# Glacier National Park Visitor Management at Many Glacier and Two Medicine

An Interactive Qualifying Project submitted to the faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the Degree of Bachelor of Science by


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Date: October 13, 2022

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# *Abstract*

Reservation systems have been used to manage an increasing number of visitors at national parks. Surges of visitors to Glacier National Park (GLAC) in recent years led to the implementation of vehicle reservation system pilot programs in areas of the park. This project examined potential reservation systems at two of GLAC's valleys. Using data analysis and interviews, we compared four reservation types and determined staff believe ticketed entry should be implemented in the valleys. We analyzed the reservation system design and its impacts on park preservation, staff, and visitors. We presented recommendations to GLAC about reservation system design, visitor experience, resource preservation, and staff roles. We also identified questions for long-term implementations.

# *Acknowledgements*

We want to thank the many people who made this project possible.

We would first like to thank Tara Carolin and the Crown of the Continent Research Learning Center for providing us the opportunity to complete this project with them. We would also like to thank Katherine Barrs, Phil Wilson, and Pete Webster from Glacier National Park for supporting us, providing invaluable insight, and guiding us throughout the duration of the project.

We would also like to thank our parents, Hal and Stephanie Moody, Steven and Pamela Robinson, Dave and Catherine Cote, Gregory and Donna Ridolfi, and Gregory and Laura Tierney for supporting us throughout this project and our academic careers.

Lastly, we would like to thank our advisors, Dr. Robert Traver and Dr. Seth Tuler, for guiding us in so many ways throughout this project and working closely with us through IQP, PQP, and ID2050.

This project would not have been completed without all of your help, and we thank you endlessly for supporting us!

# *Executive Summary*

Managed access and its implementations have long been discussed as a method to sustain the National Park Service's mission "to preserve and protect the natural and cultural resources for future generations" (NPS, 2015).

This project served as a comparative study of potential reservation system implementations at two of Glacier National Park's four valleys, Many Glacier (MG) and Two Medicine (TM). We compared the following reservation types: ticketed, timed, lottery, and license plate.

***Recommendations from Research:***

The goal of our project was to compare four reservation system types for MG and TM. We achieved this goal through comparative analyses presented to the park as a deliverable. This analysis showed that interviewed staff believe ticketed entry should be implemented at MG and TM.

During our interviews, other topics arose. From these topics, we gathered additional recommendations in addition to the comparative analyses. We recommend that the Park:

1. Maintain consistency across implementations of reservation systems
2. Ensure ease of comprehension and accessibility for visitors
3. Assess the impacts of the systems on infrastructure and natural resources, including roads, parking lots, and trails for vegetation regrowth
4. Evaluate the success of reservation systems and identify long-term options for entry management

To supplement the above recommendations, we created recommendations based on the components of a reservation system.

For consistency, MG and TM reservation systems should have the same design as North Fork (NF). We also recommend that the park continue the reservation exemptions for service users, campers, natives, and other permit holders.

We suggest edits to the reservation system descriptions on *recreation.gov* and *nps.gov* such that they are more consistent and clear. A banner on those pages stating reservation information will help with clarity.

To assist with staff satisfaction, the interviewed GLAC staff expressed that the role of a Visitor Services Assistant (VSA) should be better defined to decrease frustration. With a reservation system, the role of VSAs should be to welcome visitors and check reservations, instead of only turning people away when the valley closes.

The time constraints of our project did not allow for us to investigate everything surrounding the reservation systems at GLAC. Therefore, we recommend a list of ideas for future research and/or work:

1. Evaluate the positive and negative implications of extending the reservation system season.
2. Research potential changes to availability/timing of booking windows for vehicle reservations
3. Define the success of the reservation systems at MG and TM and develop measurable metrics: number of cars in parking lots, vegetation growth, etc.
4. Determine the point at which these reservation systems would fail; its limitations and threshold. In other words, identify possible extenuating circumstances when this reservation system would be insufficient due to increasing visitor demand.

5. Determine long-term plans and goals for reservation systems. (ie. What should the system look like in 5 years? 10 years? When would other actions have to be taken?)

### *Results of Research:*

Our recommendations are based on input from park employees. The GLAC staff, whom we interviewed, agree that reservation systems in MG and TM will help with visitor congestion. These interviewees indicated that reservation systems should:

1. Decrease visitor confusion
2. Utilize a simple design
3. Improve visitor experience
4. Improve visitor-staff interactions
5. Reduce impact on natural resources
6. Decrease gridlock and traffic closures on entrance roads and parking lots
7. Clarify staff roles

Based on these items, we found that staff believe ticketed entry makes the most sense because of its simplicity and consistency with other systems in the park. Other systems discussed and compared in our interviews include timed entry, alternating license plate systems, and a lottery system.

According to park staff at NF, ticketed entry worked very well. Signs of success include noticeable vegetation regrowth along roadsides, more positive visitor-staff interactions, and zero closures since system implementation.

It is important to note that interviewed staff only have knowledge specific to their roles. While we interviewed staff from many levels to gain as much information as possible, our interviews may have missed some information due to the specific roles of our interviewees.

### *Methodology of Research:*

Our project compared reservation system options for MG and TM to help GLAC maintain their mission. To achieve this goal, we completed the following project objectives:

1. Gathered information about current conditions at MG and TM
2. Identified impacts of current reservation systems at NF and GTSR
3. Considered implementation design of proposed reservation systems at MG and TM
4. Compared reservation system types for MG and TM and gave additional recommendations

To complete these objectives, we interviewed 10 park staff from NF, MG, and TM representing various positions. We then analyzed the interviews. We compared different types of reservation systems through a comparative matrix. We provided results from our interviews and analysis as recommendations to the park.

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# *1.0 Introduction*

Many people visit national parks due to their natural beauty. In 2021, over 297 million people visited U.S. national parks (NPS, 2022). Glacier National Park (GLAC) experienced a surge in visitors over the past five years. In 2017, GLAC saw over 3 million visitors between June and September (NPS, 2021).

The increased visitor congestion at national parks in recent years has negatively impacted visitor experience (U.S. Department of the Interior, National Park Service, 2021). The "substantial demand for public use of the parks" has led to frequent gridlocks, parking lot closures, and changes in "visitor behavior, use levels [of the park], types of use, time of use, and location of use" (Belnap et al., 1997). Visitors have also impacted natural resources – for example, vegetation has drastically declined along the edges of trails, parking lots, and roads.

National parks developed plans and strategies to help control high visitation (Belnap et al., 1997; Burns et al., 2010; Manning et al., 2007). From these plans emerged reservation systems.

GLAC implemented vehicle reservation systems at Going-to-the-Sun Road (GTSR) and North Fork (NF) in 2021. These systems "reduced congestion during peak hours and circumvented the need to close vehicle access" (NPS, 2022c). Other visitor management strategies at GLAC include traffic visitor-staff communication about road congestion.

While reservation systems successfully limit the number of visitors, they have negative consequences at other places in GLAC, including Many Glacier (MG) and Two Medicine (TM). For example, new management strategies spark visitor confusion. At GLAC, visitors who didn't have a reservation for GTSR or NF went to MG or TM. This redirection of traffic led to congestion, stress on park staff, impaired visitor experience, and vegetation decline.

Our project compared options for reservation systems at MG and TM. These options look to maintain Glacier National Park's mission to preserve the park for future generations (NPS, 2016). Our team investigated how reservation systems at GTSR and NF affected visitor experience and park staff at MG and TM. We interviewed park staff to understand the traffic, vegetation loss, and parking closure conditions at these valleys. We also asked park staff about their thoughts on different reservation systems as potential solutions. We presented recommendations based on the results of comparative analysis to GLAC.

# *2.0 Background*

This chapter provides a general overview of Glacier National Park. It then describes the increase in visitation at the park and current visitor management strategies.

## *2.1 Overview of Park Preservation at Glacier National Park*

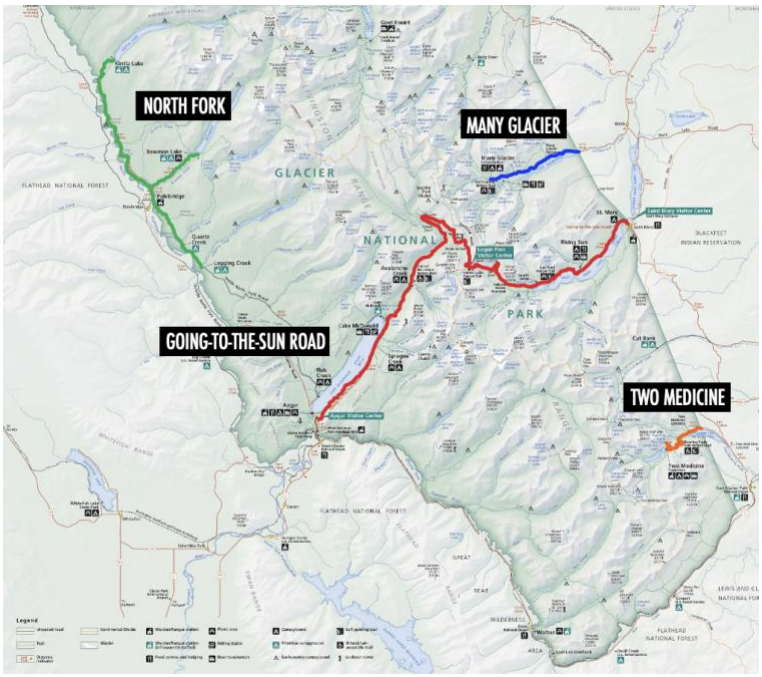


*Figure 1.* Map showing locations of North Fork, Many Glacier, Going-to-the-Sun Road, and Two Medicine

Frequently referred to as the "Crown of the Continent," Glacier National Park (GLAC) remains one of the top 10 most visited parks in North America. Due to GLAC and other parks' high visitation, the National Park Service (NPS) drafted system-wide plans to improve visitor experience and preserve resources (NPS, 2016; Burns et al., 2010). These plans comply with the Organic Act of 1916 in "promoting use of national park lands while protecting them from impairment" (NPS, 2015). In addition to system-wide plans, GLAC also has approved their own plans for visitor management (e.g., Going-to-the-Sun Road Corridor Management Plan and Environmental Assessment) (NPS, 2021). Overall, GLAC still encounters long lines at entrances, backups on roadways, degraded trails, and frustrated visitors across the park.

## *2.2 Understanding Current Conditions at MG and TM*

The following sections describe the current conditions, specifically at MG and TM, in terms of visitation, traffic, and congestion.

### *2.2.1 Parking and Management Conditions at MG*

Many Glacier has roughly 525 legal parking spots (Glacier National Park, 2021). Over 1000 people travel the Grinnell Trail in Many Glacier daily in the peak season (July) and up to 140 cars enter per hour (Barrs, 2022). Thus, visitors struggle to find parking and park along roadways; this greatly recedes roadside vegetation. The visitors that do find parking hike, camp, ride boats, stay at hotels, and picnic. The valley experiences high visitation numbers from mid-June to mid-September; this aligns with the GTSR and Many Glacier Hotel openings.

In recent years, staff at MG have tried different solutions to manage the large numbers of visitors. In 2019, visitor services assistants (VSAs) began to direct traffic, mark parking spots, and

turn cars around when parking lots got full. Park staff also lowered the hotel occupancy to increase the number of parking spots available to day-users (Hagen, 2012; Historic Hotels America, 2022). The campground switched from first come first serve to reservation-only in 2021 to eliminate the traffic that would start at midnight to get a spot.

However, Many Glacier has still seen numerous days with parking closures. A closure occurs when parking lots fill and the number of incoming cars can no longer be managed. Figure 2 shows the valley's 59 closures (over 58 consecutive days) in 2022. Many Glacier only had 30 days without closures in the 2022 peak visitation season (June 18th-September 13th)

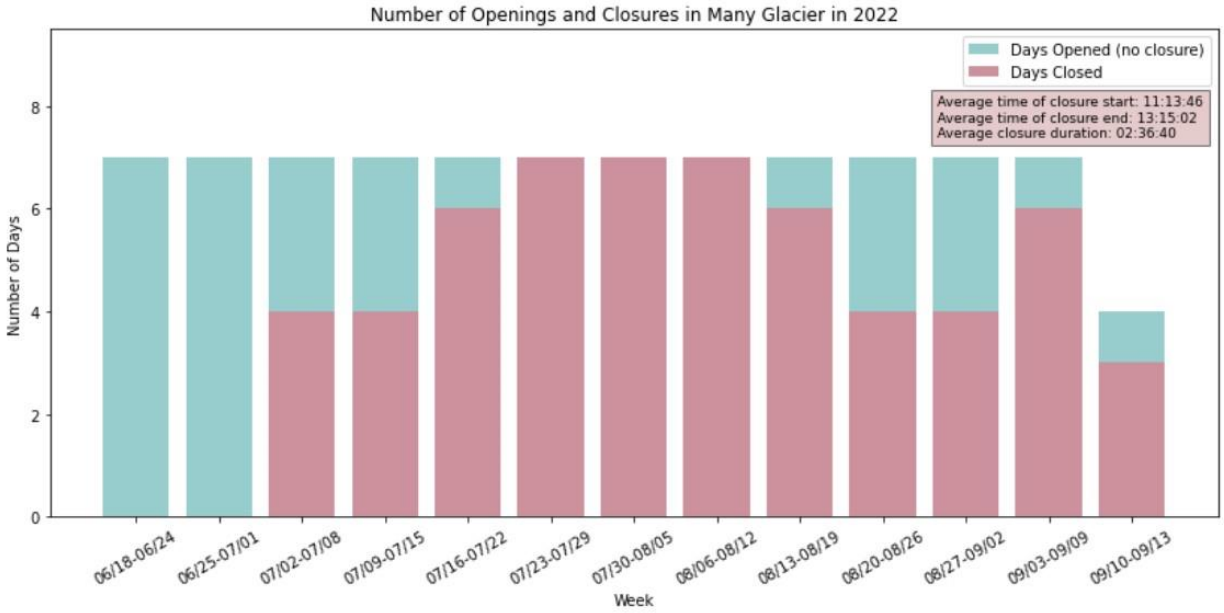


*Figure 2.* Days With vs Without Closures in Many Glacier, 2022 Season
(Data source: Katherine Barrs, 2022)

After GTSR opened on July 13, 2022, the number of closures at MG significantly increased, as seen in Figure 2. Staff redirected visitors without a reservation at GTSR to MG. The diverted traffic caused congestion and visitor frustration.

### *2.2.2 Parking and Management Conditions at TM*

While Two Medicine (TM) has fewer visitors than Many Glacier, the valley faced similar challenges. Before GTSR opened in 2022, up to 126 vehicles entered the valley per hour (Barrs, 2022) with approximately 250 parking spots available (Glacier National Park, 2021). Because the parking lots could fill within two hours, TM experienced many traffic closures, as shown in Figure 3. These closures frustrated visitors, and law enforcement (LEs) diffused visitor situations at the entrance. Once the GTSR opened, the number of closures per week drastically decreased (Figure 3).

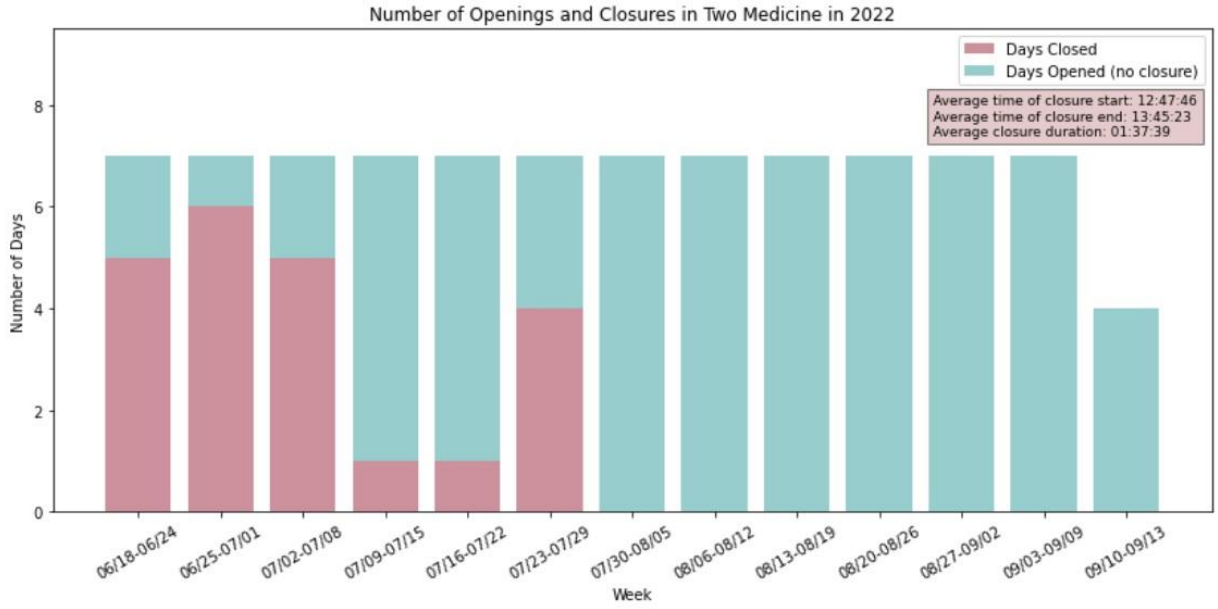


*Figure 3.* Days With vs Without Closures in Two Medicine, 2022 Season
(Data source: Katherine Barrs, 2022)

In addition to closures, Two Medicine uses a road sign on the access road to the valley to tell incoming visitors about the current congestion levels in the area. Other management strategies include the addition of  VSA roles to better distribute visitors and direct traffic.

TM has many different parking areas to accommodate various types of visitors: campers, hikers, picnickers, and service users. However, a lack of staff at TM in 2022 made it difficult to manage visitors, and impossible to control parking. This uncontrolled parking eroded vegetation on the edges of roads, trails, and parking lots.

Overall, the current conditions at MG and TM are not ideal. To prevent traffic issues, parks have used different types of reservation systems as a management strategy.

## *2.3 Reservation Systems*

The implementation of visitor reservation systems in national parks has relieved traffic congestion (Reynolds, 2021). The following sections describe the components of a reservation system and the various types of reservation systems currently implemented. The analysis of these different reservation systems can be used to identify which design would best fit for MG and TM.

### *2.3.1 Components of a Reservation System*

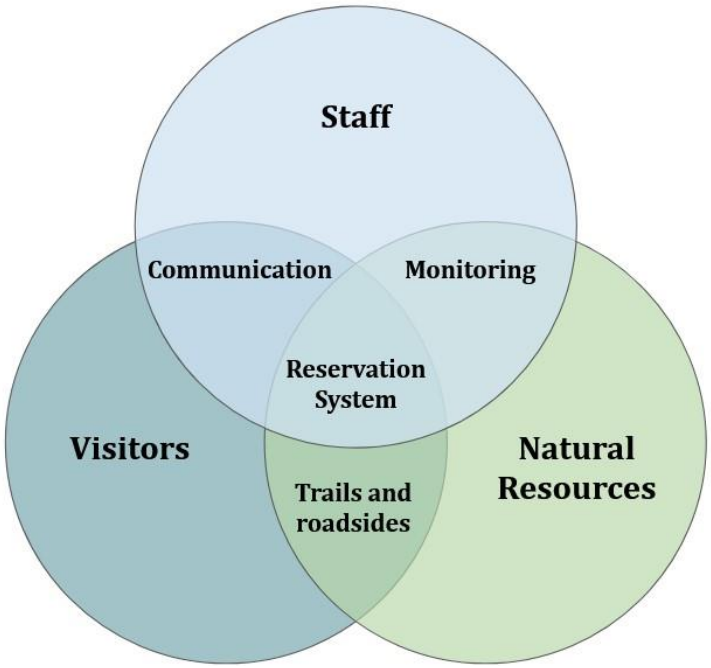


*Figure 4.* Components of a Reservation System

Figure 4 shows the three major components of a reservation system: park staff, visitors, and natural resources. These three components all intertwine in different ways. First, staff communicate with visitors through recreation.gov, signage, and entrance stations. Second, visitors engage with natural resources by using trails and roadsides. Third, staff monitor trail and roadside vegetation to track natural resource regrowth. All 3 components combine in order to establish a functional reservation system.

### *2.3.2 Types of Reservation Systems*

Reservation systems can take different forms. Eight national parks have implemented reservation systems to improve visitor experience, protect natural resources, and aid park staff. The top reservation system types are: (1) ticketed entry, (2) timed entry, (3) alternating license plates, and (4) a randomized lottery system (U.S. Department of the Interior, National Park Service, 2021).

For a ticketed reservation system, visitors buy tickets for an identified number of days (i.e., 1, 3, or 7 days) and can enter the park on specified day(s) during "reservation only" hours. At GLAC, Going-to-the-Sun Road and North Fork both use ticketed systems.

In comparison, a timed entry pass designates a fixed time window where a pass holder gains access into the park. However, timed entry does not dictate duration of stay. Both Rocky Mountains National Park (RMNP) and the Arches National Park (ANP) have experimented with timed entries. RMNP uses a two hour entry window, and ANP uses a one hour entry window.

For license plate reservation systems, vehicles with an odd digit at the end of their license plate have access to the park on odd days of the month. Alternatively, vehicles with an even digit can enter on even days. Yellowstone National Park implemented an alternating license plate system in response to the unprecedented flooding in 2022 (NPS, 2022d).

A lottery-based reservation system mandates that visitors must purchase a "lottery" for a ticket. Parks usually use lottery systems for specific attractions. For example, Paria Canyon-Vermilion Cliffs Wilderness in Arizona requires a pass to visit its premier photographic destination: "The Wave" (Recreation.gov, 2022). Other examples that incorporate lottery systems include Denali National Park, the Grand Canyon, and Yosemite's "Half Dome" (NPS, 2022b).

In addition to the type of reservation system, parks consider time of year, type of ticket, duration of ticket, and number of tickets for a reservation system. Evaluation of each of these reservation system implementations will help determine the best design for MG and TM.

### *2.3.3 Going-to-the-Sun Road Reservation System*

As previously mentioned, GLAC has implemented ticket reservation systems since 2021. For example, Going-to-the-Sun Road (GTSR) ticketed reservations are valid for 3 consecutive days. Reservations to GTSR are available 120 days and 24 hours before the selected date (at 8am MDT). The reservations are available via *recreation.gov.* GLAC requires vehicle reservations on the road between 6am and 4pm MDT. The park first implemented a 3-day GTSR reservation in 2022. In 2021, GTSR used a 7-day reservation but the duration was shortened to better fit visitor patterns. The system maximized the number of visitors who can drive the road and protected roadside and trail vegetation. The implementation of the reservation system resulted in less gridlock, trail congestion, and road congestion.

Analysis of a road, or "corridor," reservation system will help us evaluate the impacts of reservation systems on GLAC valleys.

### *2.3.4 North Fork Reservation System*

Reservations at North Fork (NF) were implemented in 2022. The reservations are only valid for one day, to fit the patterns of day-use visitors in the valley. The reservations are available on a rolling basis, similar to GTSR. NF requires a reservation between 6am and 6pm MDT.

Figure 5 compares the number of closures GLAC valleys faced in a given year from 2019-2022 (except the pandemic year 2020). After the implementation of the ticketed reservations in 2022, the closures at NF dropped to zero.

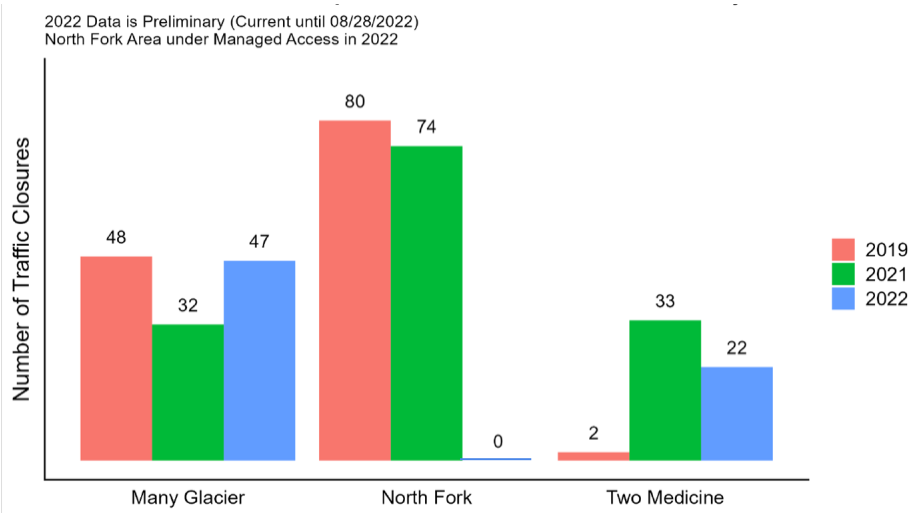


*Figure 5.* Traffic Closures Per Year in Glacier National Park Valleys (Katherine Barrs, 2022)

The analysis of the NF reservation system will help us assess how well a valley reservation system worked in GLAC, and serve as a reference to determine implementations at MG and TM.

# *3.0 Methodology*

Our project compared reservation system options for MG and TM to help GLAC maintain their mission. To achieve this goal, we completed the following project objectives:

1. Gathered information about current conditions at MG and TM
2. Identified impacts of current reservation systems at NF and GTSR
3. Considered implementation design of proposed reservation systems at MG and TM
4. Compared reservation system types for MG and TM and gave additional recommendations

The following sections describe the methodology used to create a comparative analysis of potential reservation systems at MG and TM.

## *3.1 Gather Information About Current Conditions at MG and TM*

To help the park understand the options for reservation systems at Many Glacier and Two Medicine, we gathered information about:

1. Natural resource preservation
2. Peak visiting times (time of day and time of year)
3. Traffic congestion patterns and current tools in place to help with visitor management
4. Visitor impact on park staff
5. Staff-to-visitor interactions and staff opinions on reservation system implementations

To gather that information, we conducted semi-structured interviews with 10 park staff that represent various positions. These interviews consisted of approximately 20 questions in total.

## *3.2 Identify Impacts of Current Reservation Systems at NF and GTSR*

We determined the impacts – to MG and TM, NF, and park-wide – of the current reservation systems in place at GLAC.

First, we investigated how the GTSR reservation system impacted visitation in the MG and TM valleys. In interviews with park staff, we questioned the staff who had worked in these valleys for years about how visitor patterns changed since the implementation of the GTSR reservation system.

Second, we interviewed the two heads of traffic management on the East and West sides of the park to understand the park-wide impacts of the reservation system.

Finally, to determine the impact that the NF reservation system had, we interviewed the NF district ranger and a law enforcement officer. The collected information discerned the possible implications of reservation systems at MG and TM.

To analyze the interviews, we isolated fourteen main themes into three categories that allowed us to develop insights.

## *3.3 Consider Implementation Design of Proposed Reservation Systems at MG and TM*

We investigated the design and impacts of potential reservation system implementations at MG and TM.

Through analysis of interviews, we determined the potential impacts of reservation systems on visitor and staff related components.

We also considered how a reservation system would impact visitors. To gather this information, we asked questions about visitor traffic congestion, visitor-staff interactions, and visitation trends in our interviews with MG and TM staff.

For park staff, we considered how reservation systems at TM and MG would change their job roles.

For the design of the system, we asked in our interviews about types of reservation systems, time of day, and time of year constraints. We evaluated the nuances of these factors, and how the park may consider them for the implementation of reservation systems.

## *3.4 Compare Reservation System Types for MG and TM and Give Additional Recommendations*

To compare the strengths and weaknesses of different types of reservation systems, we compared their pros and cons through the information gathered in interviews.

Afterward, we gave additional recommendations on the following questions/topics:

1. What should the design of the reservation system be?
    a. What time of year should these reservation systems be active?
    b. What time of day should these reservation systems be active?
    c. How many days should the tickets be valid for?
2. What impacts should the park consider when implementing reservation systems in these valleys?
3. Additional visitor, park staff, and natural resource recommendations, found through interviews.
4. Recommendations for future research and work.

# *4.0 Results*

## *4.1 Evaluation of Reservation Systems at MG and TM*

The following sections discuss staff views about whether a reservation is needed at MG and TM, and compare multiple types of possible reservation systems in the two valleys.

### *4.1.1 Interviewed Staff at GLAC Believe a Reservation System is Needed at MG and TM*

The interviewed GLAC staff agree that reservation systems in MG and TM will help with visitor congestion.

Rangers at Two Medicine stated they support a reservation system in their valley. They showed concern about current vegetation loss: "each and every year, we give up more, and a little bit more, and a little bit more." To protect roadside vegetation, they mentioned how they would rather close the valley than fill every inch of parking.

The TM staff described that the majority of congestion occurs before GTSR opened. Therefore, a reservation system would be useful during the early season.

The rangers and VSAs at Many Glacier said that a reservation system in their valley is "long overdue," and they are "very on board" with a reservation system.

In summary, interviews with staff at MG and TM indicated that reservation systems should:

1. Decrease visitor confusion
2. Utilize a simple design
3. Improve visitor experience
4. Improve visitor-staff interactions
5. Reduce impact on natural resources
6. Decrease gridlock and traffic closures on entrance roads and parking lots
7. Clarify staff roles

We must note that this is not an exhaustive list; while MG and TM staff know much about their valleys, they may not have mentioned everything in interviews. We also only interviewed a sample size of staff from both valleys, so some factors may not have been brought up.

In terms of items 1 and 2, the interviewed park staff believe a simple reservation system would decrease visitor confusion. Many staff mentioned that the structure of *recreation.gov* and *nps.gov* confused visitors, due to their inconsistent wording. For example, *nps.gov* refers to the GTSR reservation system as: "VehRes," "vehicle reservations," and "tickets." Additionally, tickets are embedded in the FAQs sections on *nps.gov* pages, so visitors struggle to find where to purchase tickets.

For item 2, we determined consistent design of reservation systems at park valleys (MG, TM, and NF) would reduce visitor confusion.

In terms of item 3, a reservation system at MG and TM would decrease congestion and improve the naturalistic experience. However, visitors must plan ahead. Additionally, we determined 8 types of visitors in GLAC: day-hikers, campers, backpackers, natives, locals (Flathead/Glacier Counties), service users, "gawkers," and picnickers. Day-hikers tend to arrive early and stay for the majority of the day. Campers and backpackers stay multiple nights and

have designated areas to camp. “Gawkers,” picnickers, day hikers, and locals have shorter stays than campers and backpackers.

For item 4, a reservation system would decrease the number of negative visitor-staff interactions. With a reservation system, park staff would check reservations and welcome people to the park. Staff at NF said that since the implementation of the system, the number of negative visitor-staff interactions decreased.

However, interviewed staff expressed concern about a lack of staff. The inability to hire sufficient staff would handicap a reservation system, as they would lack the ability to check if a visitor has a reservation.

For items 5 and 6, a reservation system would reduce the impact visitors have on trail and roadside vegetation, and decrease traffic congestion and gridlock. The NF rangers noted that trail and roadside vegetation has rebounded, and trail usage is estimated to be at a more acceptable level in their valley.

In terms of item 7, park staff mentioned the need for role clarification. Some VSAs described how no reservation system in their valley (MG or TM) made their role confusing. Examples of their questions include: Who should we let in during a closure? When is the exact right time for a closure? How do we explain to people that even though we don’t have a reservation system, they can’t come into the park?

Many staff also had to cover VSA shifts. Some staff mentioned that while a reservation system may be difficult to implement with a lack of staffing, a reservation system would make covering shifts more enjoyable.

Overall, we used these interview results in the following sections to compare the various types of reservation systems.

### *4.1.2 Pros and Cons of Different Types of Reservation Systems for MG and TM According to Park Staff*

The following sections discuss the results of our research about different types of reservations that could be implemented in MG and TM: ticketed entry, timed entry, and randomized systems.

#### *4.1.2.1 Interviewed Staff Believe Ticketed Entry Should Be Implemented in MG and TM*

We found that the interviewed GLAC staff believe a ticketed entry system should be implemented in MG and TM.

Across all interviews conducted at GLAC, everyone agreed that “something has to be done” and “[the solution] has to be the easiest for the visitor.” The interviewed staff interpreted ticketed entry as the “simplest to understand.” Additionally, a common theme across interviews was to “keep consistency with NF and GTSR” with one type of reservation system: ticketed entry.

Figure 6 presents a pros and cons chart of ticketed entry systems at MG and TM derived from interviews. Pros that we determined include staff approval, limitation on visitors, consistency, and improvement of staff experience. Cons of the system included an uneven spread in visitation and cause for visitor confusion.

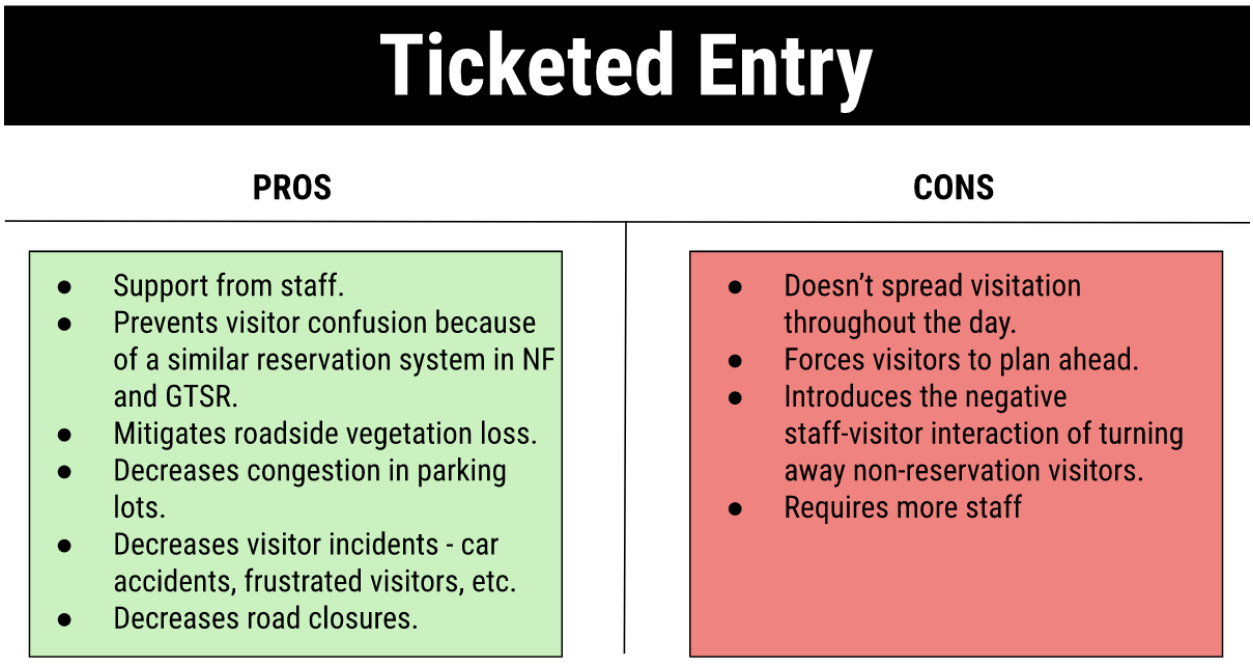


*Figure 6.* Pros and Cons Analysis of Ticketed Entry Systems at MG and TM

Some main points about ticketed entry we extracted from our interviews are:

1. Ticketed entry is the simplest option for visitors to understand.
2. Staff find that a reservation system would facilitate significantly more positive visitor-staff interactions.

We must note that staff may have an inclination towards ticketed entry systems since they already exist in GLAC.

*4.1.2.2 Interviewed Staff Believe Timed Entry Should Not Be Implemented in MG and TM*

We found agreement among the interviewed GLAC staff that GLAC should not implement timed entry systems at MG and TM.

Every staff member we talked to at MG or TM had concerns about the implementation of a timed entry system. A word used to summarize their thoughts about timed entry was: "chaos."

According to interviewed park staff, timed entry can be viewed as a faucet. In regards to entry time windows, "do we let in a trickle, or a flood [for a given time interval]." Other comments from park employees about timed entry included: "do not know how it will work well," "how strict are the time windows going to be…do we let someone in 4 minutes past [their] entrance window because there was a backup on route 2?," and "people do not recognize time out here."

Figure 7 shows a pros and cons chart of timed entry systems at MG and TM derived from interviews. A few pros that we determined include spread in visitation, minimized roadside vegetation loss, and decreased visitor incidents. Some cons of the system included a lack of consistency with other park systems and a doubt in the system's abilities among park staff.

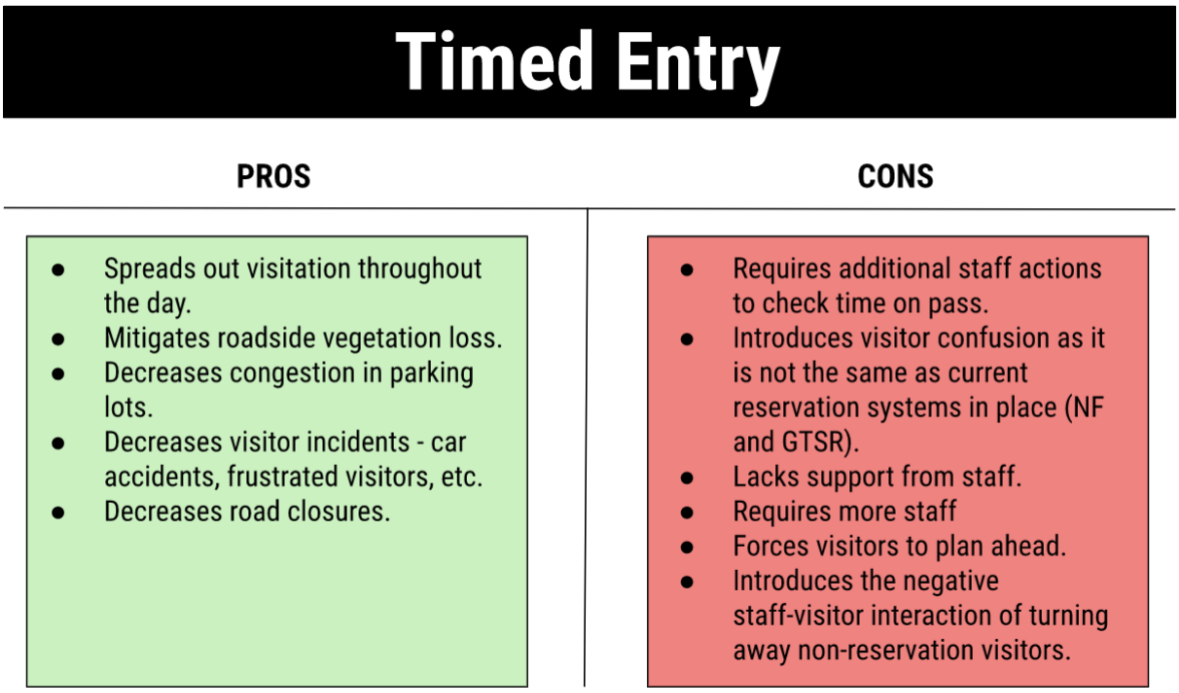


*Figure 7.* Pros and Cons Analysis of Timed Entry Reservation System at MG and TM

Some main points about timed entry that we drew from our interviews are:

1. Several interviewed staff members are opposed to timed entry or concerned about the "chaos" that could ensue with a timed entry system.
2. Timed entry is not the same as other reservation systems in the park, leading to visitor confusion about the reservation systems.
3. Enforcing time related components is not favored by staff (How strict are time windows? How many parking spots should be allotted per window?)

*4.1.2.3 Interviewed Staff Believe Lottery Systems Should Not Be Implemented in MG and TM*

We found agreement among the interviewed GLAC staff that GLAC should not implement any randomized systems at MG and TM.

Lottery systems help reduce traffic congestion and vegetation loss. Due to less traffic, the number of positive visitor-staff interactions may increase. However, given how current reservation systems confuse visitors, lottery systems would increase visitor confusion. Lottery systems have a multi-step structure—(1) an individual must pay into the lottery, (2) get selected, then (3) purchase an entrance ticket. This process may lead to visitor frustration. Additionally, lottery systems are used at specific popular attractions inside parks, while MG and TM are entire valleys. Appendix E shows additional pros and cons of lottery systems.

#### *4.1.2.4 Interviewed Staff Interest in Alternating License Plates Systems at MG and TM*

In interviews, park staff expressed curiosity about license plate systems, but were uncertain about the implementation of it at GLAC. License plate systems help reduce traffic congestion and vegetation loss, and improve visitor-staff interactions. While license plate systems have a simple design, they also require visitors to plan ahead if they can. Many visitors utilize rental vehicles and would not know their license plate until arrival. Additionally, a system that halves total visitor count may not be sustainable with increased visitation trends. The system also emerged very recently, so long-term efficacy is still unknown. Appendix E shows more information about the pros and cons of alternating license plate systems.

Overall, the license plate system satisfies many components (Table 1), but does not make sense for GLAC due to its lack of consistency with current park systems.

### *4.1.3 Comparative Analysis of Reservation Types*

We analyzed our interviews to produce a comparative analysis of each type of reservation system. Then, we identified 14 key components to be addressed with a reservation system, and grouped them into 3 categories, as shown in Table 1.

| | Comparison Matrix | | | | | |
|---|---|---|---|---|---|---|
| | | Ticketed | Timed | Lottery | License Plates | No System |
| **Infrastructure** | Consistent with current GLAC systems | ☑ | ☐ | ☐ | ☐ | ☐ |
| | Randomized reservation booking | ☐ | ☐ | ☑ | ☑ | ☑ |
| | Communicability | ☑ | ☐ | ☑ | ☐ | ☐ |
| | Technology independent | ☐ | ☐ | ☐ | ☑ | ☑ |
| | No reservation fees | ☐ | ☐ | ☐ | ☑ | ☑ |
| **Desired Impacts on Park Overall** | Limits number of visitors | ☑ | ☑ | ☑ | ☑ | ☐ |
| | Spreads visitation | ☑ | ☑ | ☑ | ☑ | ☐ |
| | Attempts to preserve natural resources | ☑ | ☑ | ☑ | ☑ | ☐ |
| | Less parking congestion | ☑ | ☑ | ☑ | ☑ | ☐ |
| **Visitor and Staff Related Components** | Simple to understand | ☑ | ☐ | ☐ | ☑ | ☑ |
| | Efficient staff usage | ☑ | ☐ | ☐ | ☑ | ☐ |
| | Encourages staff/visitor interactions | ☑ | ☑ | ☐ | ☐ | ☐ |
| | More naturalistic experience | ☑ | ☑ | ☑ | ☑ | ☐ |
| | Allows for trip planning | ☑ | ☑ | ☑ | ☐ | ☐ |

*Table 1.* Comparison Matrix of Different Reservation Systems

Ticketed entry fulfills the most components and supersedes other reservation system options in the desired impacts and visitor/staff related categories.

The components fulfilled by a reservation system may or may not be the decisive factor when determining the best system for the park, as the rows may be weighed differently. This comparison matrix is an overview, and the park may decide to weigh the key categories to better compare the reservation systems.

We also must note that this is not an exhaustive comparison; while MG and TM staff know much about their valleys, they may not have mentioned everything in interviews. We also did not interview every staff member at MG and TM; we interviewed a sample from both valleys. Therefore, the comparison may be missing some components, due to factors not mentioned in interviews. Additionally, the interviewed staff have knowledge specific to their

roles. While we interviewed staff from many levels to gain as much information as possible, our interviews may have missed some information due to the specific roles of our interviewees.

# *5.0 Recommendations*

The goal of our project was to compare reservation system types for MG and TM. We achieved this goal by giving the park the comparative analyses, as seen above.

From our interviews, we formulated the following recommendations:

1. Maintain consistency across implementations of reservation systems
2. Ensure ease of comprehension and accessibility for visitors
3. Assess the impacts of the systems on infrastructure and natural resources, including roads, parking lots, and trails for vegetation regrowth
4. Evaluate the success of reservation systems and identify long-term options for entry management

## *5.1 GLAC Should Design a Reservation System for TM and MG Consistent with the Rest of the Park's Reservation Systems*

We recommend that GLAC design reservations systems that maintain consistency across the park to avoid visitor confusion.

Specifically, we recommend:

1. The reservations systems in MG and TM should be ticketed systems to remain consistent with NF and GTSR.
2. The reservation systems in MG and TM stay consistent with the time of year as other reservation systems in place at GLAC.
3. The reservation systems at MG and TM align with the operating hours of NF.
4. The tickets for the reservation systems at MG and TM are 1-day tickets.

If a single valley adjusts reservation dates/hours, we recommend the valleys discuss changing as a whole to maintain a consistent system. Consistency across valleys will limit visitor confusion and make the reservation system easier for park staff to enforce and explain to visitors.

## *5.2 GLAC Should Consider Changing Online Reservation Descriptions and Continue Reservation Exemptions for Specific Groups in MG and TM*

We propose that the park consider changing online reservation descriptions and continue reservation exemptions for specific groups in MG and TM.

We suggest the descriptions of the reservation systems on *recreation.gov* and *nps.gov* are edited to be more consistent and clear. A banner on those pages stating reservation information will help with clarity.

We also recommend that the park continue the reservation exemptions for service users, campers, natives, and other permit holders.

## *5.3 GLAC Should More Clearly Define the roles of VSAs in MG and TM*

To assist with staff satisfaction, the interviewed GLAC staff expressed that the role of a Visitor Services Assistant (VSA) should be better defined to decrease frustration. With a reservation system, the role of VSAs should be to welcome visitors and check reservations, instead of just turning people away when the valley closes.

## *5.4 GLAC Should Monitor Vegetation, Implement Parking Dividers, and Implement Additional Vegetation Regeneration Areas*

A common concern of the staff at both MG and TM is the impact of visitors on the natural resources of the park, specifically roadside and trailside vegetation.

Pending staffing, workload, and funding, we recommend the following action items to support natural resource protection:

1. Monitor roadside and trailside vegetation to help quantify the reservation system's impact on natural resources.
2. Implement immovable dividers (examples: boulders, parking bumpers) at parking boundaries to prevent visitors from driving over vegetation.
3. Implement additional vegetation regeneration areas along trails, as needed.

## *5.5 Recommendations for Further Research and Work*

Time constraints of our project did not allow us to research everything related to the reservation systems at GLAC. Therefore, we recommend the following list of ideas for future research and/or work:

1. Evaluate the positive and negative implications of extending the reservation system season.
2. Research potential changes to availability/timing of booking windows for vehicle reservations
3. Define the success of the reservation systems at MG and TM and develop measurable metrics: number of cars in parking lots, vegetation growth, etc.
4. Determine the point at which these reservation systems would fail; its limitations and threshold. In other words, identify possible extenuating circumstances when this reservation system would be insufficient due to increasing visitor demand.
5. Determine long-term plans and goals for reservation systems. (ie. What should the system look like in 5 years? 10 years? When would other actions have to be taken?)

These ideas will encourage and optimize long-term solutions, and provide a better understanding of reservation systems at GLAC.

# *6.0 Conclusion*

Reservation systems and their implementations have long been discussed as a method to sustain the National Park Service's mission "to preserve and protect the natural and cultural resources for future generations" (NPS, 2015). Due to surges of visitation to national parks in the last decade, parks today continue to investigate reservation systems through variations of pilot programs, such as vehicle reservation systems. This project served as a preliminary study of potential reservation system implementations at GLAC's valleys, Many Glacier and Two Medicine. Through interviews with current park employees, we performed a comparative analysis of various reservation systems, their operational components, and impacts on park preservation and visitor experience. The work conducted over the duration of this project was presented as recommendations to GLAC administration and can serve as a reference for future research.

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# *Appendix A: Semi-Structured Interview Questions for MG and TM Rangers, LEs, and VSAs*

We are a team of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews, in collaboration with Glacier National Park, to evaluate what a potential reservation system in Many Glacier and Two Medicine will look like. Your participation in this survey is voluntary, and you may opt out at any time. Your comments will be anonymous, and if you are interested, a copy of the interview results can be provided at the conclusion of our research. Underlined items indicate questions of higher importance.

**Icebreaker/Introduction:**

1. How long have you been working at the park, and specifically at Many Glacier/Two Medicine?

**Traffic Congestion:**

2. Did you face any congestion-related problems this summer at Many Glacier/Two Medicine?
    a. How has congestion affected the visitor experience and resource conservation at Many Glacier and Two Medicine?
    b. What types of congestion-related problems occurred this summer at Many Glacier and Two Medicine and how have they impacted the visitor experience and other operations.
    c. How long have these issues been occurring?
3. What current congestion management tools work well/do not work well in Many Glacier/Two Medicine, if any?
4. What are traffic patterns like? Time of day, day of week, time in the summer, related to trail openings?

**Reservations:**

5. What consequences have you found with the reservation system at GTSR?
    a. What of these were expected?
    b. What of these did you find surprising?
6. Current options for visitor management include ticketed entry/timed entry/daily permits/or anything else (currently considering all options).
    a. What do you think of each of these options at Many Glacier/Two Medicine?
    b. And at what time of day, and time of year, do you think Many Glacier/Two Medicine most needs visitor management?
7. How would you expect a reservation to impact your valley in the following ways:
    a. Visitor experience
    b. Resource conservation

8. What does your day-to-day job look like now? What impacts do you see a reservation system would have day-to-day?
9. How do you perceive the purpose of the reservation systems? Or, how do you evaluate the success of these reservation systems?

**Staffing**:

10. What is the current level of staffing in Many Glacier/Two Medicine? How do you think this may affect the implementation of a reservation system?
11. We would like to talk to members at different levels of your organization. Can you provide contact information and names so that we can reach out?

**Conclusion**:

12. Do you have any other thoughts that were not covered in this interview?

# *Appendix B: Semi-Structured Interview Questions for North Fork District Ranger*

We are a team of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews, in collaboration with Glacier National Park, to evaluate what a potential reservation system in Many Glacier and Two Medicine will look like. Your participation in this survey is voluntary, and you may opt out at any time. Your comments will be anonymous, and if you are interested, a copy of the interview results can be provided at the conclusion of our research. Underlined items indicate questions of higher importance.

**Introduction**:

1. How long have you been working in the park, and at North Fork?

**Congestion**:

2. What congestion issues were you facing before the reservation system was implemented?
3. Are you facing any congestion related issues since the implementation of the reservation system this year?
4. Besides a reservation system, what other visitor management strategies (if any) are you using?
    a. Traffic closures, signage, trail closures
5. What kind of visitors do you find to be the biggest concern with regard to visitor management?
    a. Local vs Non-local?
    b. Day-use, campground, back country, service/activity goers?

**Job/Staffing:**

6. How has your day-to-day job changed since the implementation of the reservation system?
7. How many staff are stationed at North Fork?
    a. Do you have staffing issues, and if so, how do you run the reservation system while understaffed?

**Reservation System**:

8. How do you think the reservation system has impacted resource conservation?
    a. Trails, parking spaces, edge vegetation
9. How do you think the reservation system has impacted the experience visitors have at the park?
    a. Traffic, congested trails, no parking
10. Are you often questioned about the reservation system by visitors?

a. Are they confused or frustrated? Do they understand how the reservation system works, or is it difficult to understand?

11. Do you think the current reservation system should be implemented next year?
    a. If not, what would you change?

**Conclusion**:

12. Do you have any other comments that we didn't cover, or questions for us?

# *Appendix C: Interview Request Email Template*

Dear _____,

Hello! We are a team of students from Worcester Polytechnic Institute in Worcester, Massachusetts doing research at Glacier National Park this fall. Our research is about visitor management; specifically, we are looking at whether Many Glacier and Two Medicine need a reservation system/visitor management, and what that would look like if it is needed. Part of our research includes park employees' thoughts on the current system and its needs, since you all know the park the best.

We have been working with Kat Barrs and Tara Carolin, but we would like to interview you to get your perspectives. Please let us know your availability (enter time period) for an 1-1.5 hour interview.
Attached please find some of the questions we would like to ask you!

Thank you in advance,
Natalie, Kelsey, Dominic, Steven, and Ryan
Worcester Polytechnic Institute, Visitors Team
gr-glacvisitors@wpi.edu

# *Appendix D: Semi-Structured Interview Questions for Heads of East and West Traffic Management*

We are a team of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews, in collaboration with Glacier National Park, to evaluate what a potential reservation system in Many Glacier and Two Medicine will look like. Your participation in this survey is voluntary, and you may opt out at any time. Your comments will be anonymous, and if you are interested, a copy of the interview results can be provided at the conclusion of our research..

1. How long have you worked in the park, and specifically at your current position?
2. Thoughts on potential reservation systems:
    a. TM: ticketed reservation system in place before GTSR opens
    b. MG: ticketed entry (1-day) enforced mid June through September
3. What do your operational plans look like at MG and TM?
    a. Strengths, weaknesses
    b. Implemented next year?
    c. Consistency with GTSR/North Fork?
4. When it comes to visitor management, what key factors are you using to access your potential solutions?
    a. Traffic on roads (US highways, GTSR), parking lot congestion
5. How are you scaling the success of the reservation system?
    a. What did you expect? What actually occurred?
    b. Anything surprising you found to consider for modifications?
        i. How might these findings alter the implementation of a reservation system in other parts of the park?
6. We are discovering that one of our biggest limitations with implementing a reservation system is that there is not enough staffing (and therefore a res system will be difficult to enforce). How are you taking that into account within your planning?

## *Appendix E: Pros and Cons for Randomized Systems*

To better inform GLAC about different types of reservation systems, we analyzed the pros and cons of randomized systems in place at other national parks—lottery and alternating license plate.

### Lottery System

| PROS | CONS |
| --- | --- |
| • Equalizes chance of getting tickets.<br>• Reduce traffic congestion.<br>• Mitigates roadside vegetation loss.<br>• Increases visitor-staff interactions. | • Purchase doesn't guarantee ticket.<br>• Forces visitors to plan ahead.<br>• Introduces negative visitor-staff interactions from turning away non-reservation visitors.<br>• Increases visitor confusion due to inconsistency with GLACs reservation system.<br>• Only proven success at specific attractions. |

### License Plate System

| PROS | CONS |
| --- | --- |
| • Curiosity from staff.<br>• Equalizes chance of getting tickets.<br>• Requires no technology.<br>• No reservation fees.<br>• Ease of implementation.<br>• Mitigates roadside vegetation loss.<br>• Decreases gridlock and traffic closures on roads and parking lots. | • Doesn't spread visitation throughout the day.<br>• Forces visitors to plan ahead.<br>• Unknown long-term efficacy.<br>• Requires visitors to plan ahead, especially for rental vehicle users. |