High-Use Recreation Plan
Proposal for Quandary Peak

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Acknowledgments

Special thanks to Dr. Joel Hartter, a Professor and the Director of Master of the Environment Program at CU-Boulder, Adam Bianchi and Bill Jackson from the US Forest Service Dillon Ranger District, and SJ Hamit the Summit County Sheriff for providing knowledge, feedback, and support throughout this project.

The Project Team would also like to thank all of those who participated in surveys and interviews.
# Table of Contents

Executive Summary ........................................................................................................... 4  
Background ......................................................................................................................... 5  
   Geographic Scope .............................................................................................................. 5  
   Problem ............................................................................................................................. 6  
   Project Goal ...................................................................................................................... 6  
Stakeholder Analysis .......................................................................................................... 6  
   Key Stakeholders .............................................................................................................. 7  
   Stakeholder Roles ............................................................................................................ 8  
Survey Results .................................................................................................................... 9  
   Perceived Problems ....................................................................................................... 10  
   Solutions to the Perceived Problems ........................................................................... 10  
   Perceptions of a Shuttle System as a Solution .............................................................. 12  
Research and Case Studies ............................................................................................... 12  
Proposed Solutions ........................................................................................................... 16  
   PHASE 1: Expanding and Redesigning the Parking Lot ................................................ 17  
   PHASE 2: Increase Awareness ...................................................................................... 18  
   PHASE 3: Shuttle Service and Permit System ............................................................... 18  
   Support for a Shuttle Service ......................................................................................... 20  
Adaptive Management ....................................................................................................... 21  
Next Steps .......................................................................................................................... 23  
References .......................................................................................................................... 24  
Appendix .............................................................................................................................. 25  
   Quandary Peak Management and Usage Survey ...................................................... 25  
   Stakeholder Opinions Matrix ......................................................................................... 26
Executive Summary

Quandary Peak is Colorado’s 5th most popular fourteener, receiving between 15,000 and 20,000 visitors per year. Its popularity has brought significant strain to its fragile alpine ecosystem and the surrounding communities. The main trail leading from the McCullough Gulch trailhead has been eroded and widened from the plethora of hikers, wildlife has experienced stress from humans and their pets, and litter can be regularly found along the trail during the summer months. One of the most difficult problems to tackle from this popularity is parking. The McCullough Gulch trailhead parking lots have very limited parking that regularly fill far beyond capacity during summer weekends. The excess cars tend to spill out onto the adjacent county roads, nearby parking areas for other trails, and local private property. The parking lot for this peak has been expanded once before, but once again available capacity was too limited.

This report is a 3-month study that explored possible management solutions to the mountain’s overcrowding and specifically to the issue of parking lot overcrowding at the primary trailhead. Multiple case studies were reviewed from similar high-use, publicly accessible lands to gain an understanding of what strategies were successful in the past. Local stakeholders such as the United States Forest Service Dillon Ranger District and Summit County were surveyed and interviewed in order to identify local capacity and preferences for enacting change as well as to judge the feasibility of previously identified solutions. The research and stakeholder engagement elements were used to form a 3-stage phased approach to reducing overcrowding at the Quandary Peak trailhead.

Phase 1 - Expanding and Redesigning the Parking Lot: While a parking lot expansion has occurred before with little long-term improvements, expanding the parking lot deliberately will help to make later steps in this management plan run more smoothly. The redesign of the parking lot should specifically be done to accommodate emergency vehicles and a future shuttle turn-around point. Currently, large vehicles have little space to turn in the lot.

Phase 2 - Increasing Awareness: Education is a critical component in changing visitor behavior. Using signs and the internet to spread knowledge on future plans for the parking lot will help generate a familiarity with regulatory changes and an eventual shuttle service to the trailhead. These outreach tools can also be used to build awareness of the impact that visitors have on the natural beauty of the peak.

Phase 3 - Shuttle Service and Permit System: The final stage to the proposed phased management plan is the combined use of a seasonal hiker shuttle and permit system. Permit systems have recently seen increased use in highly popular federal lands, including in the nearby Hanging Lake area of the White River National Forest. The permit system allocates a limited number of hiking permits per day to hikers attempting the peak. The shuttle service will reduce the number of cars attempting to park at the McCullough Gulch trailhead by having visitors park in the ski resort parking lots of Breckenridge, which are largely empty during the summer.

This report offers an initial framework for managing Quandary Peak’s visitors. Further research will need to be conducted to identify funding and detailed logistics.
Background

Summit County, located in central Colorado, has experienced significant growth in tourism since the turn of the century. This increase in tourist traffic includes outdoor enthusiasts, predominantly hikers. Increased hiker use has been particularly prominent on the region’s tallest peaks, commonly known as “14ers,” 14,000-plus foot mountains. Summit County is home to four of the state’s 14ers, several 13,000+ foot mountains and many of the state’s other popular hiking trails. The lands in Summit County are managed by several different entities—including the U.S. Forest Service (USFS), the U.S. Bureau of Land Management (BLM), the Colorado State Forest Service (COFS), as well as private landowners. Multiple management entities have led to difficulties in addressing the recent influx of outdoor enthusiasts to the area, but also creates potential for a positive collaborative process.

Geographic Scope

Summit County is located in the North Central part of Colorado and in the heart of the Southern Rocky Mountains. Home to ski resorts such as Breckenridge and Keystone, the county’s population has been known to grow significantly during the winter months. During the summer months, tourism spikes due to recreationists hiking the county’s popular mountain peaks, including Quandary Peak. Interstate 70 runs directly across the northern portion of the county and Colorado State Highway 9 runs through the county from North to South. Quandary Peak and its lower parking lot are the primary focus of this study. The peak sits in the southwestern corner of Summit County, just south of the Town of Blue River on State Highway 9 (Figure 1). The main parking lot for the popular 14er lies south of the trailhead (Figure 2).
Problem

An iconic landmark of the county, Quandary Peak, has experienced a significant portion of the tourist upsurge. The multiple management entities involved with the area compound the challenges associated with the recent influx of tourism. Once home to a small, four-car parking lot, the county and the USFS decided to expand the parking capacity in 2013 by creating a larger gravel parking lot 0.1 miles from the trailhead down McCullough Gulch Road. This helped remedy the parking situation initially, however it has become a hazard once again. Cars have resumed parking illegally on McCullough Gulch Road as well as surrounding residents’ properties. This also creates problems for emergency vehicles. Cars often park illegally on both sides of the small road leading up to the original parking lot next to the trailhead, causing emergency vehicles to either become stuck trying to access the trailhead or prevent access altogether to the trailhead leading to longer response times for critical rescue missions.

Project Goal

The goal of this project is to provide the USFS, Summit County, and other stakeholders with a plan to manage the parking issues at the trailhead and the associated increasing number of Quandary Peak hikers. Additionally, this management plan will be a resource for other high-use recreation areas and the U.S. Forest Service’s Dillon Ranger District. Our goals for this plan are to:

1. Create a solution for parking issues in the Quandary Peak parking lot and along McCullough Gulch Road.
2. Educate hikers on the importance of the alpine ecosystem and being stewards of the environment.
3. Provide a phased approach to easing overcrowding at the Quandary Peak parking lot.

Stakeholder Analysis

A system map (Figure 3) was produced using the online software, Kumu (https://kumu.io/). The map was used in early stages of research of the project in order for the team to grasp the actors and issues involved with Quandary Peak. The result is a conceptual framing exercise rather than a definitive representation of the issues surrounding Quandary Peak. The map has informed the team as to who the involved stakeholders are, as well as directed the team to various areas of research.
Key Stakeholders

<table>
<thead>
<tr>
<th>United State Forest Service</th>
<th>Dillon Ranger District</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Colorado</td>
<td>Colorado Parks &amp; Wildlife</td>
</tr>
<tr>
<td></td>
<td>Colorado Department of Transportation</td>
</tr>
<tr>
<td>Summit County</td>
<td>Summit County Manager</td>
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<tr>
<td></td>
<td>Sheriff’s Department</td>
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<td></td>
<td>Summit County Open Space</td>
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<tr>
<td>Non-Profits/ NGOs</td>
<td>Colorado Fourteeners Initiative</td>
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<td></td>
<td>National Forest Foundation</td>
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<tr>
<td></td>
<td>Friend of Dillon Ranger District</td>
</tr>
<tr>
<td>Local Communities</td>
<td>Town of Breckenridge</td>
</tr>
<tr>
<td></td>
<td>Town of Blue River</td>
</tr>
<tr>
<td></td>
<td>Residents adjacent to Quandary Trailhead</td>
</tr>
</tbody>
</table>

**Table 1:** Key Stakeholders that participated in outreach and engagement efforts
Stakeholder Roles

The **Dillon Ranger District of the United States Forest Service** (USFS) is responsible for managing the White River National Forest land that contains Quandary Peak. Their duties include maintaining National Forest land for public use and preserving the natural beauty that brings people to the area.

**Colorado Parks & Wildlife** maintains wildlife resources for the state. While Parks & Wildlife also maintains state parks and provides recreation opportunities, their involvement with Quandary Peak primarily lies in wildlife protection since the mountain itself is under federal jurisdiction.

The **Colorado Department of Transportation** (CDOT) is responsible for managing, monitoring, and maintaining state roadways. Due to the large number of tourists at Quandary Peak’s primary trailhead during the summer months, vehicles cause congestion and illegally park on SH-9 which present a safety hazard that involves roads managed by CDOT.

Quandary Peak and much of the associated impacts of its visitors exist in Summit County. **Summit County managers** must find ways of managing the overcrowding, littering, illegal parking, and other issues. For the issues facing Quandary Peak, county managers will need to work with other involved agencies before implementing solutions.

The **Summit County Sheriff’s department** has multiple roles directly related to Quandary Peak. The sheriff’s department enforces the parking laws in effect near the trailhead and addresses issues with local residents. Furthermore, because Summit County Search & Rescue is under the Sheriff’s department authority, hiker safety and rescue for the mountain is handled through this department.

**Summit County Open Space and Trails** monitors and maintains the publicly open lands of Summit County. Management of trails and designated open area surrounding Quandary Peak is split between Open Space and the USFS. Open Space and Trails also has jurisdiction over the lower parking lot at Quandary Peak’s trailhead.

The **Colorado Fourteeners Initiative** (CFI) is a non-profit whose mission is to protect and preserve Colorado’s many 14ers. CFI uses education and engagement to help preserve the peaks and their ecosystems, while also utilizing its volunteer network to restore and relocate low-impact trails.

The **National Forest Foundation** is the official nonprofit partner of the USFS. Their mission is to engage communities to restore and enhance the nation’s National Forests and Grasslands. They engage local communities to provide them with the tools to preserve and enhance public enjoyment of their National Forests.

The **Friends of Dillon Ranger District** fosters sustainable management and recreational enjoyment of the White River National Forest’s Dillon Ranger District. The non-
profit helps to maintain and build trails, cultivate partnerships with the USFS and community stakeholders, and provide stewardship education.

The **Town of Breckenridge** is the largest town near Quandary Peak. Breckenridge experiences much of the traffic and tourism that occurs during the summer months due to the mountain’s appeal. Breckenridge also has a Parks and Open Space department that helps manage local recreation space.

The **Town of Blue River** is the town nearest to Quandary Peak. It is significantly smaller than Breckenridge, but experiences similar levels of traffic. Unlike Breckenridge, Blue River tends to see less economic benefits and encounters more of the overcrowding originating from the trailhead.

There are a number of **residents** who live opposite of the Quandary Peak parking lot. The residents bear direct impacts of overcrowding present at the trailhead. There are additional concerns of visitors trespassing and illegally parking on private property once the official parking lot is full.

**Survey Results**

A survey comprised of 12 questions (available in the Appendix) was created and distributed to the key stakeholders directly impacted by Quandary Peak’s rise in popularity and increasing level of use. The 12 core stakeholders were asked to forward this survey to relevant departments and staff members who are familiar with this issue. The survey resulted in a total of 67 responses from at least five different organizations. The purpose of this survey was two-fold:

1. To better understand the issues perceived to be the major problems facing Quandary Peak, and
2. To gather the general level of interest that stakeholders have regarding the solutions we proposed in this report.
**Perceived Problems**

Stakeholders were asked to choose one or more options on what they thought were the main problems facing the high-use of Quandary Peak. As shown in Figure 4, illegal parking was considered the biggest issue, as the capacity of the existing parking lot falls short of meeting current demands. A degraded visitor experience (caused by overcrowding and lack of solitude on the trail), as well as trail deterioration were the second and third concerns, respectively.

![Figure 4: Survey response of the largest perceived issues at Quandary Peak](image)

Due to the rise in the popularity of Colorado’s 14er culture and Quandary Peak’s ease of accessibility from I-70, we can expect to see that other perceived problems, such as ecosystem damage, poor hiking etiquette, off-leash pets and safety, would continue to develop as hiker populations increase. The level of interest amongst stakeholders to solve the issues at Quandary Peak was high, with 54% of respondents selecting “very interested”, 40% selecting “somewhat interested” and 6% selecting “not at all interested” (Figure 5). From the responses, it is evident that there are many collaborative opportunities that can be maximized from this level of interest.

**Solutions to the Perceived Problems**

Figure 7 shows the top three preferred solutions from the survey results:
1. Establishing a permitting system (39.2%):
   i. A permit system would limit the use of Quandary Peak and can range from charging a parking fee at the established parking lot to regulating the number of daily hikers.

2. Creating a shuttle service (16.2%):
   ii. A free shuttle service that would pick up and drop off hikers would alleviate illegal parking concerns.

3. Providing more educational opportunities (14.6%):
   iii. There is great potential for educational opportunities and outreach at the trailhead to address issues such as “Leave No Trace” principles, renegade trails, littering, backcountry etiquette and safety.

Figure 6: Solutions that stakeholders suggested without prompting

Figure 7: Solutions that stakeholders chose when provided choices and how their perceptions changed
Figures 6 and 7 demonstrate overlap between the solutions we proposed and the solutions suggested by the stakeholders. Roughly 40% of respondents in both scenarios recommended creating an established permit system to manage hiker populations. There was also a 10.6% increase in favorability of establishing a shuttle system when stakeholders were prompted with this solution. Similarly, solutions such as permitting, signage, and creating a tourism package saw increases in popularity.

The survey results indicated that there were mixed opinions regarding the effectiveness of signs in preventing people from parking illegally on the side of the road. 13.8% of stakeholders were in favor of signage. Their written suggestions included “signage could absolutely be beneficial,” “would love to see increased signs at the trailhead,” and “proper and more attention-grabbing signage is needed.” This contrasts the sentiment that the “no parking signage further exacerbated the lack of adequate parking” and that “signs have to be constantly replaced after each winter season.”

Perceptions of a Shuttle System as a Solution

When asked if visitors were likely to use a shuttle to access the Quandary Peak Trailhead, 52% of respondents said that this was moderately likely to occur. Furthermore, our results indicated that the respondents believe that all the following entities--USFS, Summit County, Town of Breckenridge, tourism companies, local businesses, hotels/resorts and non-profit organizations, would support and promote the development of a shuttle service for hikers. While 24% of stakeholders chose “slightly unlikely” that hikers would use a shuttle service, there was no strong opposition to this idea.

Research and Case Studies

To better understand identified problems at Quandary Peak and applicable implemented solutions, the research team studied existing management plans for sites in Colorado on USFS lands experiencing similar issues (i.e. lack of parking, extensive use of trails and increased number of visitors). After conducting a literature review, we identified five cases with issues most similar to Quandary. The five management plans in focus were Hanging Lake, Brainard Lake, Maroon Bells, Arapaho and Roosevelt National Forests (Transportation Plan) and Boundary Waters Canoe Area Wilderness. The cases reviewed fit the following criteria: high-use recreation issues that provided impetus for creating a plan, effective solutions, and methods of managing site degradation and excessive use. The information from the case studies, specifically the successful tactics, were used to formulate our proposed solutions with a phased adaptive management approach.

Table 2 below is organized into the following columns:

- identified problem(s),
- proposed solutions,
- desired outcomes,
- adaptive management,
- challenges, and
- applicability to Quandary Peak plan
<table>
<thead>
<tr>
<th>Proposed Solutions</th>
<th>Identified Problem(s)</th>
<th>Plan (BWCAW) Boundary Waters Canoe Area Wilderness (2001-2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permit and Quota System (May-Sept), Lottery System to select peak and off-peak seasons for permit holders</td>
<td>Lack of bandwidth of Forest Rangers Excess human and outside waste, trail vegetation degradation</td>
<td>Management Plan</td>
</tr>
<tr>
<td>Short-, mid- and long-term solutions</td>
<td>Comprehensive management approaches to managing recreational impacts to camping sites. If Greater Area Overuse Threshold (GAOT) exceeds thresholds, then permit system will be triggered.</td>
<td>Management Plan</td>
</tr>
<tr>
<td>The Brainard Lake Management Plan includes 5 objectives and 4 goals for the management of the area. The 5 objectives are: (1) improve winter and non-motorized recreation opportunities; (2) improve summer and non-motorized recreation opportunities; (3) provide information and education; (4) reduce conflicts and improve visitor satisfaction; (5) reduce conflicts and improve visitor satisfaction.</td>
<td>Objectives and Goals for the Management of the Area. The objectives are: (1) maintain/enhance access and quality and variety of recreational experience opportunities; (2) specify where developed areas and concentrated use should occur and identify and maintain/enhance underdeveloped areas; (3) ensure development, operation, and maintenance of recreation opportunities.</td>
<td>Management Plan</td>
</tr>
<tr>
<td>Short-, mid- and long-term solutions</td>
<td>campground services, shuttle service, information kiosks</td>
<td>Management Plan</td>
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<td></td>
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<td>Plan</td>
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<td></td>
<td>Study</td>
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 Identified Problem(s):

- Excess human and outside waste, trail vegetation degradation
- Comprehensive management approaches to managing recreational impacts to camping sites. If Greater Area Overuse Threshold (GAOT) exceeds thresholds, then permit system will be triggered.
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Plan Description:

- Short-, mid- and long-term solutions
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Study:

- Management Plan
- Plan
- Study
## Boundary Waters Canoe Area Wilderness (BWCAW)

### Protective Goals and Objectives

- **Protect and Perpetuate Natural Ecosystems**
- **Provide an Enduring Resource of Wilderness for Future Generations**
- **Provide for Unconfined and Primitive Recreation**

**Management Areas**
- Pristine, Semi-primitive, Non-motorized, and Semi-motorized

**Incorporate Forest goals and objectives for transportation and recreation management, and (2) manage visitor use to the identified user capacity for each site without incurring unacceptable resource impacts.**

**Reduce biophysical impacts from overnight visitor use and manage MBSW in accordance with the Wilderness Act (preserve wilderness character by sustaining natural and undeveloped qualities).**

### Desired Outcomes

1. Permit/Quotas are reassessed on an annual basis, as is the permit price. "If standards are exceeded, then management action will be taken such as education, length of stay limitations at particular lakes, or quota adjustments."
2. Indicators, thresholds and management actions around BWCAW permit system and daily quota (if problem persists in 5-10 years). For Guanella Pass: adjust quota during weekdays if necessary.

### Case Study

<table>
<thead>
<tr>
<th>Indicators, thresholds and management actions around BWCAW</th>
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<tbody>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td><strong>[4]</strong> Support local recreation infrastructure</td>
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### Management

- **Indicators, thresholds and management actions around BWCAW**
- **Protect and Perpetuate Natural Ecosystems**
- **Provide an Enduring Resource of Wilderness for Future Generations**
- **Provide for Unconfined and Primitive Recreation**

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<tr>
<td><strong>Challenges</strong></td>
<td><strong>Case Study</strong></td>
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<td>----------------</td>
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</tbody>
</table>
| The entrance through Quandary can be difficult, especially for 
| hikers or LSR volunteers. | What can be used for Quandary? |
| Annual reassessment of permit/quotas system once the shuttle and permit system is in place. |
| and use a reservation and/or permit system. | |
| Depend on these outcomes — expand parking or expand counters (or both) and increase people at one time. | |
| Reduce unauthorized road access. | |
| Quandary, (6) shuttle service from a central parking to the site (e.g., from Guanella Pass). | |
| From Brainard: (1) upgrade the parking lot to be more effective (e.g., disperse use away from trailhead). | |
| Management actions (permit system) | |
| On how many visitors are permitted for one day (GPT indicator) and associated | |
| development schedule with projects (i.e., budget) (24). | |
| Visitor use monitoring strategies to reach desired conditions (i.e., and infrastructure. | |
| One of the busiest sites in the FRNF, with steadily increasing visitors. | |
| Short- and long-term solution plan including a list of options that can be used depending on the situation (adaptive management). | |
| A menu of educational components in the planning process when applying for permits, including | |
| a lottery system if necessary. | |
| There is an extreme concentration for use around the permit area because there are no services parts are hard to access (only by canoe), park-in. | |
| All of the sites are experiencing increased use and visitor use monitoring strategies to inform landscape management. | |
| Opportunities and protecting natural resources. | |
| - Find a balance between high-quality recreation - one of the most visited places in the FRNF. | |
| - One of the busiest areas, few created trails and parts are hard to access (only by canoe), park-in. | |
Proposed Solutions

The proposed management actions have been determined to preserve natural conditions on Quandary Peak by addressing the effects from the increasing number of hikers and the vehicle congestion at the trailhead while continuing to provide opportunities for recreation. An analysis of case studies and engaging with stakeholders helped inform solutions and determine feasible scenarios that balance the overall goals for the plan.

To address the primary issue of overcrowding and illegal parking at the trailhead, below is a multi-phased approach to mitigate problems associated with this behavior (Figure 8). The three phases include 1) the redesign of the parking area; 2) building awareness and proper signage; and, 3) implementing a permit system and shuttle service to ease trailhead congestion and improve access to Quandary Peak. The proposed phases consider short-, middle-, and long-term management actions that are based on feasibility and applicability. The interventions were developed to meet the overall objectives below:

1. **Manage congestion**: Enhance monitoring and manage congestion in the parking area to ensure that visitors have opportunities for safe, high-quality recreation experiences. Traffic and parking congestion is eliminated by instituting a shuttle system and permit system.

2. **Enhance public safety**: Enhance monitoring and manage a permit system that provides safe access and well-maintained infrastructure throughout the area. Visitors are provided with enhanced services that improve their overall recreation experience. Emergency vehicles have safe and easy access 24 hours per day, year around.

3. **Improve visitor experience**: Manage a permit system that provides a higher quality experience for visitors. Prior to arriving on site, visitors are prepared via sources that provide information regarding access, rules and regulations, and education about the area.

4. **Support local tourism**: By instituting a shuttle service and a permit system, economic benefits are sustained into the future as the area’s natural features are protected and opportunities for high-quality visitor experiences increased. Additionally, the shuttle service in the Town of Breckenridge provides easy access to bars, hotels, and other facilities that can benefit from the shuttle service. Consistent information is also provided for visitors regarding access, facilities, and recreational opportunities.

5. **Protect natural resources**: Enhancing monitoring and management efforts ensures that natural resources are sustained, protected, and restored for future generations to enjoy. Visitors have easy access to information and are informed prior to arriving on site so they know and understand the need for restrictions and responsible Leave No Trace (LNT) ethics.
The proposed solutions should serve as a baseline decision and be adapted accordingly to future costs and season of use analysis. A description of each phase is provided in the subsections below.

PHASE 1: Expanding and Redesigning the Parking Lot

The expansion and redesign of the parking lot is an important first step that will support the implementation of the upcoming shuttle service. Along with the expansion that will momentarily reduce problems related to illegal parking, the parking lot should be redesigned appropriately to ensure adequate space for emergency vehicles and for the proper functioning of the shuttle service. Designing an efficient parking lot is a delicate balance between maximizing the space and providing a safe environment in which users can drive, park and walk, and emergency vehicles and shuttles have designated spaced to access, stop, and turn around easily. A variety of factors, such as planning, and safety and legal requirements should be analyzed and the objectives below should be met: (a) parking layout provides continuous flow of traffic through the lot, (b) the design allows safe movement of pedestrians, and (c) circulation patterns for emergency vehicles and shuttles are obvious and are as simple as possible. According to the interviews and surveys, redesign of the parking lot was supported by 13.8% of participants.

Expanding and redesigning the parking lot without planning for future interventions that properly monitor and manage the parking capacity of Quandary Peak is strongly discouraged. The parking lot itself will not solve the problems related to tourist upsurge. It will potentially worsen issues related to trail degradation, illegal parking, poor hiker experience, and safety problems. For those reasons, a multi-phased approach is recommended.

Figure 8: Multi-phased approach to solutions for Quandary Peak
PHASE 2: Increase Awareness

Phase 2 is a bridge between expanding and redesigning the parking lot (Phase 1) and implementing a shuttle service with a permit system (Phase 3). The goal of Phase 2 is to increase awareness regarding upcoming changes. According to the interviews and surveys, building awareness was supported by 25.4% of participants and considered important in the management of Quandary Peak.

In Phase 2 of the management plan, visitors are provided information regarding changes on access, rules and regulations, education about the overuse problems of the Quandary Peak area and the reasoning behind the permit system and shuttle service implementation. The strategies for building awareness should be collaborative between key stakeholders to effectively educate users about the proposed plan for Quandary Peak. Tourist agencies, ski resorts, key websites and Facebook pages are potential drivers of information and partners for building awareness.

As indicated by research, two common forms of signage are sanction signs and morality signs. Sanction signs threaten the use of fees or other punishment to influence behavior while the morality signs encourage behavior change by appealing to common values. According to Johnson & Swearingen (1992), there is debate about which type of sign is more effective than the other. Both forms are effective in stopping off-trail hiking and parking lot overcrowding, however, neither eliminates unwanted behavior altogether. Because sanction signs appear to be effective for influencing hiker behavior, mention of a fine or ticket is recommended for trail and parking lot signs at Quandary Peak. Along the trail, signs warning of fines are most likely to be effective at deterring ecological damage.

In regard of signage placement, Meis & Kashima (2017) defends that signs are most effective when placed near the area where the desired action should occur. To properly inform users about the upcoming implementation of the shuttle service and the permit system, clear signs at the trailhead are necessary. Similarly, signs placed at potential shuttle stops in Breckenridge and/or in Blue River highlighting the changes on access and rules and regulations are recommended to facilitate familiarity with the shuttle service and permit system. It is worth noting that Quandary Peak attracts a diverse population and it is prudent to include other languages on signage.

PHASE 3: Shuttle Service and Permit System

Shuttle service and a permit system are recommended for the last phase to address the issues of overuse, trail degradation, congestion, access, illegal parking, and safety problems at Quandary Peak. According to the interviews and surveys, a permit system was supported by 39.2% of participants and considered important in the management of Quandary Peak, while the shuttle service was supported by 16.2% of participants. Although there is less support from participants, research and case studies find that a shuttle service is an effective method to
mitigate many of the issues associated with tourist upsurge. Even further, a shuttle service can also provide collaborative opportunities for tourism and educational programs.

The shuttle service can be a gap filler between managing a permit system and limiting parking at the trailhead by providing transportation services that ease the impact of vehicle traffic and enhance the visitor experience. The shuttle service and the permit system will facilitate capacity management and support decision making process in critical situations. Both can also be used to provide information regarding changes on access, rules and regulations, education and interpretation about the problems facing the overuse of Quandary Peak area and the reasons why the permit system together with a shuttle service are important pieces to solve many of the challenges.

During peak season, all visitors will be expected to obtain a permit use in which they define a day of entry either via shuttle or in their private vehicle to the Quandary Peak parking lot depending on availability. Initially, a shuttle service should be instituted during high-use peak months, which is currently from May 1 through October 31. Before implementing the shuttle service, it is recommended management entities evaluate visitors’ use patterns to determine the shuttle time schedule and frequency.

The following are recommendations for the USFS and its partners to implement and manage the permit system along with the shuttle service. The recommendations can be implemented alone or in combination with other alternatives:

- The permit system could provide the option of parking on-site or allow visitors to reserve a seat on a shuttle. It is recommended that on-site parking permits have a fee to cover administrative costs of managing such a system, while the shuttle service remain free, or kept at a lower cost.
- Proper human waste facilities and solid waste collectors should be placed (if not already) at the main pick-up location and other appropriate shuttle stops. Providing adequate facilities for users at the beginning and at the end of their visit would help minimize waste issues at Quandary Peak.
- We recommend educational materials be developed for the main pick-up location, especially as the shuttle service gains popularity. Information such as shuttle access, safety tips, rules and regulations, as well as information on other local recreational options, Quandary Peak’s sensitive alpine ecosystem and cultural significance, could be provided for users and visitors.
- Depending how well the shuttle service is adopted by users and locals, the shuttle route could be modified to include stops at other trailheads. This action is not recommended in the beginning of the shuttle service as it may confuse users. If this option is enacted, further evaluations will be necessary to properly adapt the shuttle service to accommodate the changes.
During the off-season, the shuttle service and permit system will not be required, but it is recommended that monitoring efforts continue to ensure desired conditions are met. In the off-season, visitors can park in legally designated areas without capacity being an issue.

At any point, if monitoring indicates that the desired objectives are not being met it is recommended an adaptive management strategy is implemented. Adaptive strategies include regulating the permit system by introducing a daily capacity number, changing the permit system and shuttle service timeline, and other actions that ensure intended outcomes are met. Further details about the adaptive management strategies are provided in the Adaptive Management section.

Support for a Shuttle Service

In 1998, the National Park Service launched a new initiative called the Alternative Transportation System (ATS), as well as the Alternative Transportation Program (ATP). Together, these were created to “promote the introduction of transportation services that ease the impact of vehicle traffic on national park resources and the visitor experience.” In addition, the ATP gives parks permission to establish technologies, facilities, or management strategies to support the use of alternative ways of getting to and traveling within units of the NPS. Ultimately, the ATP helps facilitate the creation of partnerships between the NPS units and their gateway communities, transportation providers, and other important stakeholders. This way, these public-private partnerships help accomplish the ATP’s goals and mission of “preserving and protecting resources while providing safe and enjoyable access to and within NPS units.”

Several pieces of legislation have aided in the success of the ATP. These include the Intermodal Transportation Efficiency Act, the Transportation Equity Act for the 21st Century, multiple Presidential Directives and Interagency Agreements. So far, shuttles have been established in at least eight NPS units: Acadia, Bryce Canyon, Glacier, Golden Gate, Grand Canyon, Rocky Mountain, Yosemite and Zion. Other NPS units are attempting to establish shuttle services, however lack of funding and trouble establishing critical public-private partnerships have hampered these processes. Some of the numerous benefits to implementing a shuttle system include: improved air quality, reduced noise levels, reappearing wildlife, accommodating increasing visitor demands, balancing infrastructure needs, enhancing the economy of gateway communities and enhancing the park experience.

Two significant success stories of the ATP are Acadia National Park’s Island Explorer Shuttle and Zion National Park’s Zion Canyon Shuttle. Acadia National Park was motivated to develop an ATP after experiencing a substantial increase in the number of visitors as well as traffic congestion within the park and surrounding towns. Officials at Acadia created partnerships with the Mount Desert Island League of Towns and Maine Department of Transportation, which were critical in receiving funding for the ATS. There were frequent meetings between the stakeholders and constant communication which helped create the
successful system that is in place today. At Zion National Park, similar problems of increasing visitor numbers and a chronic lack of parking led to the decision to pursue the creation of an ATS. Zion has tried other solutions to its parking problems before, including building a large parking lot outside of the entrance to the park. However, the new parking lot exacerbated parking issues, as it attracted even more visitors. There were also problems with Zion’s gateway town, Springdale. Springdale felt that Zion and its town were too separated from one another, despite the dependent relationship, and wanted to form a closer relationship with the park. Together, Zion and Springdale partnered to create the ATS that is present today. The partnership has allowed for an increase in Springdale’s tax revenue, as well as alleviating some of the parking issues in Zion and allowing tourists to stay longer. The shuttle picks up visitors in Springdale and brings them to the entrance of Zion. From there, they have the option to board NPS shuttles which provides access to attractions within the park. Ultimately, ATPs are successful when there are strong partnerships, adequate funding available, a balance of old and new features, and committed stakeholders.

Based on the reviewed cases, the key takeaways to consider when implementing a shuttle service for Mt. Quandary are:

1. Strong partnerships with existing stakeholders
2. Tracking high-use patterns
3. Generating appropriate awareness and publicity, and;
4. Ensuring reliable funding streams

**Adaptive Management**

An adaptive management approach enables managers to adjust to changing conditions and ensure that desired objectives are achieved. The strategies presented in Table 3 define the indicators, thresholds, and adaptive management actions that will govern decisions and potential adjustments to the phased management plan. An **action** can be taken if and when a **threshold** is triggered that will bring an **indicator** back in line with the management plan. The process is intended to be iterative and actions continuously evaluated for the effectiveness and adapted when necessary. Monitoring data should be used as a learning tool to help inform future management decisions.
Table 3: Adaptive Management

<table>
<thead>
<tr>
<th>Indicator</th>
<th>If (Threshold)</th>
<th>Then (Adaptive Management Action)</th>
</tr>
</thead>
</table>
| Trail and Parking Lot Capacity           | Peak season: Is the illegal parking, ecological damage, congestion, safety, or visitor experiences getting worse?  
Off-peak season: Are there issues related to illegal parking, ecological damage, congestion, safety, and visitor experiences increased during off-peak season? | • Provide and promote alternative trails and recreational opportunities  
• Define a daily capacity and add to the permit system  
• Adjust shuttle drop-off times or require additional pick-up shuttles to spread use across the day  
• If monitoring indicates that desired conditions are still not being met, evaluate the potential to decrease the daily capacity number |
| Illegal Parking                          | Peak season: Is congestion resulting in parking violations or cars illegally parking on McCullough Gulch Rd and SH-9?  
Off-peak season: Is congestion resulting in parking violations or cars illegally parking on McCullough Gulch Rd and SH-9? | • Implement physical barriers to prevent illegal parking  
• Increase signage and education efforts  
• Issue tickets |
| Number of Safety Incidents              | Peak season: Did search and rescue incidents increase?                      | • Increase signage and education efforts with an emphasis on safety  
• Increase or improve signage throughout the trail  
• Define a daily capacity and add to the permit system  
• If monitoring indicates that desired conditions are still not being met, evaluate the potential to decrease the daily capacity number |
| Trail widening and vegetation degradation | Is trail widening and vegetation destruction continuing to occur at a rate faster than restoration efforts? | • Increase signage and education efforts with an emphasis on the ethics of “Leave no Trace”  
• Increase/modify engineering controls such as linear barriers, trail hardening, posts, cables, etc. to physically contain hikers to the trail  
• Define a daily capacity and add to the permit system  
• Reduce crowding by adjusting shuttle drop-off times or require additional pick-up shuttles to spread use across the day  
• If monitoring indicates that desired conditions are still not being met, evaluate the potential to decrease the daily capacity number |
Next Steps

Following the work of this paper, there are a number of steps that should be executed before commencing the proposed phased solution. This project outlines the elements of a solution to Quandary Peak overcrowding, but there are details that will need to be addressed in follow-up work.

If expansion of the trailhead parking lot for additional capacity and an eventual shuttle stop extends into federally protected land, the project will require NEPA analysis. While the impacts of expansion may be small, this is still a necessary legal step.

Stakeholder engagement should be utilized through every phase. Stakeholder feedback will help to uncover possible conflicts and gauge the effects each stage has on the stakeholders. Furthermore, many of the stakeholders will have a role in helping implement solutions. Engagement here involves cooperation and coordination between stakeholders.

As with stakeholder engagement, an economic analysis should be conducted for each phase of the proposed solution in order to gauge the costs of necessary improvements and additional provided services. Examples include the cost of parking lot expansion, the resources needed for awareness outreach, and the expected cost and revenues of a shuttle service. Attention should also be given to identifying the effect Quandary Peak hikers have on the local economies of Breckenridge and Blue River. This identifies the magnitude of cost on local communities that would result from Quandary access restrictions.
References


Appendix

Quandary Peak Management and Usage Survey

1. What do you think are the main problems facing the use and maintenance of Quandary Peak?
   - [ ] High traffic and illegal parking
   - [ ] Trail deterioration
   - [ ] Damage to the surrounding ecosystems
   - [ ] Poor hiking etiquette (e.g. littering, noise)
   - [ ] Pets off leash
   - [ ] Safety Issues
   - [ ] Degraded visitor experience (e.g. Lack of solitude on the trail)
   - [ ] Other: Please specify ( _________________________)

2. Considering your answer(s) above, what action(s) would best resolve these issues?

3. What is your level of interest in solving these problems?
   - [ ] Very Interested
   - [ ] Somewhat Interested
   - [ ] Not all interested
   - [ ] Other: Please specify ( _________________________)

4. How effective do you feel each of the following solutions would be at addressing the problems facing Quandary Peak?

<table>
<thead>
<tr>
<th>Possible Solutions</th>
<th>Ineffective</th>
<th>Somewhat effective</th>
<th>Very effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impose user fees</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Expand the parking lot at the trail head</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Set a daily user capacity and issue a limited amount of hiking permits</td>
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<tr>
<td>Implement a free shuttle service during peak season</td>
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<tr>
<td>Create an all-inclusive package for guests in collaboration with tourism and hospitality companies to provide free shuttle and other recreational services</td>
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<td></td>
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<tr>
<td>Increase signage at the parking lot, trailhead, and along trail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop and implement educational programs to raise awareness about best practices for hiking and parking</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Construct proper solid human waste containers (e.g. septic tank, vaulted toilets, composting toilets)  

Other, fill in _____________________________

____________________________________________________

5. If a free shuttle service was offered up to the trailhead of Quandary, how likely do you think visitors would use it?

☐ Extremely likely
☐ Moderately Likely
☐ Neither likely nor unlikely
☐ Slightly unlikely
☐ Extremely unlikely
☐ Other: Please specify (__________________________)

6. Do you feel any of the following would support and promote the development of a shuttle service for hikers? (Please select all that apply)

☐ Hotel & Resorts
☐ Tourism Industries
☐ Local Businesses
☐ Non-profit Organizations
☐ The US Forest Service
☐ The Town of Breckenridge
☐ Other: Please specify (__________________________)

7. Do you think there should be a fee at the Quandary trailhead parking lot to offset the costs of a free shuttle?

☐ Yes
☐ Maybe
☐ No

8. In your opinion, which stakeholder(s) has the strongest connection to all other stakeholder groups involved in finding a solution to the problems faced at Mt Quandary?

9. Do you feel the discussion surrounding Quandary has been effectively communicated with stakeholders?

☐ Yes
☐ Maybe
☐ No

10. In not, how can this be improved?

11. What is your involvement with the current Quandary project?

☐ User (hiker of Mt. Quandary)
☐ Management
☐ Trail maintenance
☐ Economic interests
☐ Research
☐ Other: Please specify (_________________________)

12. What best describes the type of organization you work for?
☐ US Forest Service
☐ Summit County
☐ Town of Breckenridge
☐ Non-governmental Organization
☐ Academic Institution
☐ Tourism Industry
☐ Commerce
☐ Real Estate, Rental and Leasing
☐ Other: Please specify (_________________________)

27
Figure 1: A matrix of stakeholder opinions about the proposed key solutions. The areas highlighted in green and yellow are ones where people were generally neutral or favorably towards, whereas ones in red indicate stronger opposition.