided Segway and Jeep tours from the Visitor Center that also use Gateway Road and Juniper Way Loop. Multiple users on heavily trafficked roads can be dangerous, and with visitation increasing, solutions to increase public safety is a priority for the City. Figure 6: *Congestion at GoG on July 12 to 13, 2017* shows some examples of congestion at GoG.

Figure 6: Congestion at GoG on July 12 to 13, 2017. Source: Volpe

Parking

Given the remote location of GoG several miles from the center of Colorado Springs, visitors are highly dependent on driving to the park. The 15 parking areas within the park total 335 available parking spaces with the Main Parking Lot being the biggest with 128 spaces. In addition, visitors may use the parking lots at the Visitor Center (208 spaces), Rock Ledge Ranch (60 spaces), and the Trading Post (125 spaces). Combined, this equals 728 parking spaces available for visitors. Figure 7: *Map of Garden of the Gods Park* provides an overview of the main parking areas, entrance points, and other key park sites.

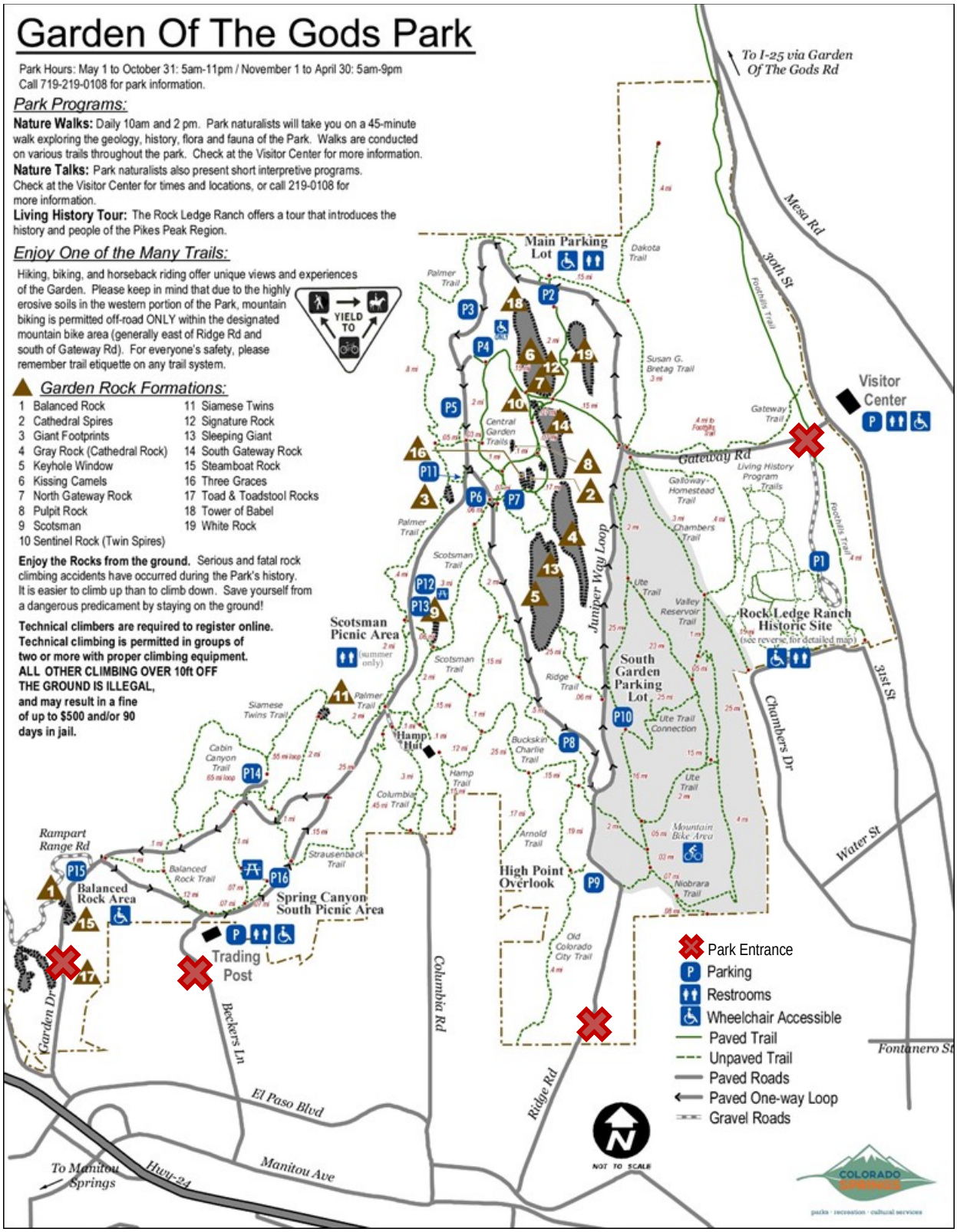


Figure 7: Map of Garden of the Gods Park. Source: City of Colorado Springs

According to the City, as well as findings from GoG Visitor Survey[4] (survey highlights included below), visitors spend 2.5 hours at GoG on average. When relating this to parking, this means that 2.5 hours of vehicles are in the park at one time and most are looking for a parking space. On an average day during peak visitation hours, this could amount to as much as 1,100 to 1,200 vehicles in the park at any one given time. With 728 total parking spaces, this leaves a gap of about 350 to 450 parking spaces. On a peak summer weekend, this can rise to a potential gap of over 600 parking spaces.

Visitor Survey Highlights

Over the course of three weeks in August 2017, the Friends of GoG collected about 350 survey responses at three park destinations: Visitor Center, Balanced Rock, and the Central Garden. For most visitors, this was their first time to GoG (54 percent). As illustrated in Figure 8: *Visitors Planned Length of GoG Visit*, most visitors spend between two and three hours at the park, including a stop at the Visitor Center (60 percent said they visited the Visitor Center when they first arrived). While a large number of visitors during this time were local or from the Denver area (33 percent total), the majority of visitors surveyed are from elsewhere across the country, with about five percent visiting from international locations.

Time Range	# of Responses
0-0.99 hours	8
1-1.99 hours	51
2-2.99 hours	135
3-3.99 hours	82
4-4.99 hours	26
5-5.99 hours	12
6-6.99 hours	4
7+ hours	3

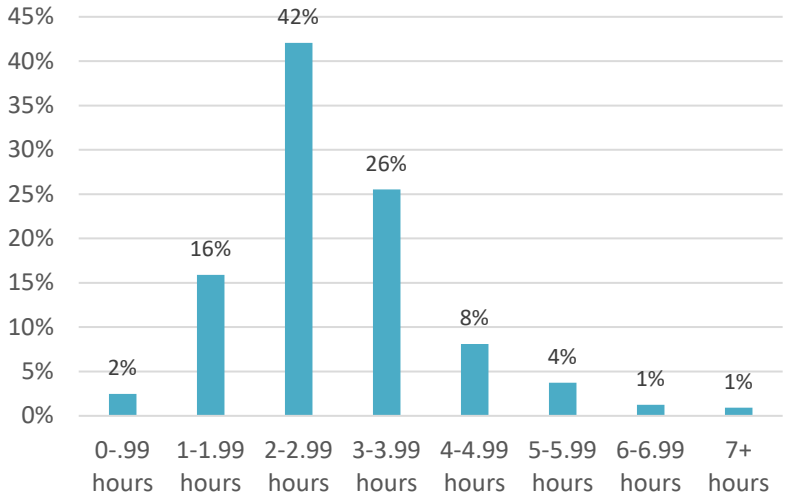


Figure 8: Visitors Planned Length of GoG Visit

[4] During August 2017, the City worked with stakeholders and Volpe to design and administer a survey to collect information from visitors related to their goals, expectations, and overall experience at GoG. The survey also gathered visitors' impressions on the possibility of a future shuttle system to improve the visitor experience.

When asked about their experience arriving and traveling through GoG, most people were pleased with their experience, particularly as it related to their expectations for some amount of congestion moving through the park. Some visitors provided some specific feedback based on why they chose not to "absolutely recommend" GoG to a friend; most of the responses related to traffic and issues with parking. Specific responses include the following:

- "more parking!"
- "traffic is terrible & there are so many people in the park"
- "better parking"
- "more pull offs for people to view and take pictures"

In an effort to understand the potential benefit of shuttle service, visitors were asked about their likelihood to use such a service at a future visit to GoG. Of those surveyed, 75 percent said they would be either very likely or likely to use this shuttle service. Further, about 60 percent said they would be willing to spend up to $5.00 for the service.

Shuttle Concepts

After collecting and analyzing data and holding a series of meetings with the City and key stakeholders to discuss goals, ideas, and solicit feedback to initial drafts, Volpe developed three distinct route options that can be organized under three different concepts. Table 1: *Shuttle Route Options* displays these options followed by a description of the three concepts.

Table 1: Shuttle Route Options

Route	Roundtrip Distance	Roundtrip Travel Time*	Stops
A1: Juniper Way Loop	3.8 miles	30 minutes	10 (Visitor Center, Rock Ledge, Gateway/Juniper Intersection, P2, P4, Garden/Juniper Intersection, P9, P10, Gateway/Juniper Intersection, Rock Ledge, Visitor Center)
A2: Barbell Route	6.5 miles	50 minutes	12 (Trading Post, P16, P13, Garden/Juniper Intersection, P9, P10, Gateway/Juniper Intersection, P2, P4, Garden/Juniper Intersection, P14, P15, Trading Post)
B1: Gateway Road Circulator	1.2 miles	10 minutes	5 (Visitor Center, Rock Ledge, Gateway/Juniper Intersection, Rock Ledge, Visitor Center)

* Includes passenger stops and buffers

Based on the routes outlined above, Volpe packaged these under the following concepts for consideration.

A. Two Overlapping Routes (Figure 9)
- A1: Visitor Center – Rock Ledge – Juniper Way Loop
- A2: Balanced Rock – Trading Post – Garden Drive – Juniper Way Loop

Figure 9: Shuttle Concept A - Overlapping Routes A1 (left) and A2 (right)

B. Barbell + Circulator (Figure 10)

- B1: Circulator between the Visitor Center – Rock Ledge – Juniper Way Loop/Gateway Road Intersection
- A2: Juniper Way Loop – Garden Dr. – Balanced Rock – Trading Post

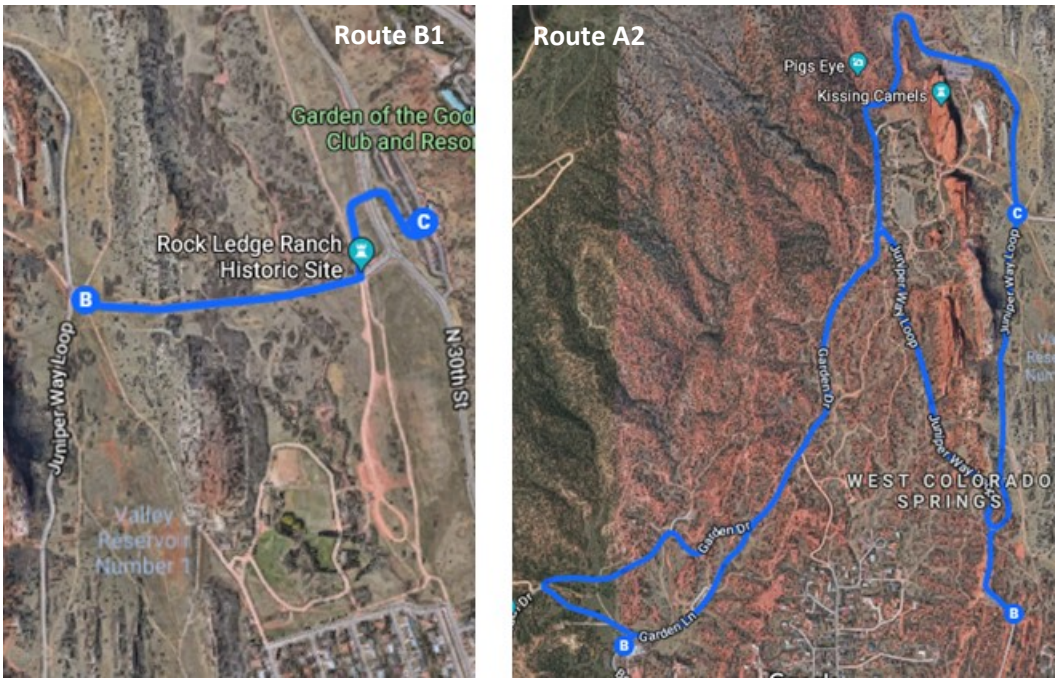


Figure 10: Shuttle Concept B - Circulator (B1, left) + Barbell (A2, right)

C. Phased Approach

- Step 1 is to implement a circulator between the Visitor Center – Rock Ledge – Juniper Way Loop/Gateway Road Intersection (see B1 above)
- Step 2 is to implement a circulator along Juniper Way Loop (see A1 above) or alternate B1 and A1 routes from the Visitor Center
- Step 3 is to add a circulator to Balanced Rock (A2) or alternate B1, A1, and A2 routes (with a route extension to Rock Ledge and the Visitor Center) from the Visitor Center

Design Day Description

Volpe used a 95th percentile design day to develop its conceptual shuttle service plan. This turned out to be Tuesday, July 4, 2017, which brought in 7,188 vehicles, or about 29,000 individuals. A 95th percentile design day is an industry standard for shuttle planning. This standard means that the service will meet demand 95 percent of the days the service is in operation. For the remaining five percent, service will be able to meet the demand during some of the operating hours, but there will be periods where the demand for the system exceeds capacity. While not ideal, these periods are rare enough to make this an acceptable practice. Planning for service to meet demand closer to 100 percent of the time would be more costly.

Assumptions

Beyond planning for a voluntary service, GoG presents some unique variables that make it challenging to predict ridership. This includes having four different entry points spread out across the park as well as there being relatively long distances between parking areas and popular sites. To create a more accurate picture of ridership, Volpe developed the following assumptions:

- Parking within the park will remain open during service, but people would have to pay for parking in the park
- 15 percent of vehicles will drive through the park without stopping/parking
- Estimated number of passengers per vehicle is 2.5
- Parking at the Trading Post will expand to 205 parking spaces[5]
- Parking at Rock Ledge Ranch will expand to at least 400 parking spaces[6]
- 50 percent of visitors to the park will use the shuttle
- Visitors will evenly utilize both shuttle options offered (e.g., 50/50 split between Concept A1 and A2 or B1 and A2)[7]
- Calculations for vehicle trips per hour and fleet needed are based on average peak visitation (between 10:00am and 4:00pm)
- Shuttles have 35 person capacity

[5] The Trading Post has been approved to expand its parking from 125 to 205 parking spaces. Additionally, there is space in an adjacent parcel that could likely fit around 100 additional parking spaces.

[6] Current parking capacity at Rock Ledge Ranch is around 60 parking spaces. A few years ago, the City commissioned a study of potential parking capacity at Rock Ledge Ranch, and found that the open area abutting 30th Street could technically hold between 1,200 and 1,400 additional spaces.

[7] Where the vehicle parks and which sites the visitors desire to see will likely distribute the demand evenly across the shuttle routes. For example, though the Trading Post parking capacity is lower than the Visitor Center and Rock Ledge Ranch, Volpe assumes that almost all visitors parking at the Trading Post will utilize shuttle A2 in order to access the Central Garden, which abuts P2. Volpe also assumes most visitors parking at the Visitor Center and Rock Ledge Ranch will choose to ride the shuttle in order to see Balanced Rock.

Vehicle Recommendation

Due to the high number of hills, sharp turns, and narrow sections of road, GoG requires a vehicle with power and a good turning radius. At the same time, a higher capacity vehicle would be ideal to support the volume of visitors on a 95th percentile day. At this initial stage of the study, Volpe recommends the vehicle in Figure 11: *Arboc Spirit of Liberty*[8] to meet the demands at GoG.[9] The Spirit of Liberty has exceptional maneuverability for a midsize vehicle around 35 feet long and is built to be heavy duty and last around 10 years. It can hold around 35 people each (sitting) and its two doors and low floors can help accelerate boarding and alighting speeds. Compared to cutaways, which may have a similar capacity but less maneuverability and lifespan, the Spirit of Liberty is fairly expensive, listed between $220,000 and $280,000 per vehicle.

Figure 11: Arboc Spirit of Liberty

Shuttle Route Characteristics

Using the *Spirit of Liberty*'s capacity, Table 2: *Shuttle Route Fleet and Service Cost Estimates*, shows the estimated fleet size and costs to operate and maintain the three routes independently. The Barbell Route, which is the longest distance and requires the largest fleet, is the also the most expensive to operate at over $509,000. On the other hand, the Gateway Road Circulator would just require four vehicles and cost $99,704 each year, making this the most affordable option. As illustrated under the shuttle concepts described earlier, any expansion in service could entail a combination of route options below, therefore increasing the overall fleet and O&M costs.

Table 2: Shuttle Route Fleet and Service Cost Estimates

Route	Roundtrip Distance	Roundtrip Travel Time	Vehicles Needed	O&M Cost/Year
A1: Juniper Way Loop	3.8 miles	30 minutes	10	$303,316
A2: Barbell Route	6.5 miles	50 minutes	13	$509,029
B1: Gateway Road Circulator	1.2 miles	10 minutes	4	$99,704

[8] More information on the *Arboc Spirit of Liberty* can be found at http://www.arbocsv.com/liberty.php.

[9] Task 3 in the Statement of Work tasks Volpe with performing an in-depth shuttle selection analysis once the route(s) have been selected.

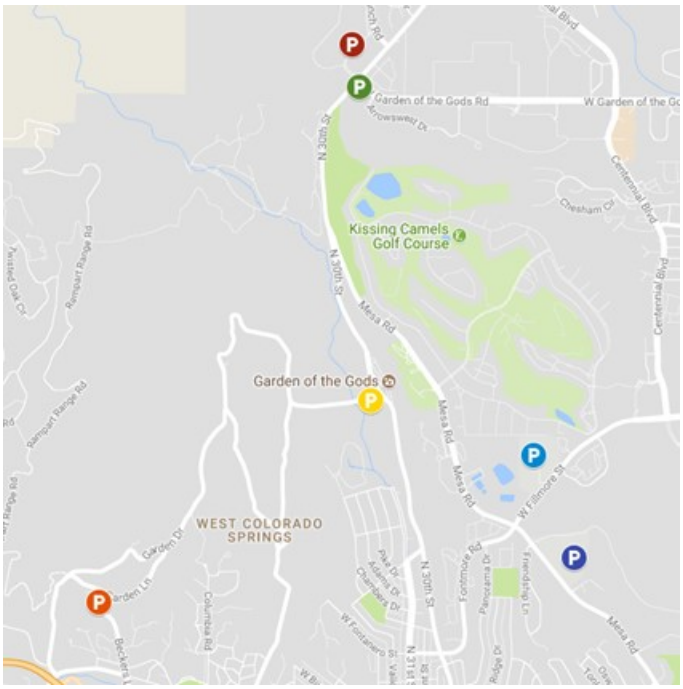
Parking Demand

Having sufficient parking can prevent vehicles from queueing and contributing to the overall congestion on the roadways and in the parking lots throughout GoG. *Table 3: Parking Demand for 95th Percentile Day* illustrates the parking need to meet the demand on a 95th Percentile Day. During the peak hours of the day, 517 vehicles are expected to enter the park looking for a parking space. Given that the average stay per vehicle is 2.5 hours, the park can have close to about 1,388 vehicles in need of a parking space at any one given time. Considering the park's total supply of 728 parking spaces, this leaves a gap (or additional need) for 660 parking spaces.

Table 3: Parking Demand for 95th Percentile Day

Current Parking Demand		
95th Percentile (total)	7,188 Vehicles	
Less 15% (Total)	6,110 Vehicles	
95th Percentile (hourly average peak)	608 Vehicles	*Peak, 10:00am-4:00pm*
Less 15% (Total)	517 Vehicles	
Average Visit	2.5 hours	
95th Percentile, less 15% (2.5 hr visit)	1,388 Vehicles	*High visitation, Peak 10:00am-4:00pm*
Parking Available	728 Parking Spaces	
Additional Parking Need (at peak)	**660 Parking Spaces**	*2.5 hour average visit*

If the Trading Post adds 80 parking spaces and the City has a total of 400 parking spaces at Rock Ledge Ranch, a need of 240 parking spaces would remain. Potentially, this difference can be added to the Rock Ledge Ranch expansion or at one of the off-site parking options listed in Figure 12: *GoG Potential Additional Parking Considerations*, all subject to availability and negotiations. When meeting to discuss possible solutions with the core project team and key stakeholders, the City identified several potential off-site parking locations that could relieve congestion within the park. While a combination of these parking areas would meet the parking need identified in Table 3, utilizing off-site parking would require the City to support an additional shuttle service to transfer visitors to and from GoG. Such a service is not ideal, as it could be expensive and may negatively impact the visitor experience. However, it is an option for the City to consider in the future.



Parking Estimates

Off-Site Parking

Coronado High School	520
Holmes Middle School	135
Verizon	2,400
Vacant Lot	1,000

Additional On-Site Parking

Rock Ledge Ranch	340
Trading Post	80

Figure 12: GoG Potential Additional Parking Considerations

Next Steps and Future Considerations

Beginning in time for the start of the peak season (late May), the City and its stakeholders would like to implement a pilot shuttle service to measure the impact it would have on congestion. Depending on the findings, the City can then modify and expand the pilot as needed in future years to provide service that enhances the visitor experience. Several considerations for shuttle service development include the following:[10]

- Test potential vehicles to determine how they perform, how much time they need to serve the route, and if they are the appropriate size; select vehicles based on test results
- Analyze the costs and benefits for different operating models and choose the best for GoG:
    - Leasing vs. purchasing vehicles
    - Sharing vehicles, such as with local ski resorts, during the off-season
    - Run by concessionaire/service contract
    - Run by outfitter and guide
- Analyze different revenue models to support the ongoing shuttle service operation. This includes:
    - Charging vehicles to park, but offering the shuttle for free, and
    - Charging visitors to ride the shuttle, but parking is free
- Particularly if charging vehicles to park, consider strategies to communicate parking availability and better determine when vehicles can enter a parking lot
- Develop a strong marketing plan to promote the use of the shuttle service and provide notification of any changes to the parking process
- Depending on the scope of service, consider developing an interpretive service that would enhance the visitor experience by providing a guided tour of the park when aboard the shuttle

[10] The first two of these considerations will be discussed and addressed in Task 3.

- Consider working with other area destinations, including Mountain Metro Transit, to develop a regional shuttle service to connect visitors to other local attractions. Developing a partnership like this would enable participating agencies to share the costs.

Addendum 1: Garden of the Gods Shuttle Study

February 2018

Gateway Road Circulator

For the 2018 peak season (late May to early September), the City of Colorado Springs (City) would like to implement a pilot shuttle system, focusing on Gateway Road, which would make stops along the 1.2 mile road between the Garden of the Gods (GoG) Visitor Center, Rock Ledge Ranch, and the Gateway Road/Juniper Way Loop Intersection (see Table 4 and Figure 13 for more information on this route). This addendum includes an updated vehicle recommendation for the Gateway Road Circulator based on an updated analysis of 2017 visitor data.

Table 4: Gateway Road Circulator Route Specifications

Route	Roundtrip Distance	Roundtrip Travel Time*	Shuttle Stops
Gateway Road Circulator	1.2 miles	10 minutes	5 (Visitor Center, Rock Ledge, Gateway/Juniper Intersection, Rock Ledge, Visitor Center)

* Includes passenger stops and buffers

Design Day Description

In order to determine the appropriate number of visitors to plan an impactful level of service, U.S. Department of Transportation Volpe Center (Volpe) took an average of the peak hourly visitation between May 26th and July 29th at the Gateway Road entrance.[11] On average, the peak hourly visitation (11:00am to 3:00pm) at Gateway Road is 365 vehicles, or 912 visitors. While there will be days where the peak hourly visitation will exceed 365 vehicles, Volpe believes that designing a system to meet this average visitation is suitable for a voluntary pilot service since other options (walking or driving into the park) will be available if visitors do not wish to wait to use the shuttle.

Assumptions

Volpe used the following assumptions when developing its recommendations:

- Estimated number of passengers per vehicle is 2.5
- An estimated 25 to 33 percent of visitors to the park will use the shuttle. This is based on survey and counter data, as well as the observations of park staff, of vehicles choosing to drive through the park

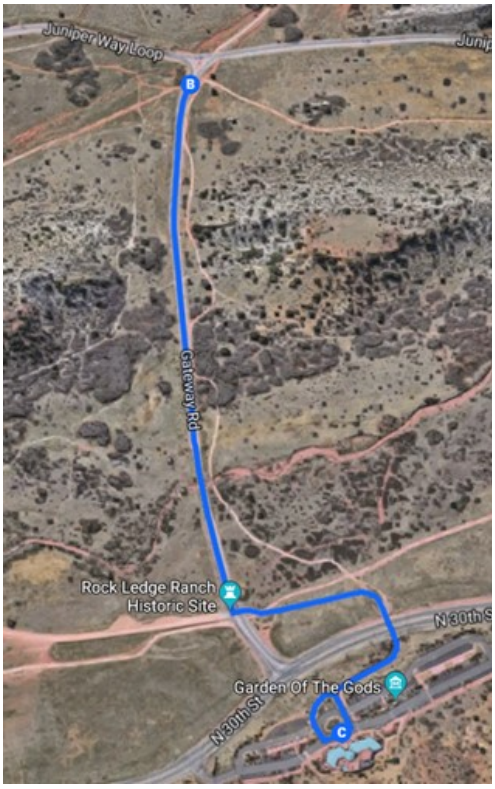


Figure 13: Gateway Road Circulator Route

[11] Volpe used May 26 to July 29 to gather visitation during the peak season. Data after July 29 was not available.

without stopping, visitors looking to visit other sites in the park, and/or visitors choosing to walk from the parking areas into the Garden
- Shuttles have a 24-person capacity

Vehicle Recommendation and Service Characteristics

Using the assumptions listed above, the pilot Gateway Road Circulator would need to meet a peak demand of 300 visitors per hour (or approximately 33 percent of the 912 visitors entering at Gateway Road per hour). A suitable vehicle would require good power to manage the Gateway Road incline as well as a decent turning radius to manage the intersection at Gateway Road and Juniper Way Loop. With these considerations, Volpe recommends one of the vehicles listed in Table 5. Each of these vehicles has good maneuverability with a 19-foot wheel base, is relatively affordable, and can seat 24 people.

Table 5: Vehicle Recommendation Specifications and Costs

	Colonial Startrans Senator HD Ford F 2015	Rohrer Bus Sales, Inc. ChampBus Challenger Ford F550 (Figure 2)	Masters Transportation Goshen Coach G-Force F Series 2016
Base Cost	$77,598	$76,224	$81,183
Extras	$8,531	$13,922	$15,689
Total	**$86,129**	**$90,146**	**$96,872**

Figure 14: Champion Bus Challenger F550

Using a capacity of 24 people, Table 6 shows the estimated fleet size and cost to operate the Gateway Road Circulator during the 2018 peak season, which will run seven days per week between mid-May and early September from 9:00am to 4:00pm. Given the estimated peak ridership of 300 visitors per hour, two vehicles would be required to meet the demand. For this pilot service, Volpe recommends leasing the two vehicles[12] at an estimated cost of $992 per month.[13] When considering the peak season of about four months, the total cost to lease two vehicles is around $4,000. Given fuel and driver costs, the additional cost to operate the two vehicles for the entire season would be around $44,000.

Table 6: Gateway Road Circulator Fleet and Service Cost Estimate

Route	Vehicles Needed	Lease Cost/Month	Fuel Cost/Month	Driver Cost/Month
Gateway Road Circulator	2	$992	$925	$10,000

[12] The City should consider leasing an additional vehicle in the event that a vehicle needs to go out of service temporarily for a maintenance issue.

[13] Please note that this figure does not include fuel or operator costs and is a GSA estimate. Local lease rates may differ.

Addendum 2: Garden of the Gods Shuttle Study

June 2018

Between winter and spring 2018, the City of Colorado Springs (City) continued to work with its partners and the U.S. Department of Transportation Volpe Center (Volpe) to prepare for the implementation of a pilot shuttle system for the summer 2018 season, as well as gather public input on options for alleviating congestion in the future, including the possibility of a permanent shuttle system during the peak season. This addendum summarizes the goals and results from a spring public meeting, outlines the steps taken to launch a pilot shuttle service in May 2018, and provides initial findings.

Public Involvement

On March 12, 2018, the City's Parks, Recreation and Cultural Services Department hosted an open house to share details about the shuttle study conducted in 2017. The City requested feedback from the public on different shuttle system scenarios, as well as other transportation alternatives to relieve congestion and provide a better visitor experience at Garden of the Gods (GoG) Park.

Volpe worked with the City to prepare eight posters to be put on display at the open house. After providing an introduction to the study, the public was given an opportunity to interact with the posters (see Figure 15), ask questions of the City, and most importantly, provide their feedback on shuttle scenarios presented, parking options and fee structure alternatives, and share any other ideas for enhancing the visitor experience at GoG.

Figure 15: Public Reviewing Posters at the City's Open House, March 12, 2018. Source: Volpe

Feedback

Overall, the public was receptive to the idea of implementing a shuttle system at GoG to relieve a growing congestion problem at the park in recent years. Most liked the idea of using open-air trams as opposed to shuttle vans or busses. When asked about parking options, the public was split between building a larger on-site parking lot near the park entrance at Rock Ledge Ranch, or utilizing off-site parking lots with shuttles to transport visitors. One of the biggest concerns expressed was keeping access to GoG free to the public. However, about half of the respondents supported the idea of charging a fee to park at the lots within the park. Most respondents also expressed interest in implementing a monthly car-free day to give bicyclists and pedestrians freedom to explore the park without competing with traffic.[14] Other ideas they would like the City to consider are a bike share program, electronic message boards to communicate parking availability, and parking reservation systems.

[14] The City hosted a "Motorless Morning" on Sunday, April 22 as part of its Earth Day celebration. This was the City's first time closing the park to vehicles to provide the public an opportunity to leisurely enjoy the scenery without any traffic.

2018 Pilot Preparation & Implementation

Throughout the winter and spring 2018, the City continued meeting with its key stakeholders to discuss details and work through challenges to launch a pilot shuttle system in time for the 2018 summer season. Some of the key challenges discussed include shuttle type and size, accessibility options, parking location(s), and whether the City can charge a parking or shuttle fee.

In February, the City worked with Gray Line to field test different shuttle options in order to see what shuttles would be able to navigate the Gateway Road Circulator route (see Addendum 1 for more information). While most of the 1.2 mile route posed no concerns, the 29-capacity shuttle (which resembles the wheelbase configurations for the 24-capacity shuttle recommended by Volpe), was not able to navigate the intersection (see Figure 16). However, a smaller 14-capacity shuttle van was successful. While trams were considered, the City determined they are not allowed to share the road with other vehicles because of safety concerns. The City also considered widening the existing trail that runs parallel to Gateway Road, but they found it would be too costly to construct this year. The City will consider developing a dedicate trail in the future based on the results of the pilot program.

Figure 16: Gray Line Shuttle Testing, February 28, 2018. Source: City

Throughout the spring, the City received proposals to implement a pilot shuttle service for the 2018 season. After considering public feedback, operation cost, and the City's goal of setting-up the service by Memorial Day, the City decided to go with Adventures Out West (AOW). AOW has a long history as a concessionaire at GoG leading different tours to enhance the visitor experience. In addition to having a good working relationship with the City and the GoG Visitor and Nature Center, AOW ensured they would be able to setup an affordable shuttle option for the pilot program by Memorial Day.

Pilot Shuttle Service Specifications

Based on the roadway configuration and Volpe's recommendation, AOW secured two 14-capacity shuttle vans for the pilot shuttle service (see Figure 17). In addition, AOW modified an existing jeep from their fleet that can also accommodate 14 passengers. The latter would only be used based on demand.

The City designed a 400-space parking area at Rock Ledge Ranch to encourage shuttle use and mitigate traffic within the park. The City used mulch as groundcover to protect the landscape.

The shuttle service will follow the route outline in Addendum 1, but will start at Rock Ledge Ranch, go to Visitor Center, and then proceed to the drop-off point at the intersection of Gateway Road and Juniper Way Loop. Service will run every 15 minutes from 9:00am to 4:30pm between Memorial Day and Labor Day.

The cost to operate the pilot service is $600 per vehicle per day, including staff and maintenance. To operate two vehicles for a 90 day pilot, this comes to $108,000. This cost will be split between the GoG Foundation and the City. Therefore, it will be a free service for the public.

Figure 17: AOW's 14-Capacity Shuttle Van

Initial Results

Since its launch on May 26, the pilot shuttle service has proved to be successful. AOW reported that it attracted plenty of passengers throughout Memorial Day weekend, and had to supplement service with a third shuttle to accommodate the demand. Shuttle drivers committed to using log sheets to track passenger counts. This system was imperfect during the opening weekend, but on average each shuttle van picked-up 200 people at each stop throughout the day.

Early on, AOW found that they had to make adjustments to the route. While the expectation was that people would like to visit the Visitor Center upon their arrival, many people wanted to go directly into the park. Therefore, most people were not getting off at the Visitor Center to allow others to get on. Because of this, AOW decided to take people from Rock Ledge Ranch directly to the park, and then return to the Visitor Center to pick-up those waiting for the shuttle. With the addition of a third vehicle, wait times were no longer than 10 minutes.

Overall, the flow of traffic throughout the park has improved. This is evidenced by the fact that other AOW tour groups were easily returning on time or ahead of schedule, unlike last year when they were generally delayed or late.

See Figure 18, Figure 19, and Figure 20 for images from the pilot shuttle service during Memorial Day weekend.

Next Steps

Volpe will continue coordinating with the City and AOW to evaluate the success of the pilot shuttle service throughout the summer, and help determine what type of service to offer in future years to help relieve congestion at the park and continue offering a quality visitor experience for the public.

Figure 20: Shuttle at Gateway Road and Juniper Way Loop. Source: AOW

Figure 19: Parking at Rock Ledge Ranch. Source: AOW

Addendum 3: Fall Update December 2018

This addendum provides an analysis of ridership and visitation data during the summer 2018 season when the pilot shuttle was in operation at Garden of the Gods (GOG) Park. The purpose of this analysis is to inform potential schedule and rate changes in future years.

Overview

The following analyses include ridership and visitation data from May 25 to September 2, 2018.[15] GoG collected detailed ridership information (by time, stop, etc.) for 58 (58 percent) of the 100 days between these two dates. Table 7 shows the number of days of the week and days within each month for which ridership data exists. For the days without ridership data, Volpe estimated daily ridership based on the number of visitors counted daily at the Visitor Center and used these estimates in the following calculations and figures unless stated otherwise.

Table 7: Number and Percent of Daily Data Collected

	Total Days	Days Collected	% Collected
Mondays	14	6	43%
Tuesdays	14	7	50%
Wednesdays	14	7	50%
Thursdays	14	6	43%
Fridays	14	9	64%
Saturdays	15	12	80%
Sundays	15	11	73%
Total	*100*	*58*	*58%*
Days in May	6	2	33%
Days in June	30	21	73%
Days in July	31	12	39%
Days in Aug.	31	21	68%
Days in Sept.	2	2	100%
Total	*100*	*58*	*58%*

Boardings

In sum, there were approximately 61,000 boardings during the 2018 operating season with an average of 671 boardings per day. Figure 21 and Figure 22 show total daily and monthly shuttle boardings, respectively. Boardings generally rose over the course of the season, reaching a single-day peak during the Fourth of July holiday period but nearly matched throughout the rest of that month. The monthly total peaked in August, perhaps due to end-of-summer vacations. Additionally, Figure 1 includes daily average temperatures alongside total daily boardings. While not a strong pattern, the figure shows an association between higher temperatures and boardings throughout the season.

[15] Note that the service was contracted to run 100 days and did not run on May 29-31 nor August 27-31.

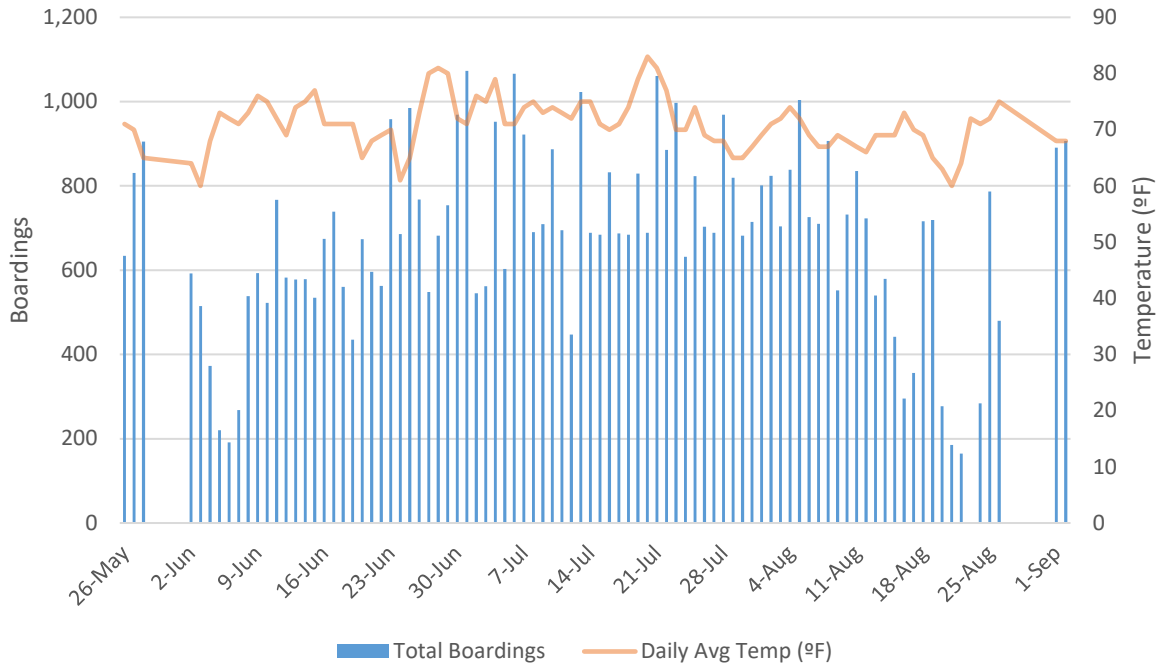


Figure 21: Daily Total Boardings and Average Temperature[16]

Note: Dates indicate the Saturday of each week during the data collection period. The shuttle was not in operation May 29-31, June 1, and August 27-31.

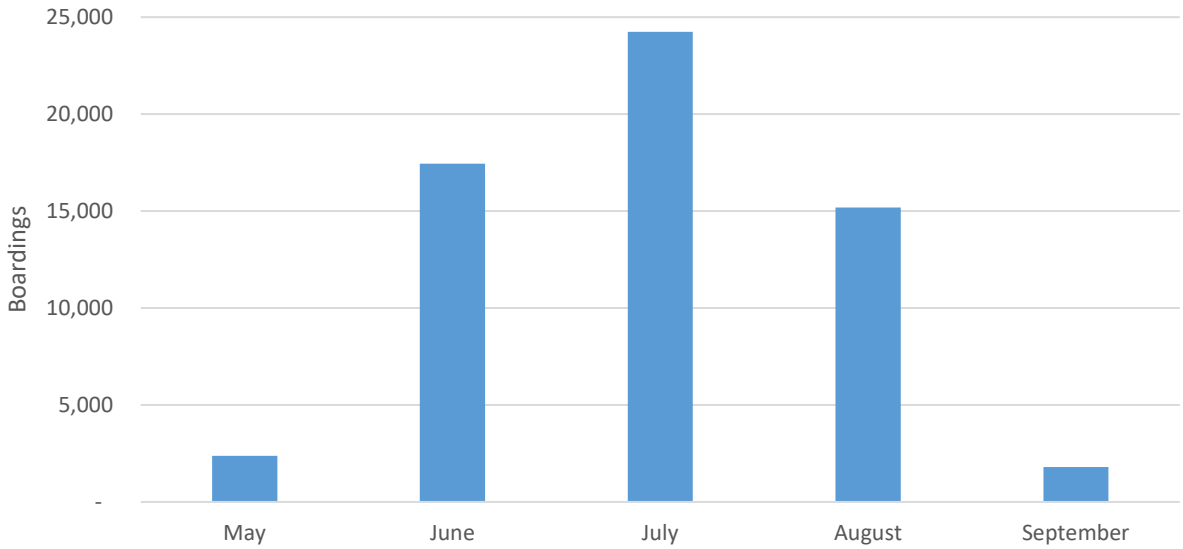


Figure 22: Monthly Total Boardings

Using only actual data (n=58 days with shuttle ridership information), Figure 23 and Figure 24 show daily average shuttle boardings by month for each day of the week (note: May and September represent only two days of data each, all of which are weekend days). Weekends saw the highest average ridership with Saturdays in June and Sundays in August having the most shuttle users. Within each month, August

[16] Historical temperature data from www.wunderground.com, City of Colorado Springs municipal weather station.

saw steady increases in boardings on weekends from Friday to Sunday, whereas July boardings were highest on Fridays, dropping by around 300 on the weekends. These patterns may be specific to summertime when vacation and work schedules fluctuate. Weekday ridership was most stable in June, particularly Wednesday to Friday. July and August had relatively inconsistent weekday patterns despite high average ridership numbers; August appears to alternate days in terms of ridership intensity.

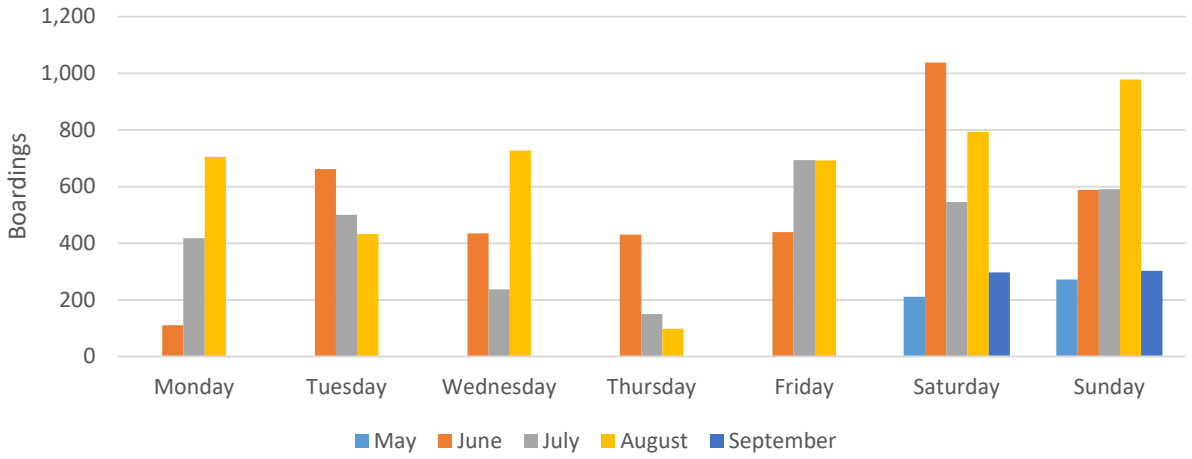


Figure 23: GoG Average Daily Boardings by Month (n = 58 days)

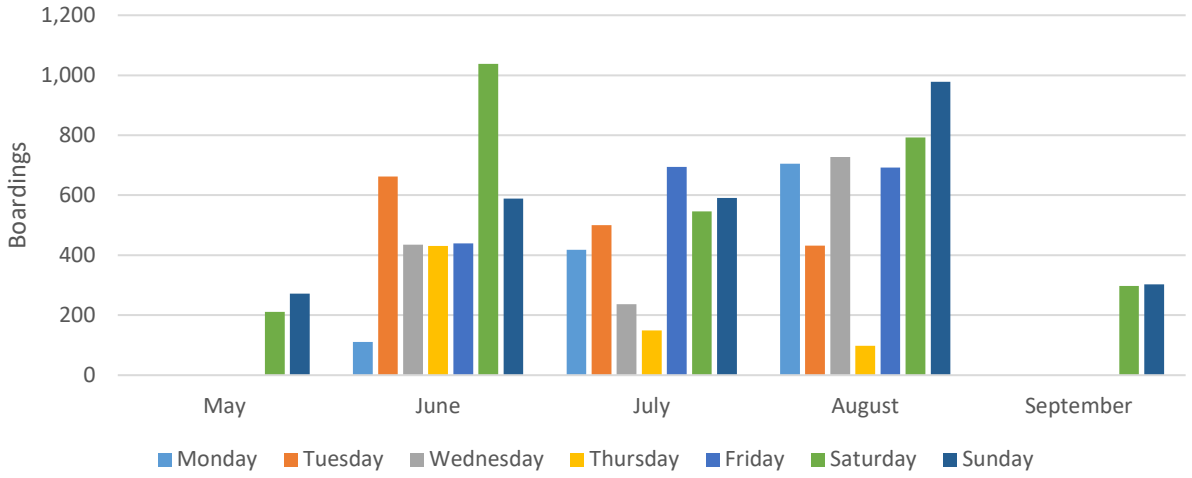


Figure 24: GoG Average Daily Boardings by Month (n = 58 days)

Boardings and Alightings by Stop

Using only actual data, Figure 25 and Figure 26 show the average boardings and alightings at each of the stops along the shuttle route (Note: there are substantial discrepancies between these two data points, sometimes as high as 25 riders at a given stop. This is likely due to errors in data collection as the boardings and alightings counts vary randomly).

Rock Ledge Ranch experiences the fewest boardings on average while the Visitor Center and GoG itself both experience more boardings and alightings. Importantly, those latter two stops have similar relative boardings across the entire week, including a slight bump on Tuesdays (also observable in Figure 4 and Figure 5) and a sharp decline on Thursdays. Since Rock Ledge Ranch is a short distance to both the Visitor Center and GoG, visitors may have decided to walk to those locations first and board the shuttle

to continue their visit. Saturdays and Sundays clearly experience the highest utilization, but, on average, Tuesdays are comparable to Fridays. A ridership flow pattern also emerges from comparing the two graphs where the number of boardings at the Visitor Center maps to the alightings at GoG. This pattern indicates that most shuttle users who board at the Visitor Center go to GoG and get off; what they do next is less obvious from this data.

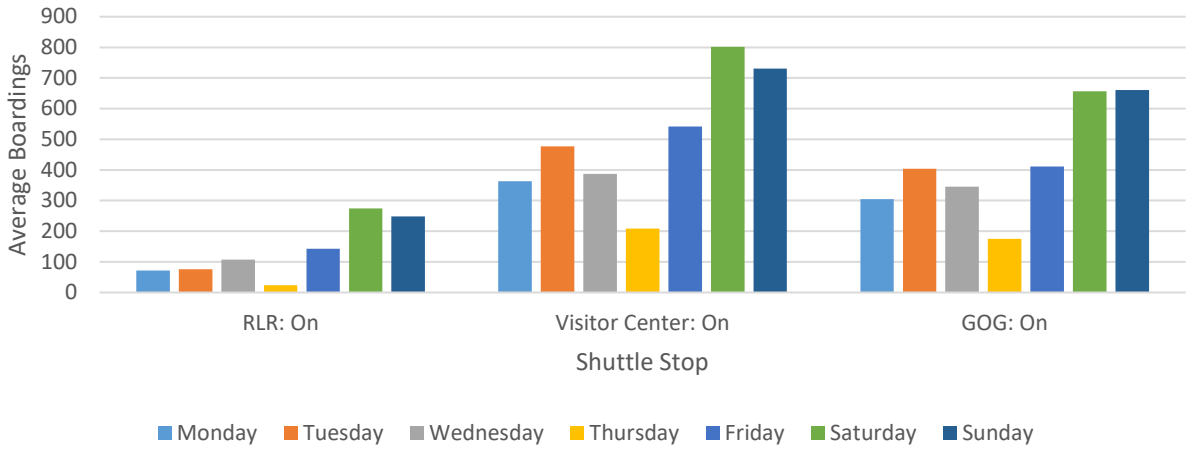


Figure 25: GoG Mean Daily Boardings by Shuttle Stop (n = 58 days)

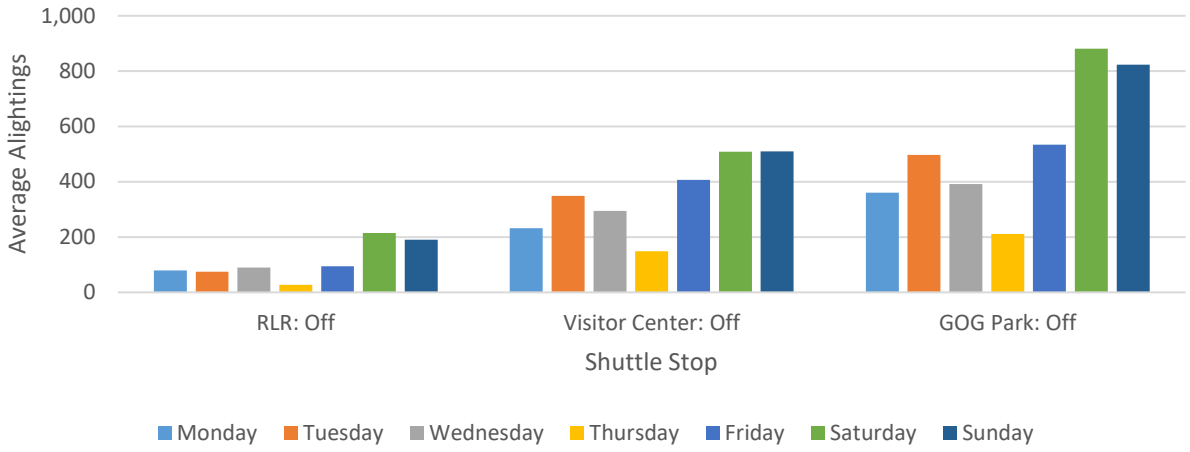


Figure 26: GoG Mean Daily Alightings by Shuttle Stop (n = 58 days)

Figure 27 and Figure 28 show average boardings and alightings by stop throughout the day according to the shuttle's fifteen-minute headway schedule.[17] This data shows the trend of how many riders are using the system at any given time of day.

Boardings follow a fairly predictable pattern of rapidly increasing ridership in the morning as visitors arrive and then a slow decline throughout the rest of the day as they leave. The trends stagger by stop: riders typically enter the shuttle system at the Visitor Center, so that graph spikes earlier in the day. This

[17] Note that n = 55 days since 15-minute interval data is unavailable for three of the 58 days with actual data.

is complemented with data in Figure 26 showing GoG stop alightings also spiking early in the day. Rock Ledge Ranch again appears to have the lowest ridership among the three stops.

The dip in both boardings and alightings around 11:30 is likely due to the proximity to lunchtime. The sharp depression at 13:00 in Figure 8 may be a data reporting error as there is no complement in the boardings data or elsewhere in the alightings data that would suggest some sort of exogenous factor.

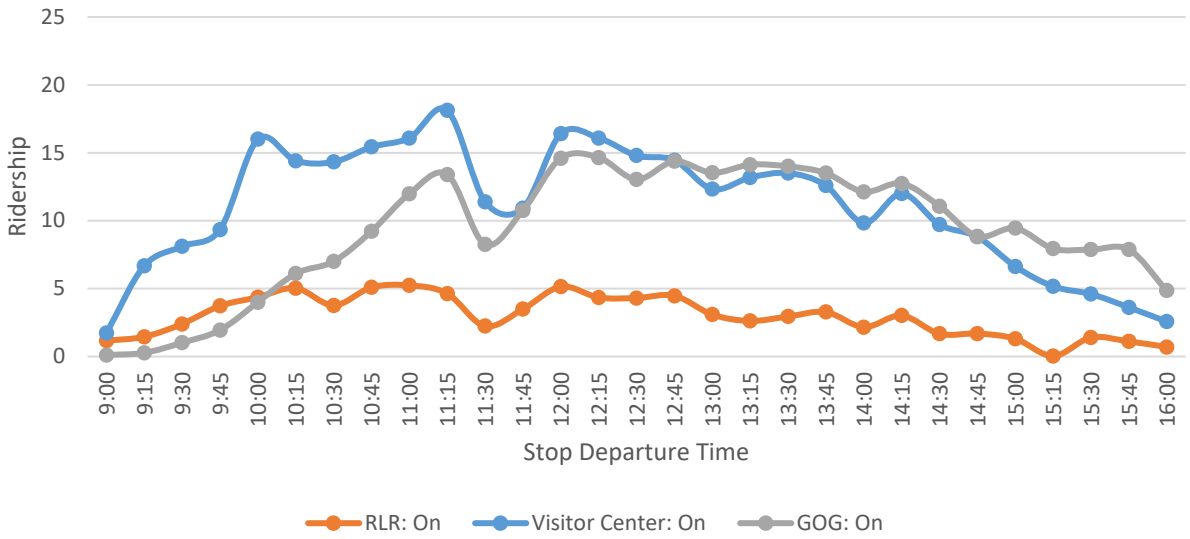


Figure 27: Mean Timely Boardings by Shuttle Stop (n = 55 observations per 15-minute time interval)

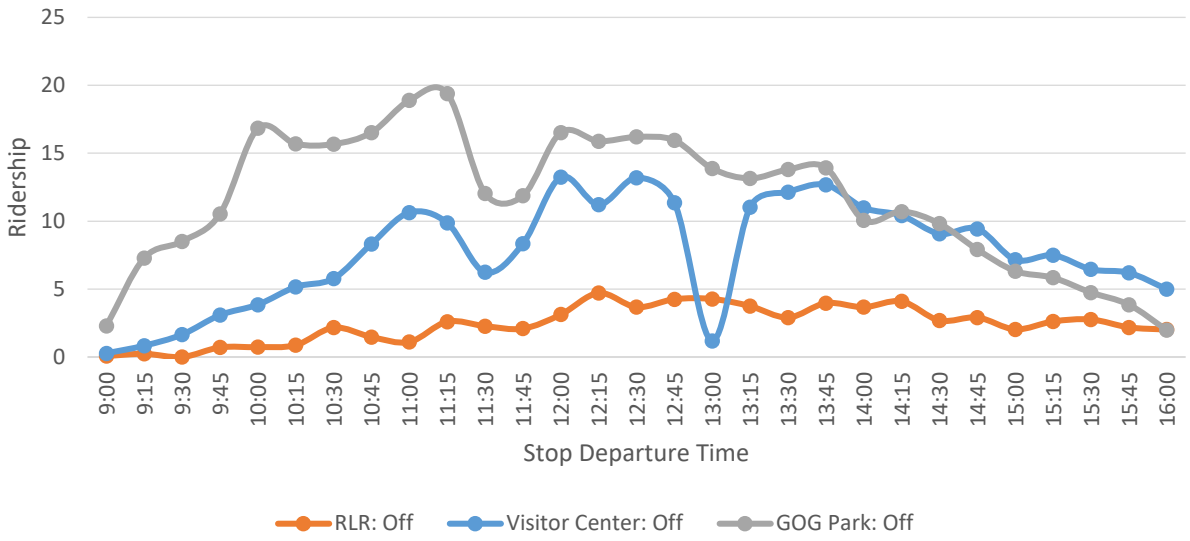


Figure 28: Mean Timely Alightings by Shuttle Stop (n = 55 observations per 15-minute time interval)

Figure 29 and Figure 30 show a subset of average boardings and alightings by stop limited to peak visitation days. Peak visitation is defined as 8,000 or more total visitors at the Visitor Center on a given day, of which there were seven during the summer 2018 season (Table 8). This dataset shows a very jagged ridership pattern, suggesting that riders are boarding and alighting in large groups. This may be the result of the visitation characteristics on those days when families and other contiguous groups may move through the park together. Should visitors complain about lack of service in the future, an analysis

of leave-behind patterns (i.e., the number of people attempting to ride the bus but unable to board and thus "left behind" at the stop) may help with service planning on peak days.

Table 8: Peak Visitation Days, 2018 (defined by number of visitors at Visitor Center)

Date	Visitor Center
Sunday, July 1, 2018	9,339
Friday, July 6, 2018	9,329
Saturday, July 7, 2018	8,998
Saturday, June 30, 2018	8,569
Saturday, July 14, 2018	8,531
Monday, July 2, 2018	8,424
Saturday, August 4, 2018	8,279

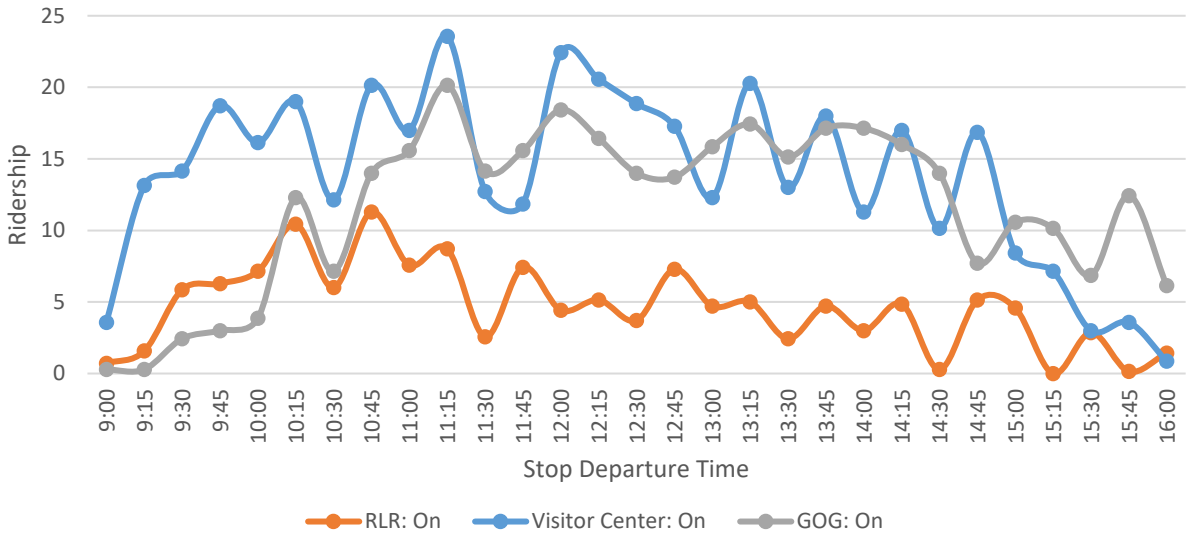


Figure 29: Mean Timely Boardings by Shuttle Stop: Peak Visitation Days Only (n = seven days where visitation was greater than or equal to 8,000 and ridership data was available)

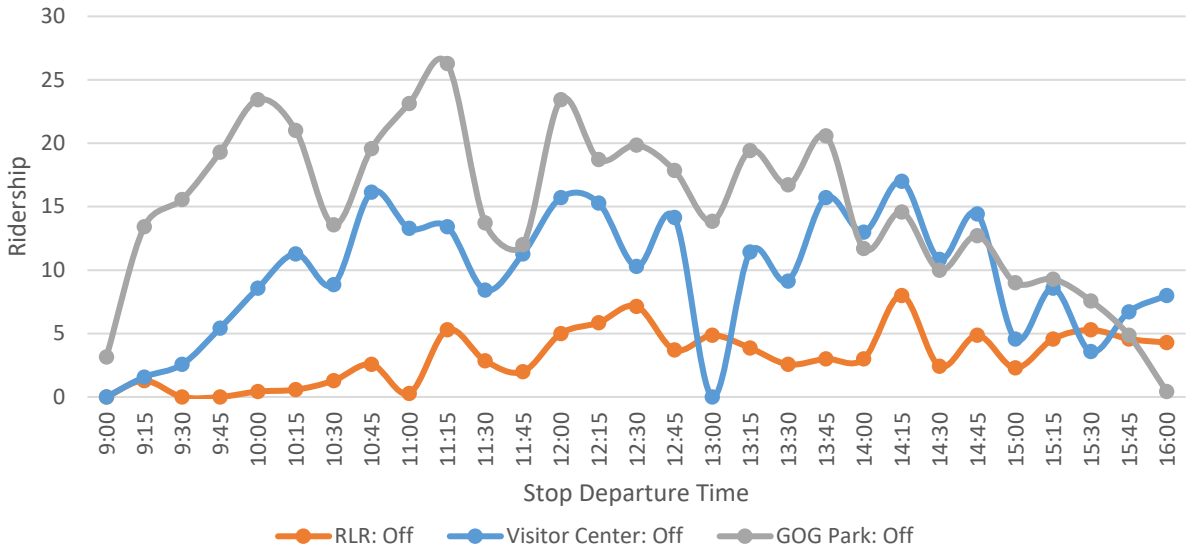


Figure 30: Mean Timely Alightings by Shuttle Stop: Peak Visitation Days Only (n = seven days where visitation was greater than or equal to 8,000 and ridership data was available)

By contrast, Figure 31 and Figure 32 show off-peak visitation, classified as all days with less than 8,000 total visitors at the Visitor Center, and those graphs show much smoother ridership patterns, reflecting the greater variation in departure and arrival times of non-peak days. The off-peak graphs are very similar to the aggregate graphs in Figure 25 and Figure 26 above and represent the majority of the season.

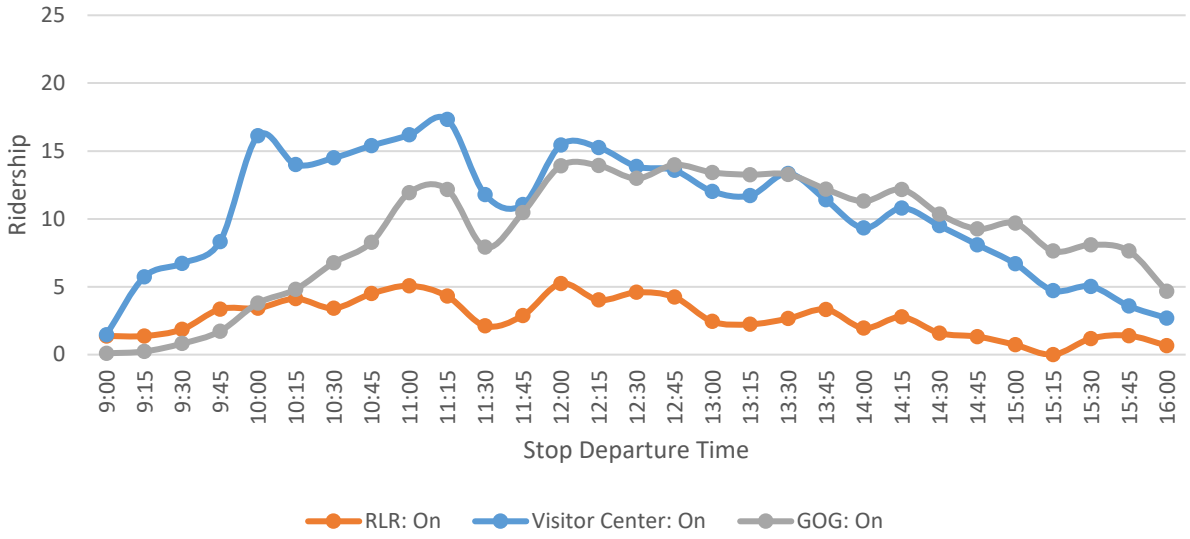


Figure 31: Mean Timely Boardings by Stop: Off-Peak Visitation Days Only (n = 49 days where visitation was less than 8,000 and ridership data was available)

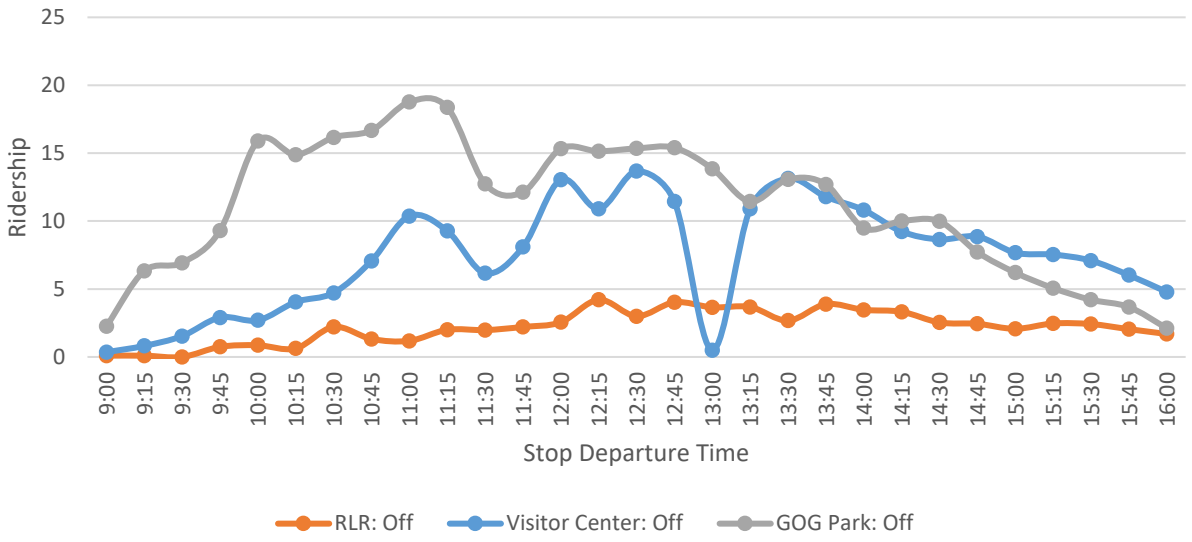


Figure 32: Mean Timely Alightings by Stop: Off-Peak Visitation Days Only (n = 49 days where visitation was less than 8,000 and ridership data was available)

Figure 33, Figure 34, Figure 35, and Figure 36 break down the data by weekday and weekend days and overall show similar trends to those in the figures presented above for all locations. Weekend days align most consistently with peak visitation days above for both boardings and alightings. However, the peaks and valleys in the data throughout the day are much smoother than the data in Figure 9 and Figure 10. Similarly, weekdays align most consistently with off-peak visitation days above for both boardings and alightings, with no noticeable differences of note. The similarities between the graphs suggest that shuttle rider behavior is relatively consistent at GoG.

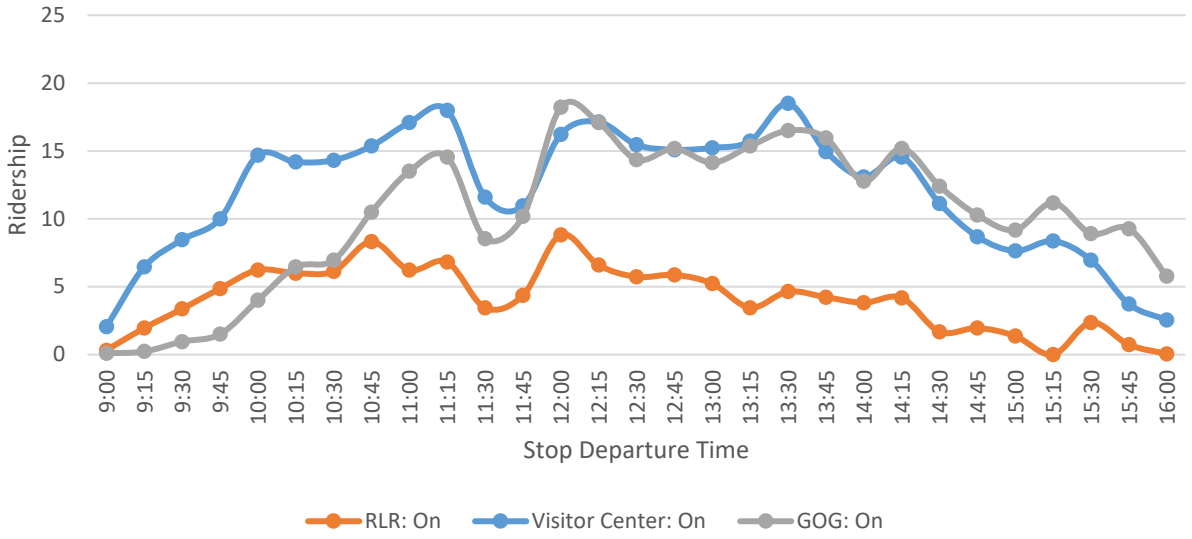


Figure 33: Mean Timely Boardings by Stop: Weekend Days Only (n = 22 days)

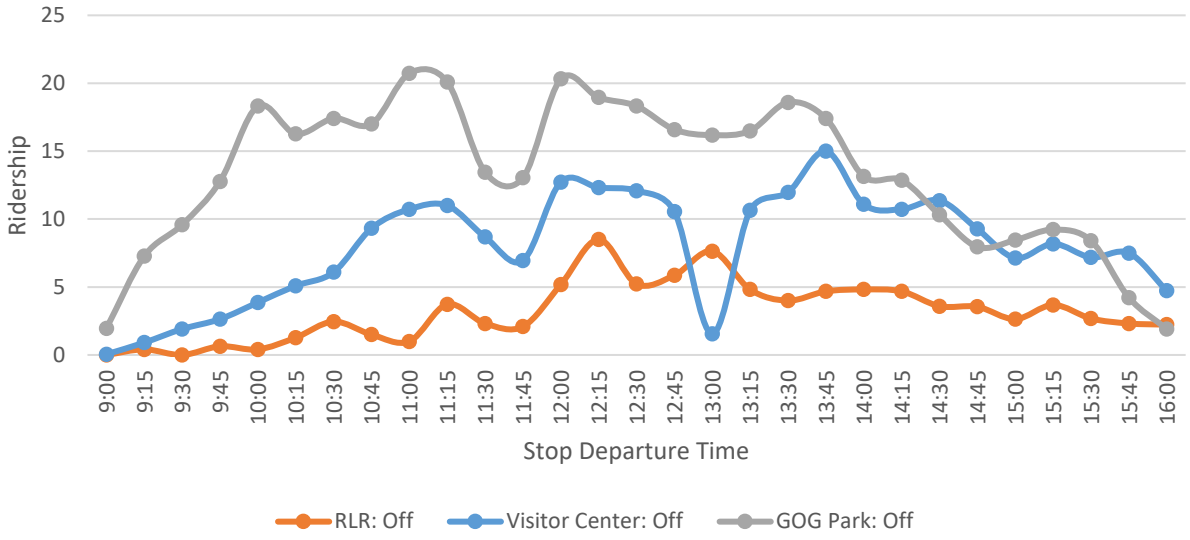


Figure 34: Mean Timely Alightings by Stop: Weekend Days Only (n = 22 days)

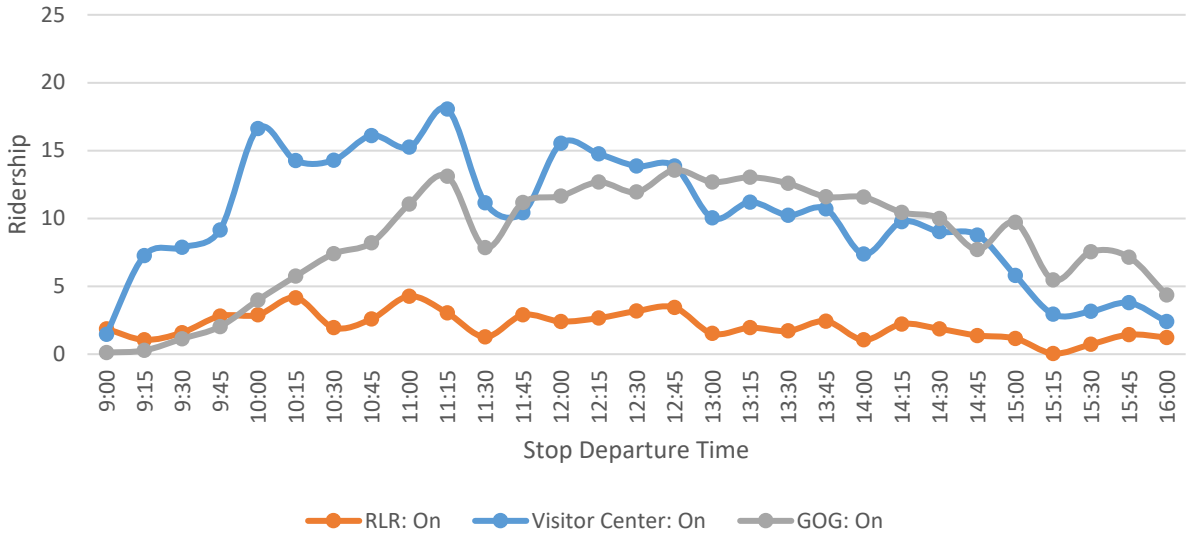


Figure 35: Mean Timely Boardings by Stop: Weekdays Only (n = 33 days)

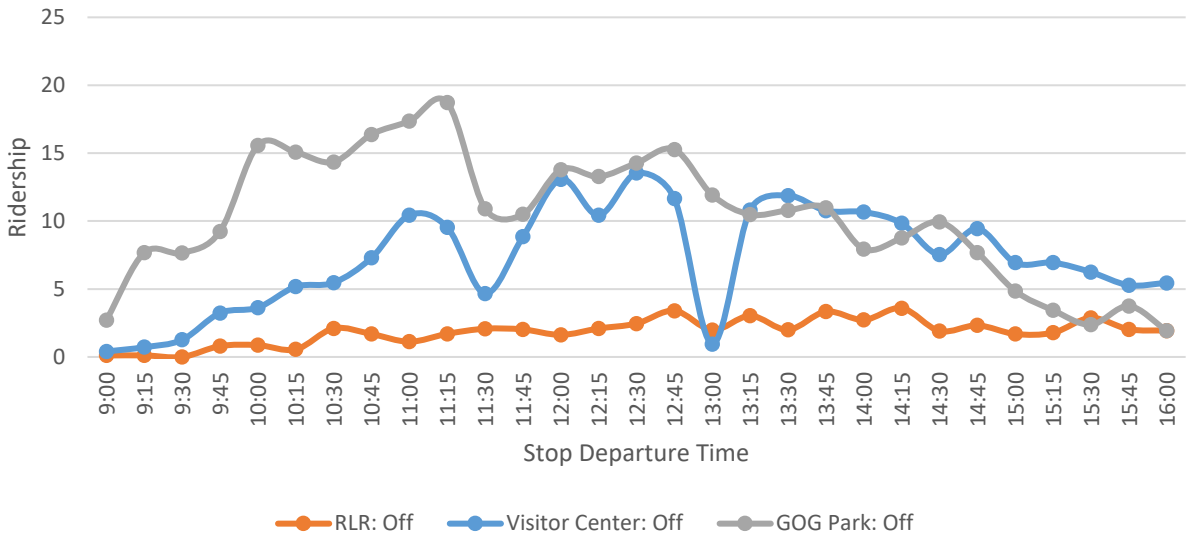


Figure 36: Mean Timely Alightings by Stop: Weekdays Only (n = 33 days)

Conclusion

As shown in Figure 37 and Figure 38, visitation counts at the Visitor Center and the number of vehicles entering the park spike during weeks when there are complementary increases in shuttle boardings (Note: boardings data does not exist for 42 days of the season including the weeks of July 21st and July 28th). For reference, alightings at the Visitor Center represent two to three percent of visits on average.

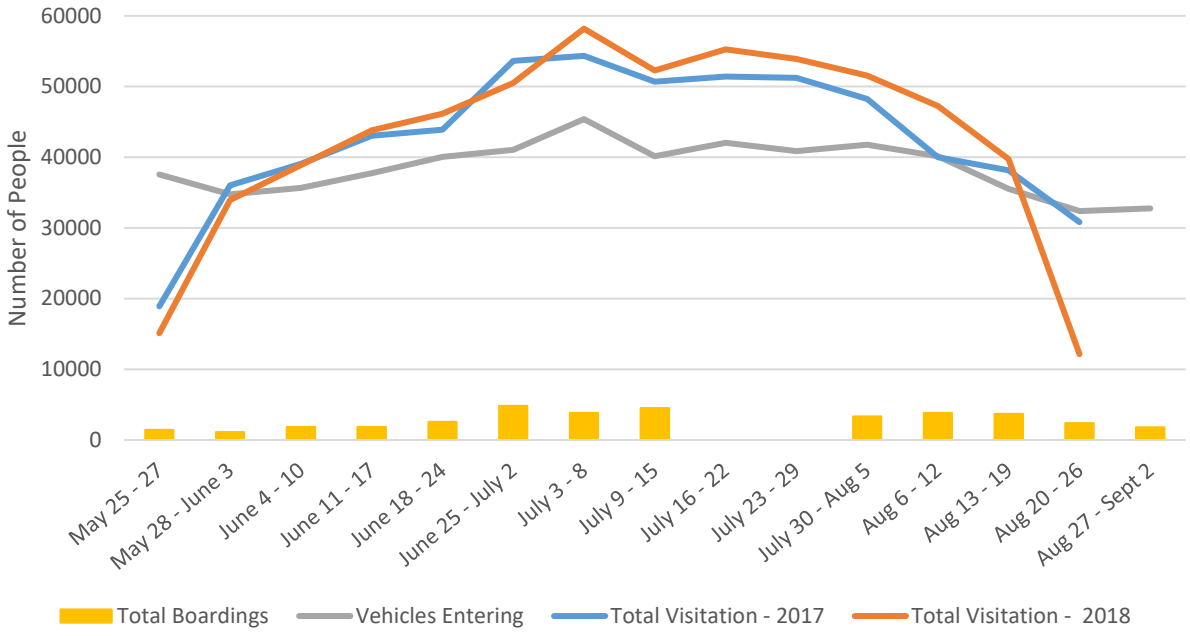


Figure 37: Total Boardings, Vehicle Counts at Entrance, and Total Visitation (2017 and 2018)

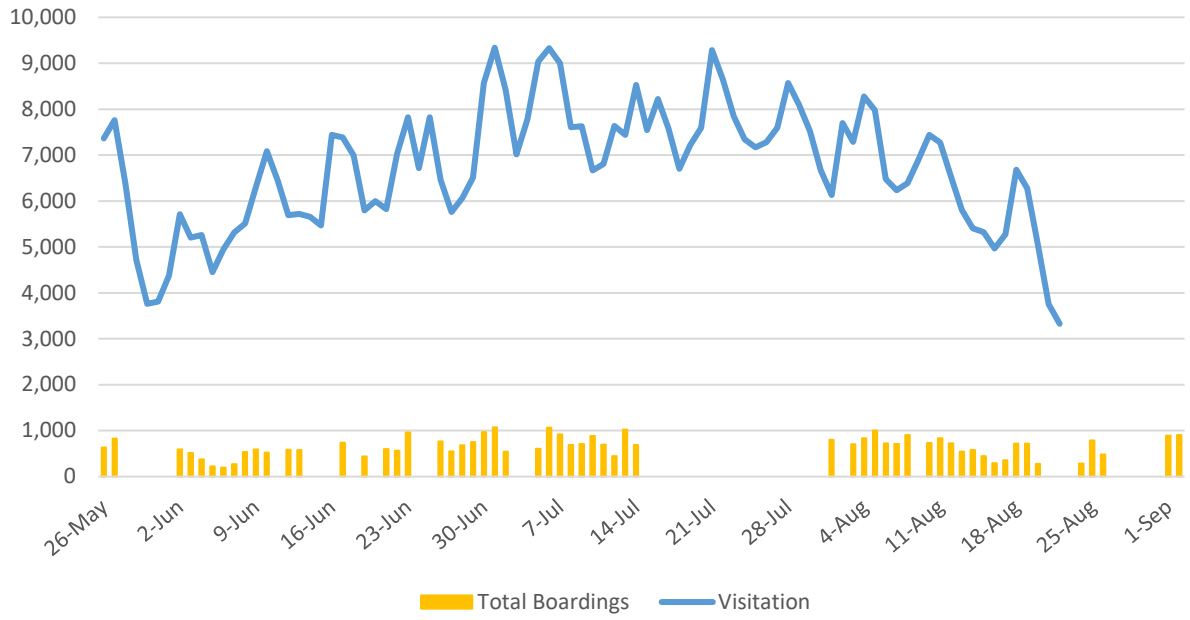


Figure 38: 2018 Weekly Visitation and Total Shuttle Boardings

Weekly vehicle counts were taken throughout the park near four unique entrances. Though visitor counts at the Visitor Center increased by four percent between 2017 and 2018,[18] monthly year-over-year data in Figure 39 shows generally fewer vehicles after the implementation of the shuttle. While not definitive nor the only factor, the decrease in vehicles could be attributable in part to the availability of transportation alternatives (i.e., the shuttle service starting in late May as well as making more parking available at Rock Ledge and encouraging people to walk into the garden from Rock Ledge). This is particularly visible from the daily data in Figure 40 where nearly every day saw fewer vehicles in the park in 2018 than the prior year. The only exceptions are Thursdays and Fridays, where the counts are nearly the same between the two years.

[18] Based on comparing May 26 to August 23 2017 and 2018 data.

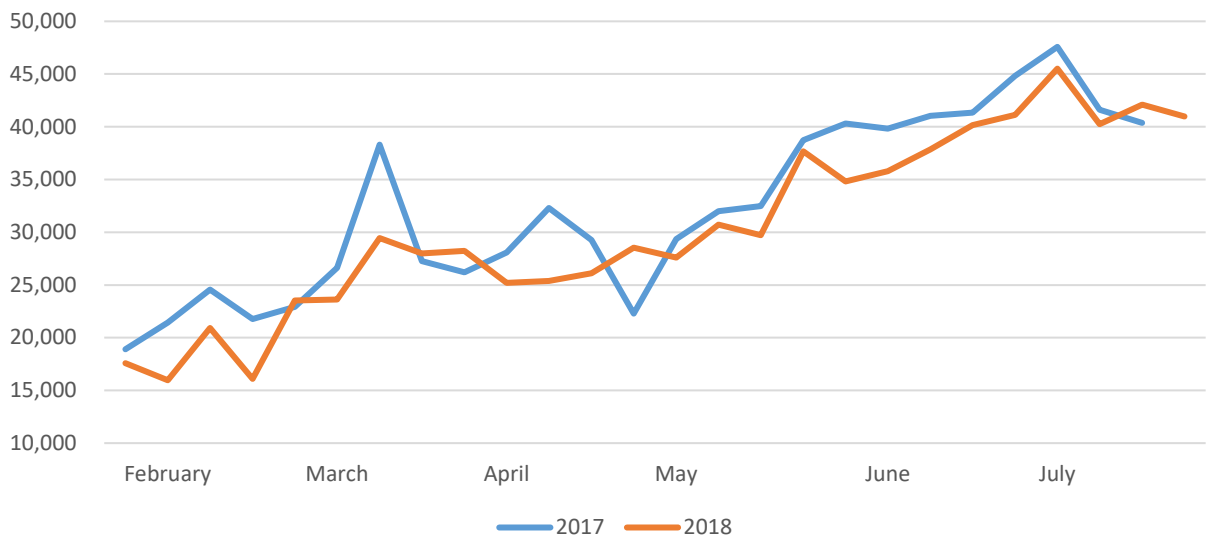


Figure 39: Weekly Vehicle Counts, January to July 2017 and 2018

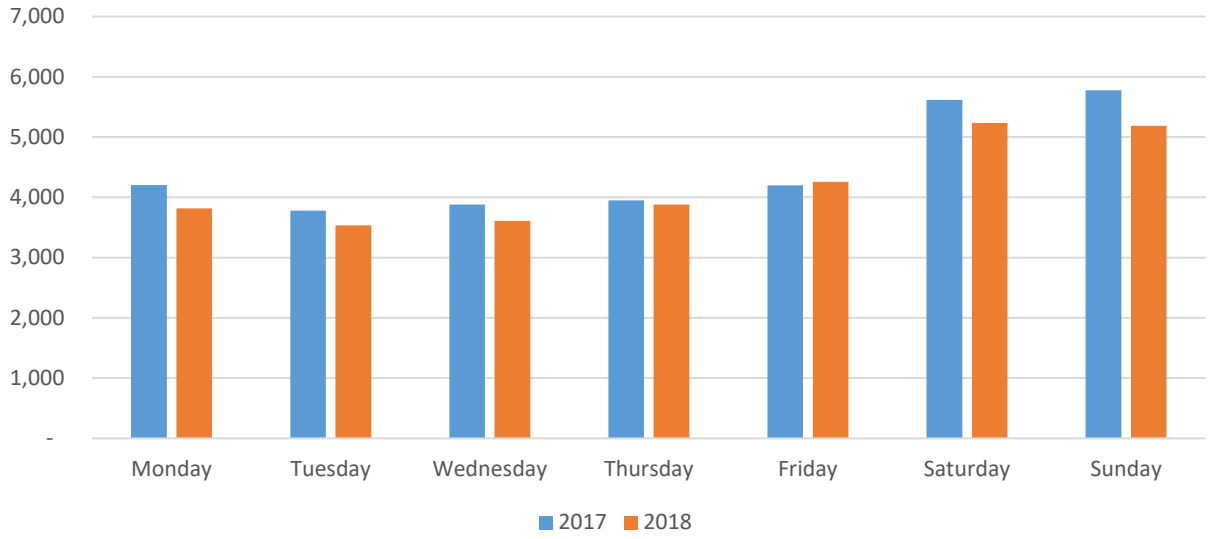


Figure 40: Average Traffic Counts by Day, January to July 2017 and 2018

Appendix A: Stakeholders

- Adventures Out West
- City of Colorado Springs – Parks, Recreation, and Cultural Services
- City of Colorado Springs – Traffic Engineering
- City of Colorado Springs – Stormwater/Water Resources Engineering
- Colorado Springs Fire Department
- Colorado Springs Police Department
- Convention and Visitors Bureau
- Friends of Garden of the Gods
- Garden of the Gods Foundation
- Garden of the Gods Trading Post
- Garden of the Gods Visitor and Nature Center
- Glen Eyrie
- Gray Line Corporation
- Mountain Metropolitan Transit
- Pleasant Valley Neighborhood Association
- Rock Ledge Ranch Living History Association
- Rocky Mountain Field Institute
- Trails and Open Space Coalition
- U.S. Forest Service
- U.S. Department of Transportation, Volpe Center

Appendix B: Public Meeting Posters, March 12, 2018

Garden of the Gods

Transportation Alternatives

Service Overview

- Visitation has steadily risen by 122% since 2013, causing high congestion, particularly on summer weekends
- In 2017, up to 8,000 vehicles entered the park during a peak summer day; averaging 20,000 visitors per day
- Vehicle queuing is common between main parking lot and entrance; even onto 30th Street; a distance of about one mile
- Shuttles are being considered to better manage congestion by taking more vehicles off the road and improve the overall visitor experience




What could these potential changes mean for visitors?

- Increased number of visitors with minimal side effects
- All visitors have a better experience
- Reduced traffic congestion within and surrounding the park
- Better traffic flow without building additional roadways
- Increased safety for all visitors regardless of transportation mode
- Mitigation of private vehicle environmental impact on the park's ecology

COLORADO SPRINGS

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Garden of the Gods

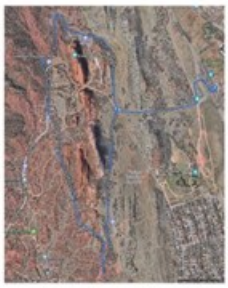
Transportation Alternatives

Shuttle Routes

A. Circulator between Rock Ledge, Visitor Center, and Juniper Way Loop Intersection (Phase 1)

- Roundtrip Distance: **1.2 miles**
- Roundtrip Travel Time: **10 minutes**

B. Route A + Juniper Way Loop Circulator (Phase 2)



- Roundtrip Distance: **3.8 miles**
- Roundtrip Travel Time: **30 minutes**

C. Route B + Balanced Rock/ Trading Post Circulator (Phase 3)

- Roundtrip Distance: **6.5 miles**
- Roundtrip Travel Time: **50 minutes**

COLORADO SPRINGS

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Garden of the Gods

Transportation Alternatives

Parking Options

Off-Site Parking

Pros

- No need to develop new parking on-site

Cons

- Need for additional shuttle, transfer, and cost to transport visitors from off-site parking locations

On-Site at Rock Ledge

Pros

- Easy access to shuttle service and park sites

Cons

- Need and cost to develop parking at Rock Ledge

Map

Vote for Off-Site Parking

Vote for On-Site Parking

Colorado Springs

Volpe Center

Garden of the Gods

Transportation Alternatives

Vehicle Type

	Shuttle Van	*Shuttle Bus*	*Tram*
Cost	Mid	Most	Least
Maneuverability	Mid	Least	Most
Power	Most	Most	Least
Loading Time	Mid	Mid	Least
Capacity	Mid	Most	Least
Environmental Impact	Mid	Most	Least
Safety	Most	Most	Least
Picture			
Vote			

Colorado Springs

Volpe Center

Garden of the Gods

Transportation Alternatives

Fee Structure Alternatives

No Fee (Status Quo)

⊕ Pros

- No change in expectations of visitors

⊖ Cons

- Congestion likely to get worse over time

Transit Fee

⊕ Pros

- Service is voluntary
- Fees will make service sustainable

⊖ Cons

- Added time to purchase transit passes upon arrival
- Cost may discourage people from taking shuttle

Parking Fee for Lots within the Park

(Parking would be free at Rock Ledge and the Visitors Center)

⊕ Pros

- Fee collection will go towards improving the visitor experience at the park, including the shuttle service
- Aims to encourage visitors to use carpooling, ridesharing, or alternative transportation, and therefore less congestion within and surrounding the park

⊖ Cons

- Fee will be new expectation of visitors
- Parking fee may deter visitation

Vote for No Fee

Vote for Transit Fee

Vote for Parking Fee

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Transportation Alternatives

Car-Free Days

Examples from other Parks

Crater Lake National Park in Oregon piloted a "car-free weekend" in 2013 and it was an overwhelming success. By popular demand, the Park has made it an annual event in September. The main roads are off-limits to motorized vehicles, while the parking areas are still available to cars. Emergency vehicles are allowed to use the roads as needed. The restriction on cars lasts from 8am to 6pm during which time bicyclists and pedestrians can enjoy the scenery without the noise of traffic. The Park website posts this information so that visitors to plan ahead accordingly.

Vote Regarding Car-Free Days

Frequency		Duration		
Once a month	*One-day trial*	*All Day*	*Mornings only*	*Never*

Autonomous Shuttle Day

Are you interested in trying out a driverless shuttle?

Yes

No

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Transportation Alternatives

Other Considerations

Reservation System for Shuttles

Denali National Park in Alaska has only one road, a small portion of which is open to cars. The remainder is only open to bus traffic and this is the main way to see and get around the Park. Bus trips are available in summer and can be reserved online. There are free courtesy buses, longer transit routes that charge a fee, as well as tour buses that may include narration.

Like this idea

Reservation System for Parking

Muir Woods in California recently implemented a parking and shuttle reservation system to mitigate the safety risks and negative environmental impacts of high visitation. Reservations can be made online or by phone and are required seven days a week, year round. Staff on site help drivers who hold a reservation to find a parking spot.

Like this idea

Queuing System

The Laurance S. Rockefeller Preserve at Grand Teton National Park in Wyoming has a parking lot that is often full before 9am. When the lot is full, arriving vehicles must queue outside of the parking lot and wait until a spot opens up. Parking lot staff direct the drivers when to enter the lot and where to park. This type of management system prevents congestion caused by vehicles looking for parking availability.

Like this idea

Parking Lot Message Board

The town of Vail has a well-developed parking management system. A website and dynamic message signs give drivers all the information they need, from maps, prices, locations of free parking, and real-time space availability.

Like this idea

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Transportation Alternatives

Transit in Parks

Boulder Shuttles to Chautauqua

The Park to Park pilot program, which provides satellite parking and free shuttle service to and from Chautauqua, is part of the Chautauqua Access Management Plan project to explore ways to create a better visitor experience while reducing vehicular and parking impacts on neighbors and the area's natural and cultural resources. For those that prefer not to use the shuttle, there is no free parking nearby, but paid parking is available for $2.50 per hour at Chautauqua and in surrounding neigborhoods. By using Lyft, visitors can receive a $1.25 discout per trip to and from Chautauqua.

Are there other ideas you'd like to propose?

White River National Forest Shuttle

Maroon Bells Scenic Area restricts vehicle access on Maroon Creek Road during the high season. All visitors are required to use the shuttle bus from 8am to 5pm, June 11th through October 2nd. Shuttle buses run every 20 minutes and tickets must be purchased from an outlet near the bus loading station or other locations downtown. When buses are not in operation, all vehicles may access the sites for a $10 fee or via one of the national recreation passes.

Are there other parks with a transportation management system you think works well?