Visitor-limiting permit programs in national forests and parks: an exploration of their design and implementation

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Thesis abstract

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With visitation to public lands on the rise, visitor-limiting permit programs are becoming an increasingly necessary management strategy to mitigate biophysical and social visitor impacts. While these types of programs have been implemented by public land managers since the 1960s, little holistic research has been conducted regarding how such programs can be designed and implemented to best meet the needs of the land unit. This study specifically looks at land-based visitor-limiting permit programs within national parks and forests to explore the ways in which these programs are being designed and the resulting implications of their implementation. This exploratory process began with gathering data regarding the design of the 64 relevant permit programs identified; as a result of this research, nine key program characteristics, or components universal to all visitor-limiting permit programs, were defined. Interviews were then conducted with managers of 15 of these programs. The data produced focuses on managers' experiences with implementation as it relates to the design of their program. The product of this project is a functional guide for designing and implementing visitor-limiting permit programs. This study is a foundational step toward supporting further research in this area of visitor use management.

An acknowledgement of the history of public lands

The public lands in the United States have a dark and often violent history. The majority of permit programs identified by this study apply to wilderness areas. While today our society understands wilderness as a place void of humans, these lands were not always this way. In fact, wilderness often could only be established, based on its legal definition, if Native populations were first forcibly removed.

This study does not focus on federal tribal relations nor am I an expert on the subject, but the reality is that all land units in this study were once home to Native populations (see below). Throughout the rest of the paper, I operate within a normative view of public lands because this allows me to best target what I have sought to do — to help visitor-limiting permit programs be as positive an experience as possible for the public, for the land, and for managers.

The first two chapters involve in-depth discussions regarding U.S. public land systems, including their management and legal definitions. In starting with this acknowledgement, my hope is that you, as the reader, will be able to see this as a normative version of history and not an objective one — what new meanings come to light when you read the definition of wilderness with the knowledge that people did in fact once 'inhabit' those areas?

The following is a list of the Native populations whose historical territories overlap with the land units featured in this study. Please note that there could be some errors; all information was sourced from Native-Land.ca, a non-profit organization that maps these territories and uses community input to make continual updates and revisions.

- **Arapaho and Roosevelt National Forests**: Ute and Cheyenne
- **Cleveland National Forest**: Kumeyaay
- **Coconino National Forest**: Western Apache, Hopitutskwa, Pueblos, and Hohkam
- **Deschutes and Willamette National Forests**: Confederated Tribes of Warm Springs, Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, Klamath, Molalla, Yoncalla, and Tenino
- **Denali National Park**: Dënéndeh, Tanana, Koyukon, Dena'ina Elnena, Upper Kuskokwim, and Ahtna Nenn'
- **Gifford Pinchot National Forest**: Confederated Tribes of Siletz Indians, Confederated Tribes of Grande Ronde, and Cowlitz
- **Mount Rainier National Park**: Puyallup
- **North Cascades National Park**: Sauk Suiattle, NIaka'pamux, Coast Salish, Confederated Tribes of Colville Reservation, Okanagan, Skagit, and Nooksack
- **Okanogan-Wenatchee National Forest**: Wenatchi, Confederated Tribes of Colville Reservation, Yakama, Skykomish, Tulalip, Snoqualmie, and Coast Salish
- **Rocky Mountain National Park**: Ute, Cheyenne, and Arapaho
- **Sequoia and Kings Canyon National Parks**: Tübatulabal, Yokuts, Western Mono/Monache, and Eastern Mono/Monache
- **White River National Forest**: Ute

Acknowledgement

I could not have undertaken this project without the gracious support of my advisor, Dr. Richard Margerum, who spent countless hours guiding me through this process and editing my work — which he probably thought would be about a third of the length it ended up being (!). I would also like to thank Matt Peterson for suggesting this thesis topic and entrusting me with being able to do it justice. I genuinely cannot think of a more engaging and empowering project.

This research would not have been possible without the individuals at the featured national forests and parks who graciously offered their time for interviews. Not only were the interviews vital to this project, but I also experienced great generosity and encouragement from the interviewed managers — several of whom expressed the importance of this research. This support helped me maintain my enthusiasm during what was a long and often challenging process.

I would also like to thank my parents for fostering my love of and appreciation for nature from a young age. Beyond just being fun, annual backpacking trips with my dad provided a valuable context for understanding the significance of different program designs.

Lastly, I would like to thank and acknowledge Ella Gilbertson for being an incredible friend, roommate, and supporter throughout not only this thesis process but also the meandering path I took to finding this academic passion.

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Chapter I: Introduction

The United States government manages approximately 640 million acres of public lands (Hoover et al., 2021). This land is, in a sense, owned by the residents of the United States and is thus managed to benefit the public, whether that be through resource extraction, conservation, or recreation. There are four primary agencies tasked with administering federal public lands. These include the National Park Service (NPS), the Bureau of Land Management (BLM), the US Fish and Wildlife Service (FWS), and the US Forest Service (USFS).

Each federal land management agency oversees distinct areas of land. Within these land areas, there are multiple land systems, both specific and non-specific to an agency. Land systems essentially categorize parcels of land. The distinguishing factors among these land systems, or categories, are the purposes and allowable uses as defined by Congressional legislation — both legislation that established agencies and that which created the land systems. Agencies have interpreted these purposes and uses to better specify the manner through and extent to which they should manage visitor impacts. Interpretations come in the form of management plans and administrative rules.

The ways in which visitor impacts are managed can vary significantly. One of the most restrictive means of visitor use management (VUM) is the use of quota-based permitting in which the number of visitors using an area is limited. This study specifically looks at these types of programs with the intention of understanding how they are designed and implemented. An important foundation for this is recognizing what motivates a land unit to implement a quota-based permit program. For this reason, the sections below outline some of the applicable legislation and rules regarding the different land systems, categorized by their managing agency. Following these sections is a brief history of VUM which provides the other key foundational piece — that is, why managers might turn to quota-based permitting over other VUM strategies.

1.1 Unassigned land systems

Unassigned land systems refer to those that do not have a single managing agency — these systems can cross multiple agency jurisdictions and can be thought of as special designations within existing land systems. The National Wilderness Preservation System (NWPS) and the National Wild and Scenic Rivers System (NWSCRS) are two of the most prominent in regard to managing visitor impacts. Areas within these systems are managed based on the system's founding legislation as well as the policies of the managing agency. For instance, the Sylvania Wilderness within Ottawa National Forest would be managed as part of the NWPS and National Forest System (NFS).

Wilderness areas, as defined by the NWPS, fall under the legal mandates of the Wilderness Act of 1964, an act that intended to preserve the most untouched areas. It explicitly directs land managers to limit the impacts of humans to the extent possible (Wilderness Act, 1964). At the same time, these impacts are meant to be limited to grant a better visitor experience.

Wild and scenic rivers, as defined by the NWSCRS, fall under the legal mandates of the Wild and Scenic Rivers Act of 1968. This act was intended to preserve free-flowing, wild rivers for the benefit of the public (Wild and Scenic Rivers Act, 1968). While this study does not look at water-based permits, the areas around these rivers may be more diligently managed for visitor impacts. Fossil Creek Wild and Scenic River in Coconino and Tonto National Forests is one such area that has land-based visitor limits to reduce visitor impacts on the creek.

1.2 National Park Service

The NPS was founded by the 1916 Organic Act with the purpose of managing the National Park System. This system is comprised of national parks, monuments, and historical sites, among others. The NPS is directed to manage these land units with a dual mission: to preserve the natural and cultural landscape and to provide for current and future generations' enjoyment of the space (Organic Act, 1916). The NPS also manages many areas with special designations, such as wilderness areas, which are incorporated into units in the National Park System.

The NPS utilizes a variety of management plans, the standard being the General Management Plan. Others include visitor-use management plans, wilderness plans, etc. (*Management Plans*, n.d.).

1.3 Bureau of Land Management

The BLM was created in 1946 through the merging of two pre-existing agencies that had been focused on distributing federal land to settlers and managing grazing. The 1976 Federal Land Policy and Management Act (FLPMA) designated remaining non-distributed lands to be managed by BLM and defined the agency's management focus — providing for multiple uses and sustained yields for the benefit of the public (*Federal Land*, 2009). The Act also declared that, where appropriate, the BLM would preserve portions of public land for its natural value (FLPMA, 1976). To fulfill these mandates, the BLM creates Resource Management Plans that set desired outcomes, determine appropriate management strategies, and segment land areas by their allowable uses (Moore et al., n.d.).

Much of BLM's land forms a non-contiguous checkerboard pattern. This is largely because the federal government had a practice of alternating land uses. The most prominent of these uses was railroad land grants which provided railroad companies with every other section of land along certain corridors ("Prologue," 2008). Additionally, this tactic was used by the federal government to break up Native American lands, in an attempt to 'assimilate' tribes (*Voting Rights*, n.d.).[1] BLM received the remaining pieces of land, leftover from these land distribution schemes.

BLM does not necessarily have a cohesive land system that was slowly formed over time, as is the case with the National Park System. In 2008, the Secretary of Interior designated BLM lands as the "National System of Public Lands". Unlike with other systems, this designation does not hold any weight over the lands' management and was largely meant to signify a connection among BLM lands (*Federal Land*, 2009).

In 2000, BLM formed the National Land Conservation System (NLCS) out of pre-existing conservation-focused land areas, including wildernesses, monuments, and wild and scenic rivers (*Federal Land*, 2009). This system was formalized by the Omnibus Public Land Management Act of 2009; though, because the NLCS is formed from pre-established areas and designations, this Act had limited effect over the management of the land areas (Moore et al., n.d.).

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[1] This tactic of assimilation was disastrous to Native cultures. The Dawes Act of 1887 was responsible for this land use distribution which ultimately led to a loss of an estimated two-thirds of tribal land (*Voting Rights*, n.d.).

1.4 US Fish and Wildlife Service

The FWS was established in 1940 through the merging of the Bureaus of Fisheries and Biological Survey (*Federal Land*, 2009). While much of the agency's focus is centered on administering the Endangered Species Act, the agency also oversees the National Wildlife Refuge System (NWRS). This system was created via the National Wildlife Refuge System Administration Act of 1966. This Act guides the FWS to manage the system for the conservation and protection of wildlife (NWRSAA, 1966). A later amendment to the Act deemed wildlife-dependent recreational uses and other commercial uses to be acceptable when non-disruptive to wildlife (*Federal Land*, 2009). Each refuge has its own management plan, outlining conservation, management, and occasionally, restoration goals for the site (Maillett & Scarlett, n.d.).

1.5 US Forest Service

The USFS was established in 1905 to manage the National Forest System. The NFS is most prominently composed of national forests and grasslands but includes units of other designations as well. In 1897, the system was created to protect forests and water supplies and provide timber (*Federal Land*, 2009). In 1960, this relatively sparse mission was further articulated through what is considered a multiple-use mandate. This mandate directs the USFS to balance recreation, industry, and ecology within the NFS (Multiple-Use Sustained-Yield Act, 1960). The sections of the NFS that receive the most visitor management are the specially designated locations, such as wilderness areas.

The USFS creates land management plans for each national forest in accordance with the purposes of the NFS. These management plans are intended to help NFS lands provide social and economic benefits in a sustainable manner (Collins et al., n.d.). Additionally, a 2012 Planning Rule established the provision of ecosystem services, or services ecosystems provide to communities (e.g., clean water), as another key goal of the management plans, alongside multiple uses (Collins et al., n.d.). While wilderness plans may be separate from the NPS's General Management Plans, wilderness management is incorporated into USFS land management plans ("Wilderness Management," 2007).

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All systems, as conglomerates of public lands, to some extent, are intended to provide for public access and recreation. Generally, the locations in which conservation has been deemed a priority also prioritize recreation. This has a lot to do with the historical motivations behind land conservation and preservation in which humans' enjoyment of the land was (and is) a significant factor. For the NPS, conservation is inherently a part of providing for visitation — enjoyment of the space can only continue in the same form if the landscape is preserved. The frequently dual purpose of recreation and conservation has led to the concept of visitor use management (VUM) — a category of management strategies, all of which have the goal of limiting the impacts of visitation. Agencies' VUM strategies can be outlined in either their standard management plans or as a separate plan.

VUM strategies began as relatively straightforward regulations of visitor use of public lands, determining the allowable behaviors and activities of visitors. With Yellowstone National Park being the first of its kind, there was not yet the knowledge, enforcement, and motivation to effectively implement VUM. Into the mid-20th century, visitors would use geothermal pools as washing machines which ultimately led to the disruption of these features' normal functions

(Steingisser & Marcus, 2009). With the proper enforcement and regulations in place, such blatant visitor impacts were able to be significantly reduced. Strategies as simple as prohibiting visitors from throwing objects in geothermal features were some of the earliest and most impactful management strategies.

Today though, straightforward management strategies have been exhausted and are now a part of the national park culture — people no longer visit expecting to feed wildlife, for instance. With this, mitigating visitor impacts has grown steadily more complex. While the 1960s saw a meteoric rise in national park visitation, the number of people flocking to public lands today dwarfs that of the 20th century (Figure 1) (National Park Service, n.d.). It is important to note that at the same time that visitation has increased, the number of land units and systems has also increased. That said, visitation has not proven to be distributed evenly across land systems; in 2020, 50% of all recreational visits to national parks occurred within just 23 of the 423 units in the National Park System (*National Parks*, 2021). This means that some land units are facing a severe need for stronger management tools while others are not receiving nearly the same level of stress to park resources.

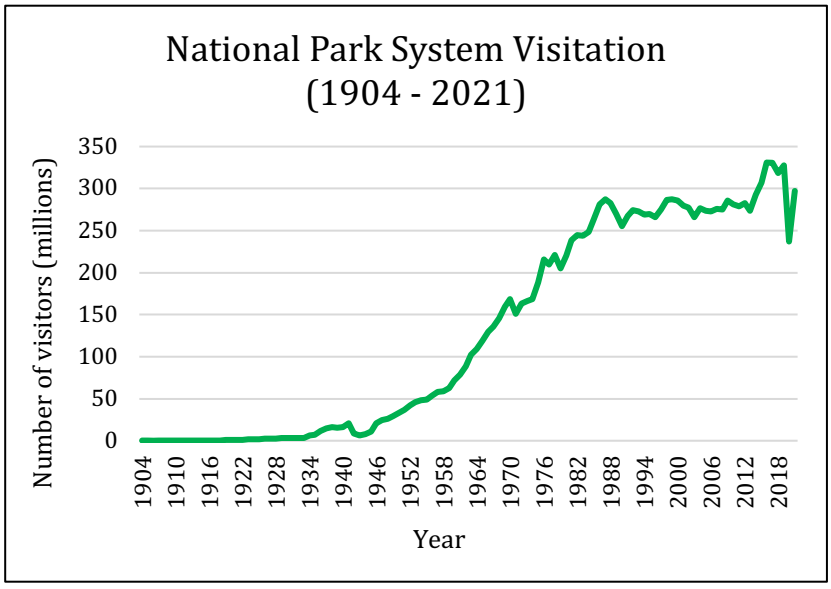


Figure 1: National Park System Visitation from 1904 to 2021

For the land units facing extraordinary visitation levels, there is less to be done regarding how visitors use a space; rather, the management challenge relates to the question of how many visitors a space can handle before the visitor impacts become unavoidable. Apart from prohibitions on types of uses, land management professionals try to mitigate visitor impacts through measures such as infrastructure development and education (IVUMC, 2016b). At some point though, no type of mitigation can account for the sheer number of visitors in a space. With increasing visitation numbers, a growing number of land units are being forced to implement limits on the number of people present in a specific area.

Programs that limit the number of visitors generally utilize permit or reservation systems that dictate where an individual or group is in a given area within a set range of hours or days. Such programs can take on a variety of characteristics to fulfill a wide range of desired outcomes and visitor experiences.

The following chapter reviews relevant literature to provide context for visitor-limiting permit programs, and ultimately, identify where research is lacking.

Chapter II: Literature Review

2.1 Overview

Visitor use management (VUM) has been the subject of a multitude of studies since the 1960s (Cole, 2016; Haider, 2006; Miller et al., 2017). While these studies vary wildly in terms of scope and content, they are similar in the sense that they all, to a degree, grapple with how much management intervention is necessary and what strategies are most effective for achieving desired outcomes.

VUM-related studies have thus far produced a significant amount of information regarding what visitor impacts are, what management strategies exist, and how decisions or plans are made. Yet, a limited amount of literature focuses on restrictive management tactics, like visitor-limiting permit programs. This literature review discusses a broad scope of VUM literature with the ultimate goal of providing context for programs that limit visitor use and concludes with an assessment of the gap in available research on visitor-limiting programs.

2.2 Legal mandates/agencies' responsibilities/legislative context for management

The previous chapter included an overview of the legal mandates for the four land management agencies and their land systems. The legal foundation for federal land management is often broad and non-specific, so agencies must interpret legislation and create more specific guidelines for fulfilling their mandates. This is a highly subjective and frequently problematic process, making it a common theme in VUM literature. It is important to look at this literature and agency interpretations in order to provide the context for when and why visitor impacts matter.

2.2.1 National Wilderness Preservation System

Wilderness was defined by the Wilderness Act of 1964 as being "untrammeled by man" with "outstanding opportunities for solitude" (Wilderness Act, 1964). Because this suggests that wilderness simultaneously provides recreational opportunities while showing little evidence of human presence, the Act's language has inspired decades of literature with interpretations changing relatively little over time. Offering even more complexity, an interagency report discusses the intangible meaning of wilderness — it defines wilderness, in part, by its "symbolic meanings of humility, restraint, and interdependence" (Landres et al., 2015).

An article written in 1973 by Robert Lucas of the Aldo Leopold Wilderness Research Institute describes VUM challenges prompted by the legal definition of wilderness. While developed recreation areas, like in many national parks, can 'harden' sites against visitor impacts, this is generally an inappropriate option in the wilderness (Lucas, 1973). Runte actually acknowledges this as a factor in the NPS's reluctance to designate wilderness areas within the National Park System; wilderness designations would prevent the development of visitor-accommodating infrastructure (Runte, 2010). Today, wilderness areas constitute approximately 17 percent of the total land area managed by the four land management agencies (Landres et al., 2015).

It is worth noting that some areas without an official wilderness designation may still be managed as wilderness if the agency is trying to maintain its wilderness character. Sometimes this is intended to preserve the area for potential future designation (Landres et al., 2015).

Lucas also confronts what he calls the "no-management myth", stating that wilderness cannot survive without management (Lucas, 1973). This no-management philosophy continues to be a topic of discussion, even today (Hobbs et al., 2010). Marion and Farrell say that intensive management actions may compromise the fulfillment of the Wilderness Act since management inherently implies human intervention (Marion & Farrell, 2002). It is possibly more accurate to describe management actions in wilderness as having tradeoffs rather than being inherently bad. In other words, one aspect of wilderness character may be protected through an action while at the same time degrading another component of character (Landres et al., 2015). Despite these complications, some of the earliest systems limiting visitor use were located in wildernesses (Cole, 2016; van Wagtendonk & Coho, 1986).

The Congressional Research Service (CRS) notes that because wilderness areas are managed by various agencies, management policies can vary (*Federal Land*, 2009). This often means that agencies have their own guides for how to manage specially-designated areas. While the no-management philosophy may continue to be grappled with, the USFS, for instance, has stated its interpretation of the Wilderness Act. The agency established that there is a difference between absolute wilderness and legal wilderness; all wilderness is impacted by humans in some way, so while true wilderness cannot be obtained, managers can limit visitor impacts to the point that the legal definition of wilderness is at least met (Figure 2) ("Wilderness Management," 2007). Even so, the application of wilderness philosophies or interpretations in the field may vary significantly.

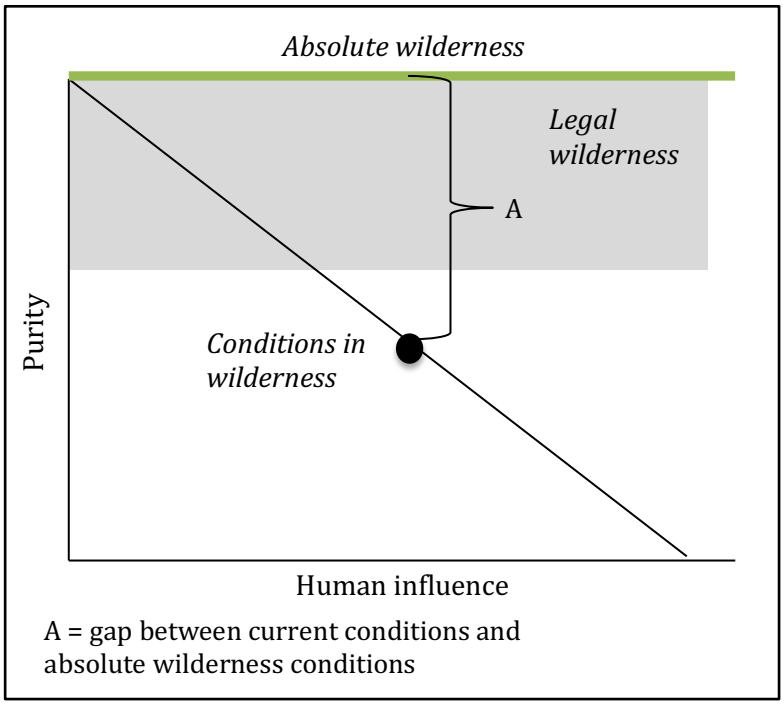


Figure 2: "The Wilderness Management Model" ("Wilderness Management," 2007)

This variation in agency management can also affect wilderness use policies. The NPS has certain management policies that are more stringent than what is mandated by the wilderness area designation, one example being the prohibition of hunting within many land units (*Federal Land*, 2009). The USFS does not abide by the same hunting restrictions, so USFS-managed wilderness areas may allow a greater range of uses.

2.2.2 National Park Service

The NPS's dual mandate of providing for visitation while preserving the natural space for present and future generations is commonly acknowledged as a source of conflict for how to best manage the National Park System (*Federal Land*, 2009; Timmons, 2019). Timmons recognizes that current visitation levels threaten both the ecological state of the parks and visitors' experiences (Timmons, 2019).

Congress did foresee there being a conflict between providing for park visitation and preserving ecological quality. In 1978, the Organic Act was amended to direct the NPS to adopt carrying capacities and general management plans for each land unit, in a sense, allowing for the prioritization of conservation (IVUMC, 2016a). The NPS has acknowledged as a policy that if conservation and visitor experience conflict, protecting the park's resources should take the highest importance (United States, 2006).

Despite this, both Timmons and Manning et al. have noted that few parks established carrying capacities; Timmons, in particular, believes that if they had, today's situation of detrimental visitation levels could have been avoided (Manning et al., 1995; Timmons, 2019). Timmons also notes that park managers might be more willing to take certain actions if the parks adopted wilderness philosophies (Timmons, 2019). This opinion does not necessarily hold when considering the number of challenges that wilderness philosophies create when considering certain forms of VUM.

The Interagency Visitor Use Management Council (IVUMC), a collaborative working group among land management agencies, in contrast to Timmons, provides the governmental perspective on the NPS's compliance with the Organic Act. While Timmons focuses on the need to identify carrying capacities universally, the IVUMC is more concerned with those areas in which the lack of capacity is causing the NPS to not meet its original dual mission (IVUMC, 2016a). The IVUMC affords the NPS some leeway by noting that deciding on a carrying capacity is no easy task. Manning et al. acknowledge this as well, saying that park managers are hesitant to make statements on visitor limits when little direction has been provided (Manning et al., 1995).

2.2.3 United States Forest Service

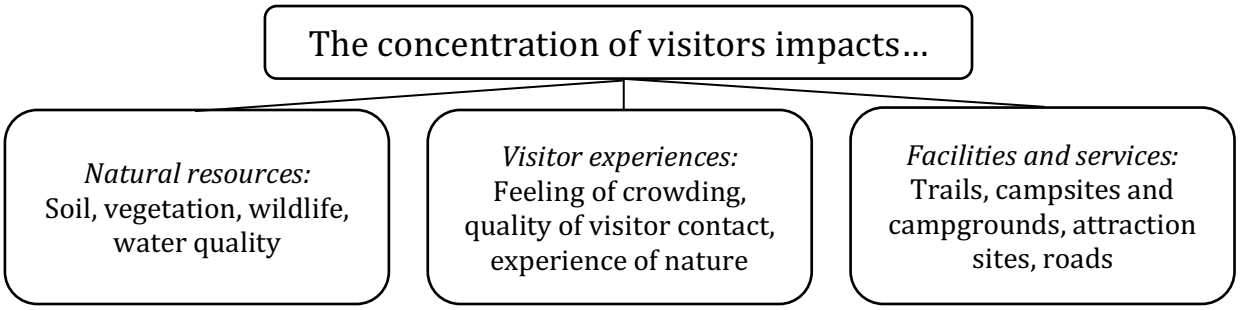
The majority of literature focused on VUM in the National Forest System (NFS) has related to the management of wilderness areas and other special designations. With few exceptions, the USFS has not applied visitor limits outside of specially designated areas (Appendix A). As already discussed, the management of wilderness areas can vary slightly depending on the managing agency. Managing agencies can also have different levels of receptivity to wilderness designations. An article by Glicksman suggests that the USFS has been relatively more supportive of wilderness areas than the BLM (Glicksman, 2014). While this study just focused on the multiple-use agencies, the USFS and BLM, it is possible that the USFS has been more receptive than the NPS, as well, given the agency does not necessarily have the same level of dedication to providing visitor services as the NPS.

Even though wilderness areas within the National Park System are, by association with the NPS, supposed to have determined carrying capacities, those that fall under the management of the USFS do not have the same requirement. It seems more likely then that NPS wilderness areas would have visitor limits imposed.

2.3 Visitor impacts

The study of visitor impacts is in many ways the study of why visitor levels prompt management intervention. Often, if an agency needs to alter its VUM of a certain area, it is because the area's condition no longer meets what is legally mandated (Marion & Farrell, 2002). The state of natural resources, visitor experiences, and facilities and services are the three broad categories of visitor impacts that largely direct VUM (Figure 3).

Figure 3: Types of visitor impacts



2.3.1 Natural Resources

The impacts visitors can have on public land are diverse — spanning from soil compaction to noise pollution. It is well-known among resource managers and researchers that relatively low-level use can cause substantial degradation (Cole, 2016; Eagleston & Marion, 2017; Manning et al., 1995; Marion & Farrell, 2002; Stankey et al., 1985). Manning et al. summarize these visitor impacts through four ecological components: soil, vegetation, wildlife, and water (Manning et al., 2017).

In regard to soil, the level of impact caused by visitors relies significantly on the type of environment. Low levels of use cause soil compaction which leads to erosion; however, the amount of erosion is dependent on the site's exposure to water and wind. Once erosion begins to occur, it is exceptionally difficult to recover an area (Manning et al., 2017). While Manning et al. focus on the trampling caused by hiking, multiple studies demonstrate that campsite use can cause long-term soil erosion (Eagleston & Marion, 2017; Marion & Farrell, 2002).

Vegetation faces similar visitor impacts. Broadly speaking, the two main signs of degradation are vegetation loss and the introduction of invasive species. Vegetation can be trampled by hikers and at campsites. It can be particularly impacted at campsites where visitors will cut down trees or branches and strip bark for fires (Manning et al., 2017). Eagleston and Marion found this to be the case in Boundary Waters Canoe Area Wilderness where the number of campsite trees declined by 44% from 1982 to 2014 (Eagleston & Marion, 2017). The ability of vegetation to regrow depends on the environment — in certain ecological regions, vegetation can take decades to grow back. Timmons mentions that in Everglades National Park (NP), it is expected to take 60 years for certain vegetation to regrow (Timmons, 2019).

Wildlife can be disturbed by poor visitor behavior as well as the indirect modification of habitat. Species have differing sensitivity to humans, so to varying levels, visitor presence can cause reduced health, displacement, lower reproduction rates, and higher death rates. Visitor impacts can also result in changes to the composition of species present in a given region (Manning et al., 2017).

Water quality can also be altered by visitors. Increased turbidity, caused by swimming or hiking over streams, results in a decline in photosynthesis and impairs the sight of aquatic species. These activities can also lead to the introduction of harmful bacteria to bodies of water that supply both humans and wildlife. Though, Manning et al. note that studies suggest wildlife are more often the source of bacterial contamination (Manning et al., 2017).

2.3.2 Visitor experiences

As Timmons observes, crowding of the outdoors has environmental impacts in addition to impacts on the level of enjoyment visitors experience. The IVUMC further elaborates on this, stating that visitors' ability to achieve their expected and desired interaction with an area is dependent on the social conditions (Allen, 2019). Because of this, the impact of visitation levels on visitor experiences has been well-studied but with sometimes conflicting results.

Much research has sought to determine when and at what level an area becomes crowded — this is also known as social carrying capacity, a counterpart to environmental carrying capacity. In a study at Arches National Park, Manning et al. explored the inevitable decline in the quality of visitor experiences and at what number of visitors managers need to intervene. The authors note the significance of social norms in establishing carrying capacities for Arches NP; an attraction site has a different crowding norm than the backcountry. As a result, they divided the park into nine zones with their own capacities (Manning et al., 1995).

The IVUMC believes, though, that the relationship between visitor use and visitor experience is more complicated. While social norms for crowding are an important indicator of visitor experience, the IVUMC stresses that there are other social variables. For instance, the quality of direct and indirect contact with other people is a factor (Allen, 2019). If previous visitors leave an area with visible environmental impacts, that would be negative indirect contact.

Further complicating the matter, researchers have also found that different types of visitors have different expectations for social conditions. This was one conclusion of a comparative study of the expectations of day versus overnight visitors to the Olympic Wilderness (Vinson Pierce & Manning, 2015). The authors found that day visitors were less sensitive to crowding and more readily supported management that created recreation opportunities rather than limited use to create the experience of solitude, a key facet of wilderness character. This study illustrates how variable and subjective the feeling of crowding can be. The IVUMC elaborates that the number of people in an area is merely a number — crowding is ultimately a judgment (Allen, 2019). The study in Arches NP relied on the idea that all visitors have the same idea of social norm for crowding in different areas of a park. Based on the IVUMC's report and the study in the Olympic Wilderness, the Arches NP research relied on an interpretation of visitor experience that was not entirely complete.

2.3.3 Facilities and services

Visitor use is generally concentrated in certain areas of a park or wilderness area. This concentration occurs on trails, at campsites and campgrounds, at attraction sites, and on roads. Because of this, the previously outlined visitor impacts are intrinsically tied to visitor facilities and services.

Attraction sites, for instance, experience a high density of people in a relatively small area. Around Old Faithful in Yellowstone NP, the NPS has built a system of boardwalks and audience seating to accommodate the number of people (Manning et al., 2017). At other sites, this may not be an option, and a lack of infrastructure could result in soil erosion and vegetation loss. That said, what Manning et al. fail to mention is that infrastructure itself has a resource impact. At Yellowstone, as visitor use increased, so did the development of visitor facilities. It is believed that the infrastructure around geothermal features at Yellowstone may be affecting their functionality; this could be considered an indirect impact of visitation (Foley et al., 2014).

While a few parks in the National Park System have no major backcountry trail system and allow for more explorative hiking, at most units, staying on the trail is mandatory. This results in trails receiving significant wear. Managers also deal with the effects of visitors not staying on trails, widening them, or creating new "social" (visitor-created) trails. Bacon et al., for a study in Yosemite NP, were able to use the length of social trails as an indicator of visitor-caused environmental conditions (Bacon et al., 2006).

Campsites and campgrounds also face visitor impacts. Campgrounds are often built with more infrastructure, such as restrooms and fire pits, to mitigate the impacts of concentrated overnight visitors. Campgrounds do not usually exist in the backcountry or in the wilderness; instead, there may be a system of designated campsites dispersed throughout a region (Manning et al., 2017). As discussed, these sites face issues of vegetation loss and erosion. Marion and Farrell found that, as a direct result of having too many visitors, campers may create "satellite" campsites, branching off of pre-existing sites (Marion & Farrell, 2002).

Lastly, roads and parking lots are affected by visitor levels, often in the form of congestion and overflow parking. Congestion of roads and parking lots is another form of crowding that can impact visitor experiences (Manning et al., 2017). Parking lots are a direct indicator of vehicle capacity. At Yellowstone NP, managers found that parking lots were frequently over capacity in summer months, with visitors parking on road shoulders, crushing vegetation in the process (Atwell et al., 2017).

2.4 Options for visitor use management

The combined effect of legal mandates and visitor impacts has led to decades' worth of applied VUM. Because impacts can occur at relatively low levels of use, it is important for managers to employ a wide range of impact prevention and mitigation.

The IVUMC has outlined a list of eight management strategies (Figure 4). Each strategy involves different management actions that could be taken. The IVUMC categorizes these actions into three groupings. One of which is site management or engineering. This can include the construction of pathways and the provision of visitor facilities. The IVUMC notes that development should be kept at a level appropriate to the site, a sentiment echoed by Timmons (IVUMC, 2016b; Timmons, 2019). Another category of management

Figure 4: Management strategies

1. Modify type of use
2. Modify visitor behavior
3. Modify visitor attitudes and expectations
4. Modify timing of use
5. Modify location of use
6. Increase the ability of sites to handle use
7. Modify the spatial distribution of use
8. Reduce use or increase the supply

action is information and education. The Leave No Trace initiative is a well-known example of this. The final category is regulation and enforcement. This includes prohibiting certain behaviors or activities, limiting lengths of stay, and setting visitor limits.

All of these management actions fall on a spectrum of obtrusion, from indirect to direct. Park et al. studied the effects of using direct versus indirect management at Acadia NP. The authors note that indirect practices are generally favored in circumstances they are believed to be effective (Park et al., 2008). This aligns well with other authors' stances (IVUMC, 2016b; Lucas, 1973); although, there continues to be disagreement over when to use direct or indirect practices.

In cases where it is necessary to reduce crowding, Timmons has determined a few actions that can be taken, some more obtrusive, or direct, than others.

One of the more straightforward, but involved, options is identifying and implementing a carrying capacity; though, as Timmons notes, this is likely the most controversial option. Implementing a carrying capacity may involve establishing a permit or reservation system, restricting either the number of cars, groups, or people. An alternative management action is to establish a mandatory shuttle system in which personal vehicles are prohibited within park boundaries. This essentially brings the park's capacity for vehicles to zero, so that the capacity for people can be increased. Zion NP has adopted a shuttle system approach which has helped the park adapt to increasing visitation. Additionally, given the uneven distribution of visitation throughout the National Park and National Forest Systems, Timmons explains that there is also the opportunity to advertise lesser-visited areas and reduce crowding in the most popular land units (Timmons, 2019).

These types of management actions are starting to be relied upon more often. This was the focus of an Energy and Natural Resources hearing in July 2021 in which all three of Timmons suggested management actions were brought up as tactics the NPS is currently using to control crowding (*Statement of Michael T. Reynolds*, 2021).

2.5 How decisions are made

Over the past several decades of VUM, the ways in which decisions are made and how they should be made have received much governmental and academic attention. A variety of decision-making frameworks have been developed to support resource managers in creating management plans (Appendix B). The Visitor Experience and Resource Protection (VERP) Process and the Limits of Acceptable Change (LAC) System are two of the most well-known. VERP was developed specifically for the NPS while LAC was developed for USFS wilderness area management. Due to the plurality of frameworks, the mission of the IVUMC was to create a single method for decision-making that could be applicable to all land management agencies. The resulting method is called the Visitor Use Management Framework (VUMF).

Procedures within each component of these frameworks can vary significantly (IVUMC, 2016b). Haider also adds that the frameworks are affected by each unique situation. Different purposes or agency needs influence how a framework is applied. The extent to which decision-makers choose to involve the public also affects the process of decision-making (Haider, 2006).

Despite these differences, it is well-observed that the same key components are present in most frameworks (Haider, 2006; IVUMC, 2016b; Miller et al., 2017). Haider outlines these key components but leaves out the post-implementation monitoring of management actions (Haider,

2006). For this reason, I have adapted Haider's list to include monitoring and incorporated public participation as opposed to listing it as a separate component.

I. Formulation of management objectives

Management objectives are essentially a statement of desired conditions. An important part of determining these conditions is deciding how to express them, using quantitative indicators. In Manning et al.'s application of VERP at Arches NP, indicators included the number of encounters with people or vehicles in different areas of the park and the number of social trails created by visitors (Manning et al., 1995). Because researchers at Arches were seeking to determine desired social conditions, surveys were conducted to gain an idea of which indicators best interpreted visitors' experience of an area. In contrast, managers in the Selway-Bitterroot Wilderness, using the LAC system, focused more on environmental conditions and determined indicators related to campsite conditions and the number of encounters with groups (Ritter, 1997).

Once indicators are chosen, a standard of quality has to be identified for each indicator. At Arches NP, at the attraction site Delicate Arch, visitor surveys resulted in the finding that up to 30 people present at one time was the limit of acceptability — thus, 30 visitors or fewer would be considered the desired condition, or management objective (Manning et al., 1995).

II. Determination of existing conditions relative to desired conditions

This stage of the decision-making process is common among frameworks as it is vital for identifying when and in what areas intervention needs to occur. Using the pre-established indicators, managers can monitor regions of a park or wilderness area to determine whether the current conditions meet desired conditions.

The IVUMC outlines the two potential results of this step (IVUMC, 2016b). One is that desired conditions are being achieved and there is no imminent risk of this not being the case. The other potential result is that existing conditions are close to surpassing the standard thresholds of quality. The IVUMC's VUMF does not address a scenario in which thresholds have already been passed and desired conditions are not being met. This is perhaps because the interagency group advocates for a proactive management approach (IVUMC, 2016b, 2017). Because, ideally, current conditions align with desired conditions, it seems like there might be potential for managers to inadvertently create standards of quality that align with existing conditions. Stankey et al., in the process of describing the LAC system, recognize this potential issue and say that using existing conditions to lend realistic standards must be balanced with setting standards at levels that encourage an improvement of conditions (Stankey et al., 1985).

III. Management actions chosen and implemented

As discussed, a variety of potential management actions exist. When identifying a management strategy, the VUMF directs managers to determine the causes that are leading to or would likely lead to nonachievement of desired conditions (IVUMC, 2016b). This step can at least clarify the most sensible management actions, but deciding what specific actions to implement gets to be much more subjective. The VUMF notes that an important consideration is the acceptable degree to which the visitor experience is impacted (IVUMC, 2016b). For instance, completely prohibiting visitors in an area of a land unit experiencing soil erosion would likely be unreasonable in a large majority of cases.

Because visitor experiences can be impaired by management actions as much as they can be improved, the public is often called upon to give input. In the study of Acadia NP, visitors were surveyed regarding their management preferences; 96.5% supported the indirect management of putting educational signs at trailheads whereas only 21.5% supported the direct action of limiting the number of visitors (Park et al., 2008). While limiting the number of visitors could be more effective, its lack of agreeability means that managers may decide to explore other options.

Even among resource managers, a variety of opinions exist about if and when visitor limits should be applied. Ambiguous management guidance, generally in the form of agency management guides and administrative rules, can induce hesitancy among decision-makers to apply stricter visitor management. The IVUMC gives input on the matter by advising the application of a carrying capacity when the number of visitors is directly related to achieving desired conditions (IVUMC, 2016a). This advice is lacking clear guidelines, though. The clearest indicator of visitor levels directly impacting desired conditions is when visitor experience is being degraded by the number of people in one area. Still, in this situation, theoretically, indirect management practices could be used to influence people to visit other areas. The IVUMC's guidance is further complicated when one considers environmental conditions. For instance, if 300 visitors were at Old Faithful in the absence of boardwalks, it seems that soil compaction would be directly caused by the number of people. However, it could also be argued that the soil compaction was, instead, caused by the lack of visitor-accommodating infrastructure.

Because of these complexities, managers can have certain biases towards using indirect management practices to try to avoid imposing harsher measures. This has been the case for the management of the Selway-Bitterroot Wilderness — the wilderness' management plan has advised that heavier-handed management actions should not be employed unless light-handed methods have been tried and failed (Ritter, 1997). Ritter, along with Marion and Farrell, caution, though, that with this approach, resources may be significantly degraded by the time managers employ direct visitor limits (Marion & Farrell, 2002; Ritter, 1997).

Resource managers also tend to prefer indirect actions because it is commonly assumed that the imposition of visitor limits equates to a loss of visitor freedom. Lucas even described certain methods as "authoritarian" (Lucas, 1973). Some studies have suggested, though, that visitor freedom may be improved with direct limits as opposed to interventions that circumvent the imposition of limits by controlling visitor movement and activities (Ritter, 1997). It is also important to note that visitor experience is, in fact, supposed to benefit from fewer people crowding an area. Timmons explains that some believe permit systems may even increase demand because the experience is improved (Timmons, 2019).

IV. Monitoring

Monitoring is one of the most straightforward steps as it is essentially repeating the "determination of existing conditions relative to desired conditions" step. The purpose of this is to understand if implemented management actions have created or maintained desired conditions. Monitoring can be an extremely beneficial tool for managers if applied well. One case of influential monitoring is at Boundary Waters Canoe Area Wilderness where long-term monitoring has allowed researchers to understand the effectiveness of certain visitor control practices — with this information, better management decisions can be made in other areas as well (Cole, 2016; Eagleston & Marion, 2017).

2.6 Visitor-limiting permit programs: a gap in existing knowledge

Based on the governing legislation, there is a well-established need for VUM across all land management agencies. For some land units, minimally obtrusive VUM tactics are all that is required. In others, despite having extensive VUM strategies, visitor impacts may still be impeding the fulfillment of legislative mandates. In such cases, implementing a carrying capacity is a logical action to take. All areas have a carrying capacity, whether perceived or identified. If a capacity has been identified and is consistently being surpassed, causing desired conditions to not be met, it is up to resource managers to find a way to limit visitors.

There are only so many ways to strictly limit the number of visitors, and most, if not all, are some form of a permit system. Other relatively synonymous names include passes, reservations, and timed-entry systems. Even though there is one primary method of limiting visitor use, there are a variety of ways to characterize a permit system to produce different outcomes. Research on quota-based permit systems is limited. The few studies that take a somewhat holistic approach generally choose one region or land unit to look at, and within this, do not consider alternative permit systems; they also primarily focus on aspects of the quota, not considering other parts of a permit program, like distribution. Cole's case study review of the management of Boundary Waters Canoe Area Wilderness is one example (Cole, 2016). Another is a review of Yosemite's trailhead-quota permit system (van Wagtendonk & Coho, 1986). That said, the majority of studies related to quota-based permit systems focus on specific characteristics of programs and their resulting outcomes. This type of research is not often focused on management nor is it necessarily placed within the context of a visitor-limiting permit program (Allen, 2019; Fix & Vaske, 2007; Marion & Farrell, 2002; Schwartz et al., 2012). Schwartz et al., for instance, looked at permit distribution mechanisms but did so from the perspective of visitor demand and preferences, rather than the management experience and achievement of desired outcomes (Schwartz et al., 2012).

2.7 Conclusion

Specific information about designing and implementing visitor-limiting programs is perhaps one of the least covered subjects in the visitor-use management field. The application of visitor limits is also likely the strategy that resource managers are most averse to, and for good reason — visitor limits are not often received well and can require more involved management. There is also not a clear path set out for implementing such programs. While holistic studies that look at individual locations can be useful for understanding the management experience of a specific permit system, they don't provide an idea of the full scope that is possible in terms of design, nor do they necessarily offer guidance on what aspects of a program could be changed to respond to new issues.

This literature review has identified a key gap in the existing available information for designing and implementing visitor-limiting permit programs, and there is much to be learned from land units that have already implemented permit systems. Based on this gap in research, it seems opportune and vital to explore why managers have designed existing permit programs as they are, what the impacts and benefits of the design are, and how it has affected their ability to meet desired conditions in their respective land units. As a part of this, it may be beneficial to also understand what triggered the establishment of a permit program, especially given frequent hesitancy to do so.

With this in mind, this study seeks to answer the question: "How are visitor-limiting permit programs being designed and what are the resulting implications of implementation?" The ultimate goal of answering this question is to provide current and future land managers with valuable

perspectives and information for implementing the best visitor-limiting permit program to meet their land units' desired conditions.

Chapter III: Methods

This study seeks to answer the question: "How are visitor-limiting permit programs being designed and what are the resulting implications of implementation?" Given the research focus, the goal is not to conclude which program characteristics or designs are better. Rather, the purpose of this study is to explore the different approaches to managing visitor-limiting permit programs and identify options, strategies, and lessons learned for managers. This study involved a mixed-method approach using literature, online analysis, and interviews.

3.1 Literature review and preliminary data gathering

The first step to answering the research question was to conduct a literature review. This process was important for gaining the necessary background information and context to understand the significance of visitor-limiting programs. The review specifically looked into available literature regarding why VUM is prompted, how management decisions are made, and what management strategies are available. Through this process, I identified major gaps in the available research — these gaps related to visitor-limiting programs' design and implementation, leaving many questions unanswered.

To supplement the literature review and gain an idea of the frequency at which visitor-limiting permit programs are used, I conducted a multi-step review of a sample of public land units. The first step in this process was to determine what public land units to focus on. The goal was to select a feasible number of units to research while also looking at systems of units with a major focus on balancing recreation and conservation. Thus, I started by determining the number of land units within land systems of interest, primarily the National Forest System, the National Parks System, and the Wilderness Preservation System. The Wilderness Preservation System consists of over 800 areas, some areas falling within the jurisdiction of multiple agencies. I concluded that this would be an unreasonable system to focus on. The National Forest System, on the other hand, includes 177 units, many of which incorporate wilderness areas. Additionally, the National Park System includes 423 units of many different designations; 63 of these are designated national parks.

From this information on the number of units and prior knowledge regarding agency goals, I decided to research the 154 national forests and 63 national parks.

After determining this sample, I used the land units' government websites and recreation.gov to determine which had visitor-limiting programs. This process was largely exploratory, and in learning more about individual programs, I noticed clear differences among visitor-limiting programs based on the targeted visitor activity or use. Given the high variability among programs and the limited time to research these cases, I chose to focus the study to allow for more in-depth analysis and comparison. Generally speaking, exclusions were made in order to target land-based recreation that the average visitor could participate in. The following permit programs were not included in my research:

- Permit programs just for large groups[2]
- River use permits

[2] For the programs that had permits for both small and large groups, I focused just on the small-group permit if the large-group permit was administered differently.

- Motorized vehicle use permits
- Canyoneering / rock climbing / caving / mountain climbing permits
- Reservation systems for structured activities (tours, viewing areas, etc.)
- Permit programs for units in US territories
- Reservation systems for transport to an island
- Permits explicitly due to COVID-19
- National Trails System permits

From the remaining list of applicable visitor-limiting permit programs, I compiled a dataset of information from each program. This was originally based on 2021 programs and was later updated to be based on the 2022 versions.[3] Information recorded included the name of the unit and the specific area for which the permit program applies. During the exploratory process of identifying relevant permit programs, common characteristics among programs were identified which I then categorized into the following:

- Type of use: overnight/day trip, parking in a day use area, vehicle entry, etc.
- Time of year required: specific dates or months unless it applies all year (AY)
- Window of request: the time frame in which a permit can be obtained
- Type of distribution: whether permits are allocated through first-come-first-serve (FCFS) and/or lottery (L) distribution
- Mode of distribution: whether permits are distributed or requested online (O), in person (IP), over phone (PH), via fax and/or through email (E)
- Cost (of a permit)
- Designated site: if a unit requires visitors to stay at a designated site — yes (Y), in certain areas (Y/N), no (N)
- Quota unit: whether the limit is based on the number of people (PP), groups (PG), and/or vehicles (PV)
- Quota location: the location(s) at which the quota is applied, including the starting point (SP), destination (D), and whole area (WA)

Note: abbreviations in parentheses (x) indicate how the characteristic was coded in the dataset

Not all information could be found for each permit program. In the cases in which NPS or USFS visitor centers could not be reached to clarify program characteristics, these programs were removed from the dataset.

It is important to note that in the dataset, land units might have multiple permit programs for the same area. This occurred if the permit programs had variances in their design due to their purpose or the time of year in which they applied. For example, North Cascades National Park was effectively treated as though it had two permit systems because there is variance in the design based on the time of year.

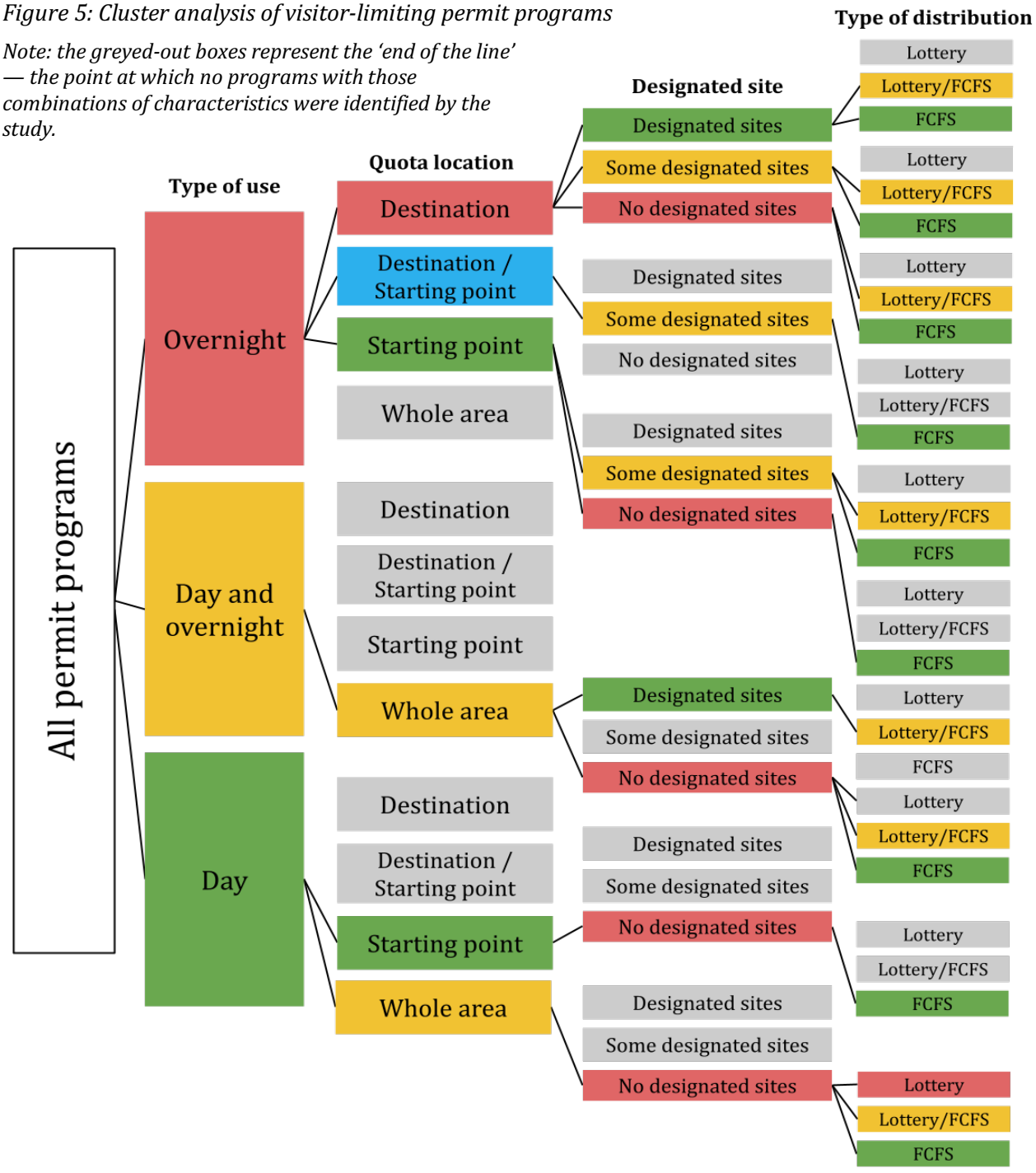
[3] The updated 2022 dataset, due to time constraints, does not include permit programs that were added between 2021 and 2022. The exception to this would be if I came across a new program at an already-included land unit while looking for information to update another program.

3.2 Preliminary data analysis

Using the dataset[4] with all relevant visitor-limiting programs and their characteristics, I conducted a rudimentary cluster analysis in order to categorize the programs into groups of similar qualities.

Figure 5: Cluster analysis of visitor-limiting permit programs

Note: the greyed-out boxes represent the 'end of the line' — the point at which no programs with those combinations of characteristics were identified by the study.



[4] Originally the 2021 dataset was used; however, the cluster analysis was later updated to reflect 2022 permit programs.

I started this process by deciding which characteristics, or variables, were most important to the structure of a permit program, thus, the most relevant to their categorization. I removed several variables and in order of importance, used type of use, quota location, designated site, and type of distribution. In some cases, general value groupings were created for a variable. For instance, the "type of use" variable was streamlined to three value groups: overnight use, day and overnight use, and day use. This moved values such as "space in one of the area's parking lots" to the day-use value group. For each variable, I coded the different values (or value groupings) using colors to effectively sort the programs. Figure 5 illustrates how the permit programs were categorized.

3.3 Recruitment of study participants

The categories created during the preliminary data analysis served as a guide for forming a representative sample of units for the study. The goal of this was to gain perspectives on a diversity of program characteristics.

I prioritized potential programs to study primarily based on their categorization, but I, at the same time, deprioritized vehicle-entry programs as they are not always a viable option for many managers to implement. "Vehicle-entry" implies that there is a way to control and monitor vehicles entering a part or the whole of a land unit which is not always the case.

After selecting a couple of land units from every category, I began calling each unit. I specifically sought out talking to the land managers in charge of the implementation and/or design of the permit program. I was able to get the name and contact information for many by just talking to someone over the phone. In certain cases, I had to email a general visitor information address if the phones were not being attended to. A few times, the person I was directed to was not the best individual for the study in which case they directed me to someone else at the agency. All potential participants were emailed a version of the recruitment email text (Appendix C). If the targeted individual responded affirmatively, a follow-up email was sent with available interview times (Appendix C).

It should be noted that the initial selection of land units to contact was based on the 2021 version of permit programs as this is what the original categorizations were based on. Because interviews were conducted from January to March, partway through, the 2022 version of permit programs became more of a focus as land units began publicizing changes to the 2021 systems. Not all units made changes between 2021 and 2022, but enough were doing so that I revised the categorizations and began also taking the 2022 versions into account when selecting programs to contact. Figure 5 reflects the 2022 permit programs.

3.4 Interviews with study participants

My preliminary research provided the scope of existing programs and the necessary background information to understand the context for implementing such programs. Nevertheless, online information could not provide the full implementation and design 'story' of each permit system.

The interviews provided context and nuance and they were also a means to verify the information I gathered online. By talking directly to program managers, I was able to collect data that would be directly relevant to managers at other land units.

Interviews occurred over the phone or on Zoom. They were recorded unless the participant declined to be recorded. The interviews lasted about an hour and covered the three categories of questions outlined below:

- *Design of the program:* The initial portion of the interview focused on the history of the program and the rationale behind its design. This was when I verified aspects of the permit system's design and asked clarifying questions.
- *Impacts of the program's design:* During this section of the interview, I asked questions that led the participant to evaluate the impacts that design choices have made on the management and visitor experience. This is where the system characteristics previously identified became especially relevant.
- *Program outcomes:* In the final part of the interview, participants were asked to reflect on the outcomes of the permit program, whether desired conditions had been achieved.

The complete list of interview questions is included in Appendix D.

3.5 Data analysis

I transcribed the interview recordings using the otter.ai software. Because this was an automated transcription, I did need to edit the resulting text for clarity and to ensure that words were correctly transcribed.

Using the edited transcripts, I coded each of them using somewhat standardized wording, the wording of which I established as I went through the data. As I did so, I compiled the codes on a separate document to streamline and categorize them. Each code was tagged with the land units it was associated with. This process allowed me to see where codes intersected and what could be condensed into the same category or theme. Upon finishing coding the documents, I sorted the themes into groups of related ones.

Not all of these established themes were necessarily robust enough to stand alone. I reviewed the compiled codes/themes and noted which ones could fit into another section as a sub-theme. For instance, the identified "common issue" of "day use impacts" made more sense to discuss under a section on the system characteristic of "type of use."

The system characteristics identified in the initial data-gathering stage were a key lens through which data is presented and analyzed in this study — these characteristics essentially became a systematic way to delineate between two programs and assess the variances in their designs. The compilation of themes included these characteristics, but there were also themes regarding influential factors in a program's design and how such programs are implemented.

Tying this back to the research question — there are two key parts that this study sought to answer. The first part regards how quota-based permit programs are being designed; this involves a discussion of considerations during the design process as well as the potential design options. The second part of the research question asks what the implications are of implementation. This involves addressing the outcomes of choosing certain characteristics and the ways in which they interact with each other.

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The following two chapters present this study's findings. These chapters are intended to build off of each other; following these, Chapter VI presents the resulting management guide meant to inform managers looking to implement a permit program or update an existing one.

Ultimately, over the course of the findings chapters, using data gathered via multiple methods, I intend to answer the fundamental research question: "How are visitor-limiting permit programs being designed and what are the resulting implications of implementation?"

Chapter IV: Definitions and context

This first chapter provides information that is useful for understanding references and terms in the following chapters. First, I define the frequently-referred-to "system characteristics." These characteristics were identified as key pillars of what forms a permit program; their definitions here are general, but in Chapter V, they are discussed in depth, using data from the interviews. Additionally, this chapter includes an overview of each of the participating land units and their respective permit programs. This includes a table with each permit system's characteristics, and a write-up including any features of the land unit that might affect the permit program, the rationale behind the program's initial implementation, and a review of any changes that have been made to the program.

The permit programs profiled in this study were included for their diverse, but overlapping, arrangement of system characteristics. They include:

- Arapaho and Roosevelt National Forests, overnight trips in Indian Peaks Wilderness
- Cleveland National Forest, day trips to Cedar Creek Falls
- Coconino National Forest, day trips at Fossil Creek Wild and Scenic River
- Denali National Park, overnight trips in 42 of 87 backcountry units
- Deschutes and Willamette National Forests, day and overnight trips in Mt. Washington, Mt. Jefferson, and Three Sisters Wildernesses
- Gifford Pinchot National Forest, day trips at Lewis River Recreation Area
- Mount Rainier National Park, overnight trips in the wilderness
- North Cascades National Park, overnight trips in the backcountry
- Okanogan-Wenatchee National Forest, overnight trips in the Enchantment Permit Area of Alpine Lakes Wilderness
- Rocky Mountain National Park, overnight trips in the wilderness
- Sequoia and Kings Canyon National Parks, overnight trips in the wilderness
- White River National Forest, overnight trips at Conundrum Hot Springs in Maroon-Bells Snowmass Wilderness

4.1 System characteristics defined

Type of use: This characteristic defines the use being managed. Broadly speaking, types of use fall into one of three categories: day use, overnight use, and a combination of the two.

Time of year: All permit programs dictate the time period during which a visitor needs a permit to do an activity in the program area. This period can be varying lengths depending on the needs of the park and the length of its peak season. It can also be required that visitors need a permit at any time throughout the year.

Window of request: This characteristic refers to the date upon which permits are released and the following window of time in which a visitor can obtain or apply for a permit.

Type of distribution: The type of distribution defines how the permits are allocated, whether it's randomized like a lottery or it's first-come-first-serve. In other words, it's the process that a visitor goes through when they seek to reserve or request a permit.

Mode of distribution: This is the platform through which a person reserves or requests a permit. Most commonly, this occurs online and/or in person.

Quota unit: This characteristic defines what specifically a quota is limiting or how the limit is being measured. A quota can be set in terms of the number of people, groups, and/or vehicles in a defined area.

Quota location: This characteristic identifies the points at which capacities are determined and quotas are applied in the permitted area. The quota(s) can be applied to a starting point (e.g., a parking lot or trailhead), a destination (e.g., the zone a visitor stays in overnight), and/or the whole area (e.g., a park). A permit specifies the starting point or destination(s) a visitor chooses for their trip.

Designated site: A designated site is a specific camping location at which overnight visitors are required to stay. A permit program may have all visitors stay at a designated site, regardless of the zone they are staying in. Alternatively, it might require visitors in only some zones to stay at a designated site, or there might not be designated sites at all. This characteristic does not apply to day use permit programs, and it does not include programs that merely advise users to stay in pre-existing sites.

Cost: This characteristic refers to the fee associated with purchasing a permit. Fees vary significantly among programs.

4.2 Overview of featured permit programs

The following portion of this chapter provides basic information about the land units and their corresponding featured permit programs.[5] This information is meant to contextualize Chapter V which discuss units' experiences with their program. Most of the following information was supplied during interviews, with some supplemental citations intermixed.

[5] Many of these locations also require visitors to obtain a permit in the off-season; however, this is not discussed in the study unless the off-season permits are restricted by quota.

Arapaho and Roosevelt National Forests (Colorado)

Permitted area	Indian Peaks Wilderness
Type of use	Overnight trips
Time of year required	June – September
Window of request	75% of permits are released pre-season and remain reservable throughout the season. 25% of permits are released on a rolling, 3-day-advance window.
Type of distribution	First-come-first-serve
Mode of distribution	Online
Quota unit	Per group
Quota location	Destination each night
Designated site	A few high-use zones have designated campsites; these are mostly around lakes.
Cost	The permit costs $11, $6 of which is a fee charged and retained by recreation.gov. The other $5 is refundable.

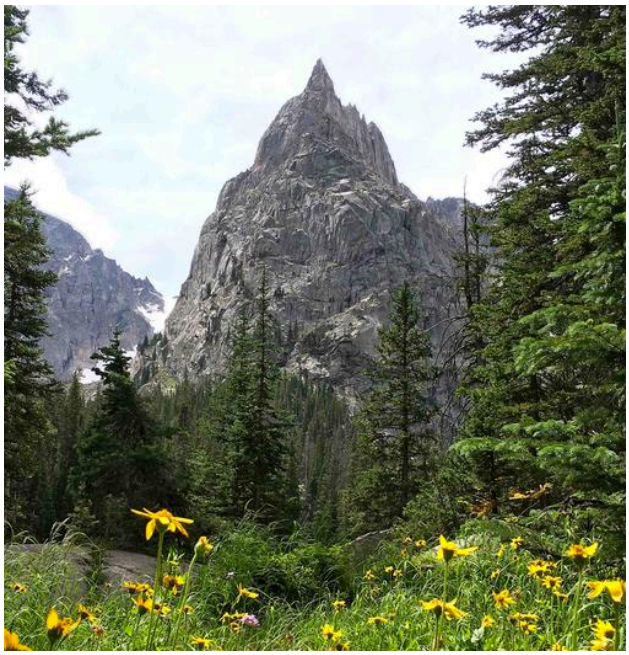

Image: Lone Eagle Peak in Indian Peaks Wilderness (USFS, n.d.)

The Arapaho and Roosevelt National Forests (NFs), located in Colorado, manage overnight trips in the Indian Peaks Wilderness through a quota-based permit program. Indian Peaks is a 73,000-acre landmass that encompasses montane, sub-alpine, and alpine life zones, and straddles the Continental Divide. Rocky Mountain National Park and James Peak Wilderness border the area (Indian Peaks Wilderness, n.d.).

The Indian Peaks Wilderness permit program has been in place since 1985, following the area's designation as wilderness in 1978 (*Indian Peaks Wilderness*, n.d.). In the early '80s, those in charge of managing Indian Peaks Wilderness tried a variety of visitor use management (VUM) methods besides direct visitor limits, but the sheer number of people ultimately prevented the success of these tactics (Fayhee, 2017). The wilderness is located within an hour of the Denver Metro Area — its proximity to this major population center was a contributing factor in the decision to implement a permit program, as were the associated resource damages occurring with such high use. With the wilderness designation, there was also a new concern for visitors' experience, given the Wilderness Act's emphasis on solitude as a key component of wilderness character.

The design of the quota-based permit program has changed very little since its implementation. The only major change that has occurred relates to its mode of distribution. Starting in 2021, the Indian Peaks Wilderness permit system was transitioned to recreation.gov; now, all permits are distributed online. Before this point, people could get permits through walk-up or mail.

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Cleveland National Forest (California)

Permitted area	Cedar Creek Falls
Type of use	Use of trail to falls (day trips)
Time of year required	All year
Window of request	All permits for the following year are released on December 1.
Type of distribution	First-come-first-serve
Mode of distribution	Online
Quota unit	Per group
Quota location	Whole area
Designated site	N/A
Cost	$6 (fee charged and retained by recreation.gov)

Image: (Cedar Creek Falls in January, 2016)

Cleveland National Forest (NF), located in southern California, uses a quota-based permit program to limit the number of day visitors accessing Cedar Creek Falls, a non-wilderness area. The permitted area is relatively small, totaling around six acres; the permit allows visitors to use the trail to reach the falls as well as enjoy the falls itself. Days of extreme heat are common in the region, and the falls typically does not run in the summer months (*Cedar Creek Falls*, n.d.).

The Cedar Creek Falls permit program was initially implemented in 2011, but the structure of the system was altered in 2013 leading to its current form. Ahead of the program's implementation, a formal trail to the falls was constructed as visitors had previously only used user-constructed trails.

There were a multitude of reasons for implementing the permit program, largely stemming from a high spike in demand. Prior to the advent of social media, the falls was a somewhat "local spot" — only dedicated hikers and locals tended to visit the area. That said, waterfalls are a rare commodity in southern California, and around 20 million people live within 50 miles of Cleveland NF's borders. With the influence of social media to spread the word, visitation skyrocketed, some days seeing thousands of people hiking down to the falls and ultimately concentrating in a very small area. Visitor behavior then became an issue, with people being drunk and disorderly.

The initial permit program, implemented in 2011, used an adaptive management approach which had intended for there to be continual adjustments to the quota to respond to changes on the ground. In 2013, the forest shifted to a system with a fixed number of permits, 75. This number has been temporarily decreased to 35 due to the COVID-19 pandemic. The final change that has occurred is the forest now closes the trail whenever the National Weather Service issues a heat warning or in the case of flash floods.

***

Coconino National Forest (Arizona)

Permitted area	Fossil Creek Wild and Scenic River
Type of use	Space in one of the area's parking lots (day use only)
Time of year required	April - September
Window of request	Permits for the month are released on the first day of the preceding month. (e.g., May permits are released April 1)
Type of distribution	First-come-first-serve
Mode of distribution	Online
Quota unit	Per vehicle
Quota location	Starting point — visitors must park at their assigned parking lot but can go anywhere from there.
Designated site	N/A
Cost	$6 (fee charged and retained by recreation.gov)

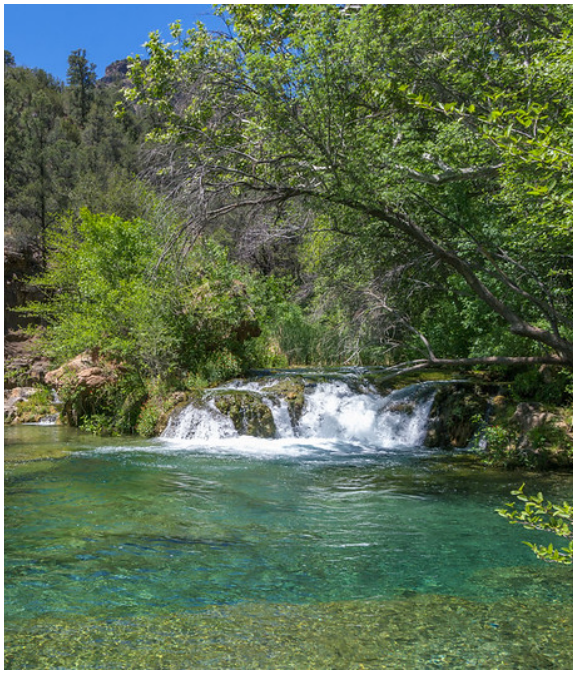

Image: "Waterfall trail on Fossil Creek" (Coconino National Forest, 2016)

Coconino National Forest, located in Arizona, manages recreation around Fossil Creek Wild and Scenic River through a quota-based permit program. Fossil Creek borders both Coconino NF and Tonto NF. There are eight parking lots in Coconino NF at which visitors may park to access the creek; however, Tonto NF also manages one access point parking lot — the popular Bob Bear Trailhead.

The Fossil Creek permit program began in 2015 after other roundabout management options had already been tried. In 2009, following the initial decommissioning of the Fossil Creek Childs-Irving power plant (completed in 2010), Congress established the creek as a Wild and Scenic River. With the decommissioning of the power plant, Arizona Power Station was no longer maintaining the 708 Road which connected the towns Camp Verde and Strawberry and led to the Fossil Creek access points (United States Forest Service, 2020). The USFS ultimately closed a section of the road due to unstable cliff sides (Figure 6). This led to a back-up of cars parking near the gates blocking the section of road. At the same time, social media was spreading the word about Fossil Creek as a recreation site. Bodies of water being relatively rare in Arizona, people were attracted to the area. The resulting gridlock from cars was making it difficult for emergency vehicles to reach people. Additionally, along the river, garbage and sanitation were becoming an issue and an increasing amount of ground was being denuded by overflow parking.

For several years prior to the permit program, Coconino NF would use the access gate (to the section of road containing the parking lots) to control the flow of vehicles based on the availability of parking spaces — essentially limiting the number of cars at the sites. This practice started to become really contentious, to the point where law enforcement was needed to handle aggressive visitors.

The permit program that came out of the challenges faced at Fossil Creek has gone relatively unchanged since its implementation. The only shift that has occurred was initially Coconino NF was managing the Bob Bear Trailhead on the Tonto NF side, but Tonto NF has since assumed responsibility and adopted the permit program.

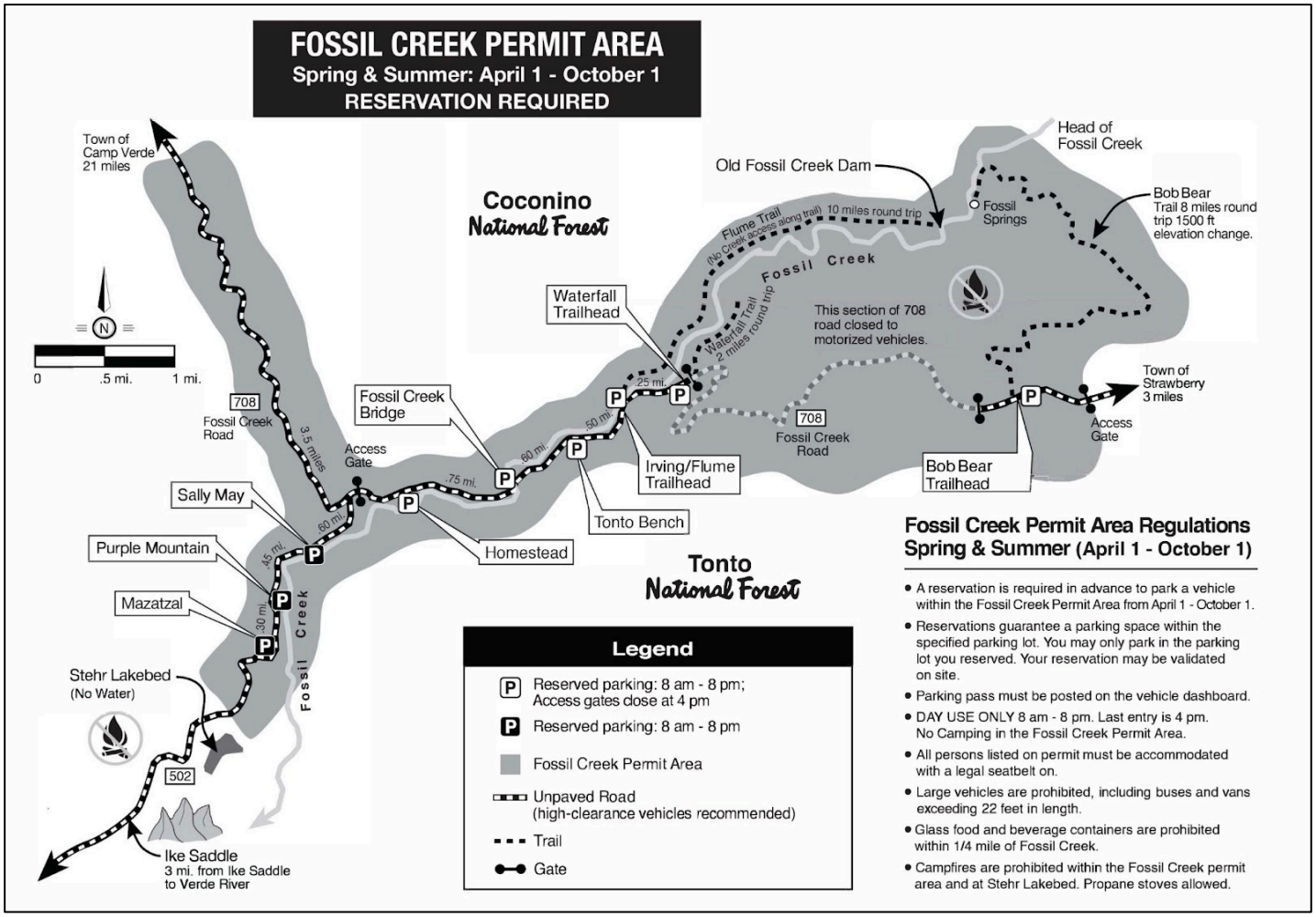

Figure 6: Map of Fossil Creek Permit Area (Coconino National Forest, n.d.)

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Denali National Park (Alaska)

Permitted area	42 of 87 backcountry units
Type of use	Overnight trips
Time of year required	All year
Window of request	Walk-up, up to 24 hours in advance of trip
Type of distribution	First-come-first-serve
Mode of distribution	In person
Quota unit	Per person
Quota location	Destination each night
Designated site	No
Cost	$0

Image: "Hiking in Unit 18 in Denali's backcountry" (Mesner, 2019)

Denali National Park (NP), located in Alaska, manages 41 of 87 units in the backcountry through a quota-based permit program. The expansive park is unique in that the majority of its backcountry has no trails, granting visitors an exploratory wilderness experience. The primary park road acts as a launching point for backpacking trips, and a bus runs in the summer, the peak season, which backpackers use to get to their launching point as well as back to their car.

The backcountry permit system was implemented in 1974 as a result of a large increase in visitation upon the completion of the Parks Highway — a major highway that connects Anchorage and Fairbanks — in 1972. Along with this higher visitation came issues including increasing campfire impacts and bear encounters.

Overall, there have been only a few changes made to the permit program since its initial implementation. In the first few years, some adjustments were made to the backcountry units, altering the size and number. Additionally, the permit program momentarily shifted to an online mode of distribution due to COVID-19. In this system, within 14 days of their trip, visitors would email the backcountry office to reserve their desired itinerary. Nothing else about the program changed as a result of the distribution being altered.

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Deschutes and Willamette National Forests[6] (Oregon)

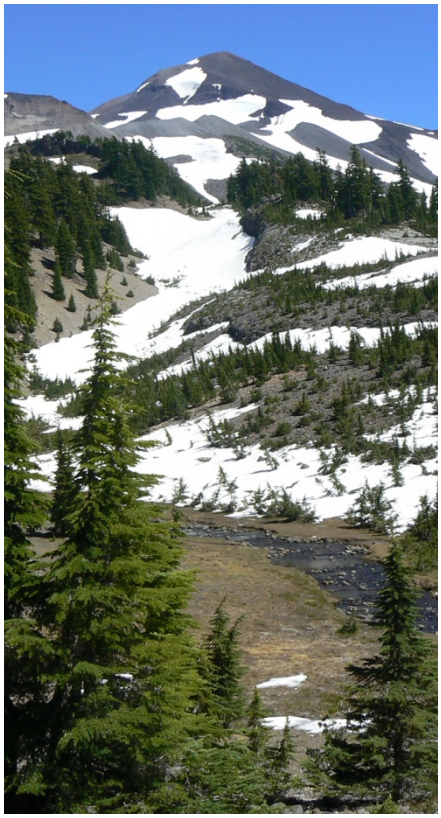

Image: (Three Sisters Wilderness, n.d.)

Permitted area	Mt. Washington, Mt. Jefferson, and the Three Sisters Wildernesses	Mt. Washington, Mt. Jefferson, and the Three Sisters Wildernesses
Type of use	Overnight trips	Day trips starting at 19 of 79 trailheads
Time of year required	June – October	June – October
Window of request	40% of permits are released pre-season. The remaining 60% are released through a 7-day-advance rolling window.	Permits are released through both a 10-day-advance rolling window and a 2-day-advance rolling window.
Type of distribution	First-come-first-serve	First-come-first-serve
Mode of distribution	Online	Online
Quota unit	Per group	Per person
Quota location	Starting point, entry date only	Starting point
Designated site	No	N/A
Cost	$6 (fee charged and retained by recreation.gov)	$1/person (fee charged and retained by recreation.gov)

Deschutes and Willamette National Forests, located in Oregon, jointly manage the Central Cascades Wilderness permit system which applies a quota to both day and overnight trips in the Mt. Washington, Mt. Jefferson, and Three Sisters Wildernesses. Prior to the current permit program, there were two small permitted areas within these wildernesses.

The permit program is very new, its first year of implementation being 2021. Visitation increased drastically throughout the 2010s. Much of this increased use occurred on the East side of the national forests, near Bend, but there were also some trailheads on the West side that experienced large jumps in visitation. Along with the increases in use came greater impacts on the physical environment, including trail widening and poor waste disposal. There also started to become issues at the parking lots which were not intended to handle that many visitors. Managers at Deschutes and Willamette NFs had concerns that these impacts would permanently alter the character of the wilderness, straying from the mandates that come with a wilderness designation.

[6] The two forests operate separately; however, they jointly manage the permit program which covers three cross-jurisdiction wildernesses. For the purpose of the study, these forests are referred to jointly. One manager from each unit was interviewed to discuss the program.

After its first year of implementation, Deschutes and Willamette NFs changed several components of the permit system which will be applied for the first time during the 2022 season. Originally, for overnight use, visitors would reserve quota for every day of their trip when reserving a permit. For instance, if a group starting at the Pamelia Lake Trailhead planned to stay four nights in the wilderness, they would need to claim quota at that starting-point trailhead for each day. Starting in 2022, the permit will still dictate the starting point, but visitors now only have to reserve quota for their entry day. In regards to day use, the number of permits available has been increased, and the window of request was significantly altered. Previously, there was a pre-season release of day-use permits; now, permits are only released through close-to-date rolling windows.

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Gifford Pinchot National Forest (Washington)

Permitted area	Lewis River Recreation Area
Type of use	Space in one of the area's parking lots (day use only)
Time of year required	June - September
Window of request	100% of permits are released pre-season.
Type of distribution	First-come-first-serve
Mode of distribution	Online
Quota unit	Per person
Quota location	Destination each night
Designated site	No
Cost	$0

Image: (Falls along the Lewis River, n.d.)

Gifford Pinchot National Forest, located in Washington, manages visitation to the Lewis River Recreation Area through a quota-based permit program. Within this area, visitors must park in one of six designated parking areas. These parking lots are all accessed along one section of road, a road that has multiple vehicle entry points (Figure 7).

The Lewis River permit program was first implemented in 2021, making it a relatively new program. Gifford Pinchot NF saw the need for a permit system due to a significant uptick in visitation caused by a few different circumstances, the first one being the pandemic when people had fewer activity options and sought outdoor recreation. While visitors would normally be better distributed among Gifford Pinchot NF and nearby land units, the Eagle Creek Fire in 2017 closed many sites to visitors in the Columbia River Gorge National Scenic Area, thus redistributing populations that would normally visit both that area and Gifford Pinchot NF. As a result of increased visitation, emergency vehicles were unable to access sites within the Lewis River

Recreation Area because the overflow parking became so great — there wasn't the infrastructural capacity for the number of people. There were also sanitation and waste issues, encroachment on vegetation, more social trails, and water quality was worsening. Ultimately, safety concerns and the forest's commitment to upholding multiple uses and considering the quality of the resource beyond its recreational value were the main instigators for intervention.

Several adjustments are being made to the permit program which will be applied for the first time in the 2022 season. The size of the permitted area is being reduced to about a 12-mile stretch rather than 14. The length of the permit season is also being shortened, and the number of permits available for reservation is being increased.

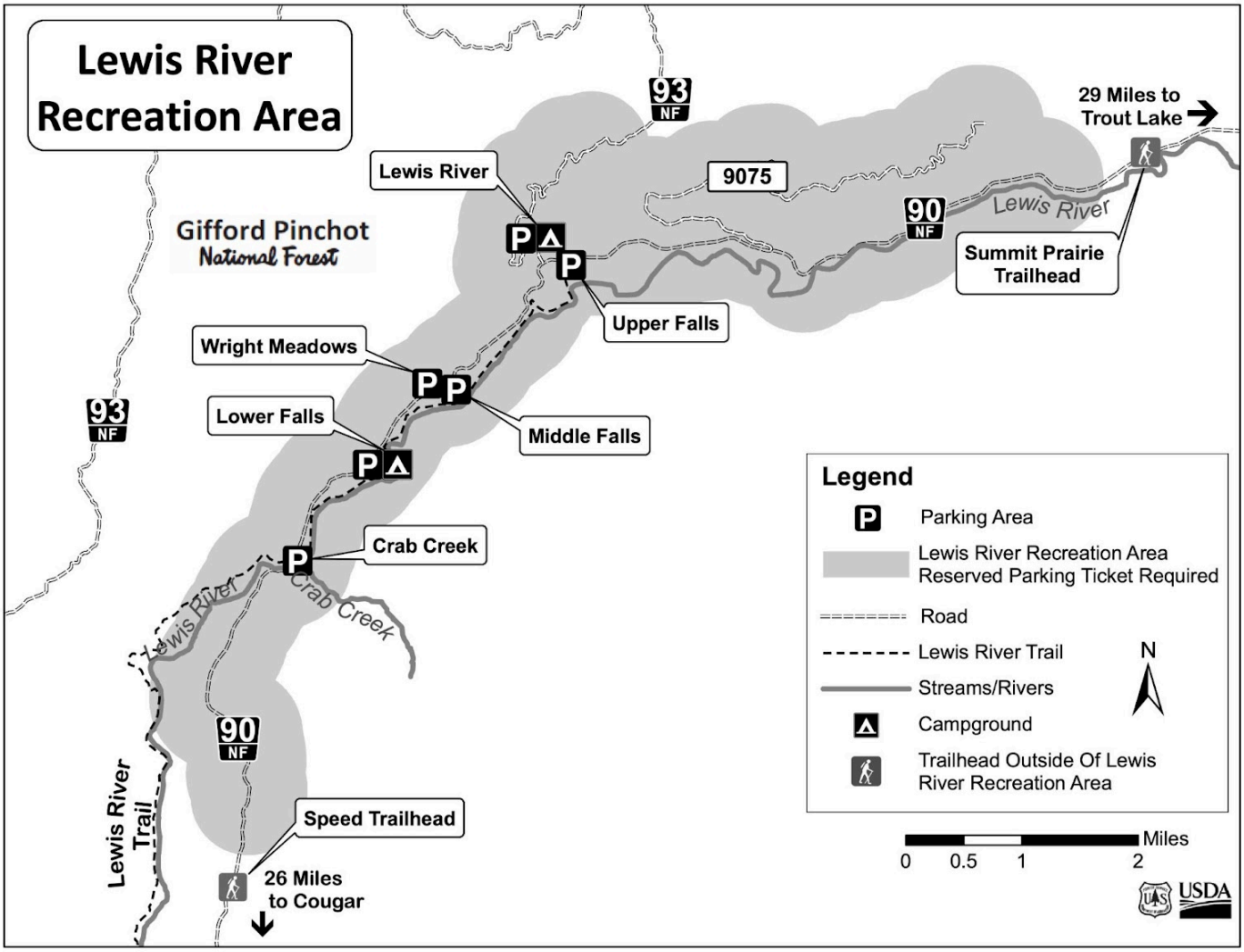

Figure 7: Map of the Lewis River Recreation Area (Lewis River Recreation Area, n.d.)

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Mount Rainier National Park (Washington)

Permitted area	Wilderness	Wilderness
Type of use	Overnight trips (peak season)	Overnight trips (off season)
Time of year required	May - October	October - May
Window of request	Approximately 70% of permits are made available through advance reservation which is composed of an early-access lottery that takes place in February and March and first-come-first-serve reservation following the lottery. The remaining 30% of all permits are set aside for day-of / day-before walk-ups.	Day-of / day-before walk-ups
Type of distribution	First-come-first-serve / lottery	First-come-first-serve
Mode of distribution	Online / In person (Online-reserved permits are also picked up in person)	In person
Quota unit	Per group	Per group
Quota location	Destination each night	Destination each night
Designated site	There are a few trailless cross-country zones that do not have designated campsites. All other zones require visitors to camp in a specified site.	There are a few trailless cross-country zones that do not have designated campsites. All other zones require visitors to camp in a specified site.
Cost	$20 + $6 (advance reservation) / $6 (walk-up)	$6

Mount Rainier National Park, located in Washington, limits the amount of visitation in the park's wilderness through a quota-based permit program. Approximately 97% of the park was designated wilderness in 1988. This wilderness includes both rugged mountain terrain as well as fragile subalpine meadows and is home to the Wonderland Trail, a popular backpacking itinerary that encircles Mt. Rainier.

Mount Rainier NP's wilderness permit program has been in place in some form since the 1970s when the park's first backcountry management plan was created. During this time, there was recognition that visitor use was having significant ecological impacts in the form of denuded areas in meadows, which were generally the most desirable places to camp, and social trails. The initial push for a permit program came out of the need to direct people to more durable campsite locations, reducing visitors' resource impacts.

The wilderness permit program has evolved over the decades it has been in place. Up until 1999, there were no advance reservations — all permits were distributed via first-come-first-serve walk-up. When peak-season advance reservations were first implemented, they were taken via phone which then transitioned to being by mail or fax, and then later, fax only. In the 2010s, Mount Rainier NP started processing permit requests received in the first two weeks through a lottery. All

requests received in this time period would then be randomly processed. In 2021, the park shifted their peak-season distribution system to recreation.gov. With the move online, the park was able to implement an early-access lottery in which applicants win time slots to reserve, rather than win the reservations themselves.

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North Cascades National Park (Washington)

Permitted area	Backcountry	Backcountry
Type of use	Overnight trips (peak season)	Overnight trips (off season)
Time of year required	May - September	October - May
Window of request	Approximately 60% of permits are made available through advance reservation which is composed of an early-access lottery that takes place in March and April and first-come-first-serve reservation following the lottery. The remaining 40% of all permits are set aside for day-of / day-before walk-ups.	Day-of / day-before walk-ups
Type of distribution	First-come-first-serve / lottery	First-come-first-serve
Mode of distribution	Online / In person / Phone (Online-reserved permits must be activated in person or over the phone; cross-country permits must be reserved over the phone or in person)	In person
Quota unit	Per group	Per group
Quota location	Destination each night	Destination each night
Designated site	There are a few cross-country zones that do not have designated campsites. All other zones require visitors to camp in a specified site.	There are a few cross-country zones that do not have designated campsites. All other zones require visitors to camp in a specified site.
Cost	$26	TBD (Not yet determined for 2022-23 off-season)

North Cascades National Park, located in Washington, manages backcountry overnight use through a quota-based permit program.

The backcountry permit program has been in place since the 1980s. The system was initially prompted by a desire to prevent resource damage and limit human-to-human contacts, maintaining the wilderness experience (North Cascades National Park, 1989).

Because of the age of the program, the full evolution of it isn't as clear. There are some significant changes occurring between the 2021 and 2022 seasons. With a shift to recreation.gov for peak-

season permits, North Cascades NP is now accepting advance reservations throughout the summer rather than just pre-season. There will now be an early-access lottery; previously, all applications received in March were randomized and reservations awarded accordingly. Additionally, the peak-season reservation fee is being increased from $20 to $26, and while walk-ups were previously free, they will now also cost $26.

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Okanogan-Wenatchee National Forest (Washington)

Permitted area	Alpine Lakes Wilderness (Enchantment Area)
Type of use	Overnight trips
Time of year required	May-October
Window of request	75% of permits are reserved through a pre-season lottery that takes place in February and March and advance reservations following the lottery. The remaining 25% of permits are released weekly throughout the season.[7]
Type of distribution	First-come-first-serve / lottery
Mode of distribution	Online
Quota unit	Per group / per person (in the Core Zone)
Quota location	Destination, entry date only — Groups must camp in their original destination zone for the duration of their trip unless that zone is the Core Zone in which they can camp in any zone.
Designated site	No
Cost	$5 per person per night + $6 (fee charged and retained by recreation.gov)

Image: Enchantment Permit Area (CleverHiker, n.d.)

Okanogan-Wenatchee National Forest, located in Washington, uses a quota-based permit program to manage visitation to the Enchantment Area within the Alpine Lakes Wilderness. The mountainous terrain of the Enchantment is divided into five zones which signify the potential destinations a group or individual can claim on their permit (Figure 8).

[7] This weekly distribution replaces the day-of walk-up lottery which was suspended due to COVID-19. The park will likely reinstate this lottery once the threat of the pandemic dissipates.

The Enchantment Area has been managed via a permit program since 1987. This area had been popular for several decades before this, though, and it was recognized in the 1960s and '70s that this area needed special protections. The Alpine Lakes Wilderness was designated as a 'wilderness' in 1976. Following this designation, there was concern over a decline in wilderness character, as relates to the Wilderness Act. This involved issues with crowding and resource damage.

The permit program has changed multiple times since its initial implementation. For one, the permit area expanded to include the Eightmile Zone following a 1993 environmental analysis. Distribution has also evolved; from 1987 to 2010, people mailed in their applications for a permit, and like the current system, reservations were awarded through a lottery system. If awarded a permit, visitors would pick up their permit in person. In 2011, this system shifted to recreation.gov. Visitors still had to pick up their permit in person despite the permit application process occurring online. Then, in 2013, visitors no longer had to come in the office to pick up their permit — they could instead print it at home. Okanogan-Wenatchee NF also decided to limit the number of applications a person could submit to the lottery, and the forest has both shortened and extended the permit season over the years as climate patterns have changed. In 2019, the Core Zone switched to a quota based on the number of people instead of the number of groups. Though, the other zones have remained per group. As noted by the interviewed manager, the forest has also "played around with the quota over the years" as the need for adjustments have arisen.

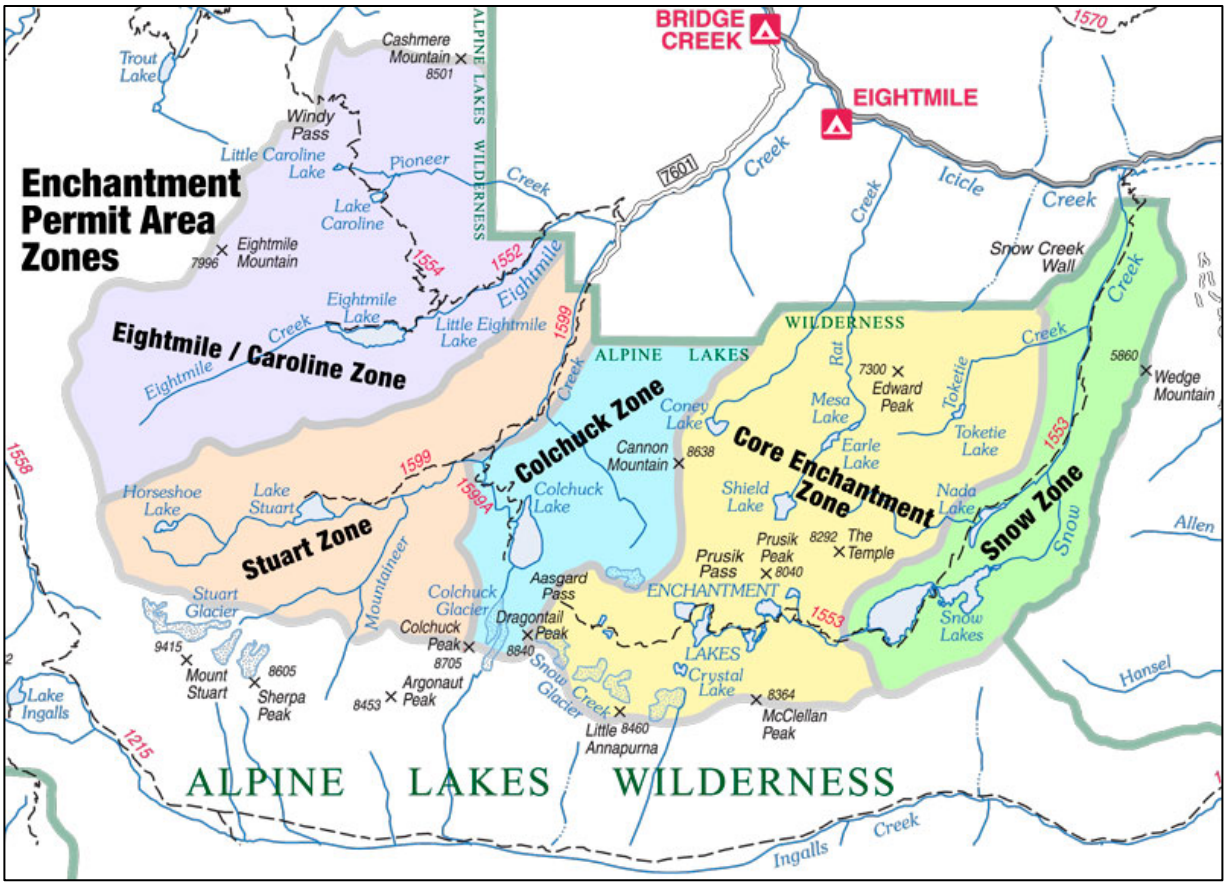

Figure 8: Map of Enchantment Permit Area zones (USFS, n.d.)

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Rocky Mountain National Park (Colorado)

Image: "Hiking Flattop Mountain" (Beach, n.d.)

Permitted area	Wilderness
Type of use	Overnight trips
Time of year required	May – October
Window of request	The majority of permits are released for reservation pre-season; however, some designated sites are set aside for day-of walk-up reservation. Permits for cross-country zones can be reserved through day-of walk-up or ahead of time over the phone.
Type of distribution	First-come-first-serve
Mode of distribution	Online / in person / phone (Online-reserved permits must be picked up in person.)
Quota unit	Per group
Quota location	Destination each night
Designated site	There are designated sites everywhere except for in the cross-country zones.
Cost	$30 + $6 (fee charged and retained by recreation.gov)

Rocky Mountain National Park, located in Colorado, manages visitation to its backcountry wilderness via a quota-based permit program. 95% of Rocky Mountain NP is congressionally-designated wilderness (*Rocky Mountain*, 2022).

The permit program was established in 1969 well before any official wilderness designations were made (*Wilderness*, 2016). The program was initially prompted by a consistently high concentration of visitors at Fern Lake. This concentrated visitation led to sanitation issues and campfire impacts, among other issues. Rocky Mountain NP wished to redistribute visitors throughout the park for more sustainable use patterns.

Rocky Mountain NP has adjusted the permit program over time. Before 1994, permits were distributed entirely in person or over the phone. From 1994 to 2021, the park used in-house online permit systems. The 2022 season will be the first time people reserve permits on recreation.gov. The cost of the permit has steadily increased, the newest increase being the $6 fee associated with

recreation.gov. Temporarily, the park switched to a lottery system in 2021 due to technical challenges.

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Sequoia and Kings Canyon National Parks (California)

Image: Hiking in Sequoia and Kings Canyon National Parks (Gieskes, n.d.)

Permitted area	Wilderness
Type of use	Overnight trips
Time of year required	May - September
Window of request	Permits are released through a 6-month-advance rolling window; a percentage of permits are saved for walk-up distribution. Permits for certain locations can only be acquired through day-before / day-of walk-up.
Type of distribution	First-come-first-serve
Mode of distribution	Online / In person (Online-reserved permits must be picked up in person.)
Quota unit	Per person
Quota location	Starting point, entry date only / Destination, each night in the area managed through a destination quota
Designated site	There are designated sites in a few areas; one of these areas is the one managed through a destination quota.
Cost	$15 + $5 per person

Sequoia and Kings Canyon National Parks (NPs), located in California, manage the backcountry wilderness through a quota-based permit program. The parks are located within a cluster of other land units, including Yosemite National Park, Sierra National Forest, and Inyo National Forest; as a result, there are several popular regional trails that extend through the parks. The terrain in this area is exceptionally diverse, including waterless areas, chaparrals, canyons, lake basins, and granite peaks (Sequoia and Kings Canyon National Parks Wilderness Permits, n.d.).

The wilderness quota-based permit program began in 1972. Motivation to implement a quota stemmed from an uptick in visitation caused by the "backpacker boom" in the 1970s. As a

consequence of higher visitation levels, the park was concerned with campsite impacts and maintaining a positive experience for visitors.

Sequoia and Kings Canyon NPs has made some adjustments to the permit program over the course of its lifetime. The biggest changes occurred in the 1970s — the permit program was initially only applied to two entry points and expanded to the whole park over the span of a few years. Since then, there have been relatively smaller changes to the program. In the 1980s, a destination-based quota was added to one location. Additionally, quotas have been increased or decreased depending on conditions. The reservation system was introduced, and later, adjustments were made to the percentage of permits available for reservation. This reservation system originally required people to send in permit applications pre-season which would then be processed throughout the summer. With the shift to recreation.gov, Sequoia and Kings Canyon NPs shifted to a rolling window for advance reservations. More recently, a couple entry quotas were redefined to dictate which of two trails that lead to the same trail could be used to continue on.

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White River National Forest (Colorado)

Permitted area	Maroon Bells-Snowmass Wilderness (Conundrum Hot Springs zone)
Type of use	Overnight trips
Time of year required	All year
Window of request	Pre-season release of permits (released every four months)
Type of distribution	First-come-first-serve
Mode of distribution	Online
Quota unit	Per group
Quota location	Destination each night
Designated site	Yes
Cost	$6 (fee charged and retained by recreation.gov)

Image: "Conundrum Creek Trail to Conundrum Hot Springs" (Wannamaker, 2021)

White River National Forest, located in Colorado, manages the Conundrum Hot Springs zone within Maroon Bells-Snowmass Wilderness through a visitor-limiting permit program.

The permit program was implemented in 2018 following the completion of an updated wilderness management plan. The Conundrum Hot Springs zone was targeted for permit program implementation as it was the most in need of limiting visitor use; though, more zones in the wilderness area are intended to be incorporated into the program in the future. In regards to Conundrum Hot Springs, there was significant concern over the biophysical impacts of camping and

the need to limit these in a wilderness area. The public also began expressing interest in having a permit program for overnight use.

While changes are likely to occur in the coming years, the only change that has been implemented since 2018 was that a campsite was moved, and its capacity was adjusted accordingly.

Chapter V: Designing a quota-based permit program — considerations, options, and implications

5.1 Introduction

With the previous chapter having provided the necessary context and definitions, this chapter looks further into the design of a permit program. This includes major themes that came up in interviews and a presentation of findings regarding system characteristics. Section 5.2, "Considerations in the design process," dives into themes regarding a permit program's design, specifically themes that have been shown to influence a program's design, in terms of its efficacy or rationale. Section 5.3, "Program design," looks at the findings for each system characteristic. The final portion of this chapter highlights a few implementation-related themes addressed during interviews.

5.2 Considerations in the design process

5.2.1 Site-specific conditions

Through this study, it was found that a land unit's unique conditions can either diminish or amplify the consequences or benefits of system characteristics or the entire permit system. They can also guide what is doable for program design. These conditions fall into three main categories: ecosystems and environment; layout and location; and land-unit operations.

Ecosystems and environment

The most frequently cited influential conditions relate to a unit's ecosystems or environment. Two primary conditions are the type of **landscape and its durability**. Specifically, fragile landscapes may require more intensive management interventions than a durable landscape to better mitigate resource damages. A manager at Mount Rainier NP spoke about their experience working at Yosemite NP as well. At Yosemite, the landscape is generally more durable which makes it possible to avoid dictating visitors' destination and campsite while still preventing resource damage. In contrast, at Mount Rainier NP, the most desirable places to camp are incredibly fragile subalpine meadows. The manager noted that if self-selected camping were allowed at the visitation level currently accommodated by designated sites, there would be a proliferation of camping impacts.

Additionally, **lake ecosystems** can be particularly vulnerable to visitor use, partly in that they tend to be hotspots for visitation and there is added concern about keeping visitors an acceptable distance from the water. Arapaho and Roosevelt NFs have designated sites in their wilderness zones with lakes partly to prevent visitors from camping too close to the water. Designated campsites ensure that they're camping in ecologically sustainable locations.

Weather can also add some complexity to a permit program. For many land units, snow does not melt until after their peak-season permit program begins, and the time of year by which snow melts can vary within land units. Arapaho and Roosevelt NFs have experienced this issue as the permit program starts in June, but snow doesn't melt in some areas until July. In this situation, weather amplifies some of the consequences of online permit distribution — people are not always aware of site conditions that could affect their experience because they don't have to talk to park staff. On the other hand, permit programs can have weather-related benefits. Cleveland NF, for instance, is able

to shut down the program area and notify permit holders on days when the National Weather Service puts out a heat advisory.

A common concern regarding environmental site conditions is ensuring visitors know what their trip will entail, so they can have a safe and positive experience. **High elevation and challenging terrain** are two conditions that can, for example, amplify the consequences of using an online platform for reservation. **Waterless areas** can have similar impacts. Sequoia and Kings Canyon NPs have some waterless areas. As a way to avoid disappointed visitors who had reserved a permit for the area without realizing it was waterless, the park distributes permits for these locations in person.

Layout and location

A land unit's layout or location can have major impacts on program operations. **Roads** are one component of a unit's layout that can have such impacts. For both of the programs with a vehicle quota (Coconino NF and Gifford Pinchot NF), the location of roads impacted their ability to enforce the permit program. At Gifford Pinchot NF, there are multiple entrances to the main road, a through-road, which accesses the permitted parking lots. Because of this, rangers are not able to check everyone entering the area for a permit nor can they restrict entry based on whether or not a person has a permit. However, at Coconino NF, there is a primary entrance used to access the parking lots along Fossil Creek; this grants them more control over vehicles' entry into the area.

Another influential site condition is its **location** in relation to other land units, specifically land units that neighbor or border the site or those that the unit shares regional trails with. Tonto NF neighbors Coconino NF and the forests share some responsibility for the management of Fossil Creek. For the initial implementation of the permit program, Coconino NF took over the management of Tonto NF's access point for Fossil Creek in order to establish a permit program for the whole area. Sequoia and Kings Canyon NPs have experienced some challenges in maintaining the efficacy of their permit program due to the cluster of land units in that region of California — several trails in these parks originate in other land units. Collaboration is necessary for them to address overuse issues through the permitting system.

Lastly, the **size** of a space, whether that be a zone or the full permitted area, can also be an influential condition for the design of a permit program. At Arapaho and Roosevelt NFs, in large zones where there's less concern about campsite proliferation, dispersed camping is considered an adequate management tool. The size of the entire permitted area can be influential regarding the complexity of the permit program and the ease of management. Cleveland NF manages a very small area via permit in comparison to systems that manage whole wilderness areas through such a system. The manager interviewed expressed doubts as to the park's ability to successfully implement and maintain a permit system for a larger area due to the burden of their current system. Sequoia and Kings Canyon NPs are in a much different situation, managing roughly 1300 square miles of wilderness through a quota-based system. For these parks, the size has impacted the best system characteristics to use; a destination-based quota across the whole wilderness area is not a viable option as it would make the system extraordinarily complex for managers.

Land-unit operations

Existing land-unit operations, generally visitor services or activities, can interact with a permit program's functionality. Because of this, a land unit's operations can help inform what program

characteristics are chosen and how they are implemented. With regard to **visitor services**, Denali NP has visitors use a bus system in the summer; during the pandemic, visitors needed advance notice that their backpacking itinerary was available, so they could secure bus tickets. Temporarily shifting to a virtual, advance-reservation system allowed it to work in conjunction with the bus system. Regarding the influence of **visitor activities**, White River NF has a hunter constituency that uses Maroon-Bells Snowmass Wilderness. The forest arranged the seasonal release of their permits to align with the time by which hunters would know if they had been awarded a tag for hunting.

5.2.2 Program rationale

In every interview, participants were asked what prompted the initiation of their permit program. The rationale behind a program in several cases informed the actual design of the permit program.

For 12 of the 15 featured permit programs, increased or high visitation was explicitly provided as a reason for management intervention.[8] Even for the locations that didn't explicitly mention this, visitor impacts were being experienced. With some of the older permit programs (i.e., those that started in the 1960s, '70s, and '80s), the rationale for implementing the permit program can be less clear. That said, Sequoia and Kings Canyon NPs retained a lot of information on their rationale, and the manager interviewed noted that the concerns that prompted the permit program in the 1970s are still relevant motivators for maintaining the program today.

While increased visitation was generally cited as the primary instigator, the rationale for a permit program was, in every case, based on issues that could be considered effects of visitation. In order to express the complex, often cause-and-effect nature of what motivates initiating a permit program, I have organized the rationale that each land unit provided into three categories. Each of these categories are meant to build on each other to create the full story regarding why visitation needed to be limited.

I. Causes of increased and/or excessive demand

Managers for nine of the featured cases provided a reason for why visitation had been increasing at their unit. Two of these locations, Coconino and Cleveland NFs, cited social media as a factor. The manager at Coconino NF said, "You've got social media that's attracting all these people to this area, because of course, you're in Arizona, so any body of water in Arizona, you're going to attract folks." These forests had similar experiences in that both locations have waterfalls which are uncommon in their respective regions. With the advent of social media as well as standard media coverage spreading the news about the waterfalls, visitation accelerated at both units. Proximity to a population center was also mentioned as a reason by Cleveland NF and Arapaho and Roosevelt NFs. Figure 9 provides a comprehensive list.

II. Conditions that make demand an issue

The following conditions can both problematize demand itself as well as explain why the problems associated with demand are in fact problems.

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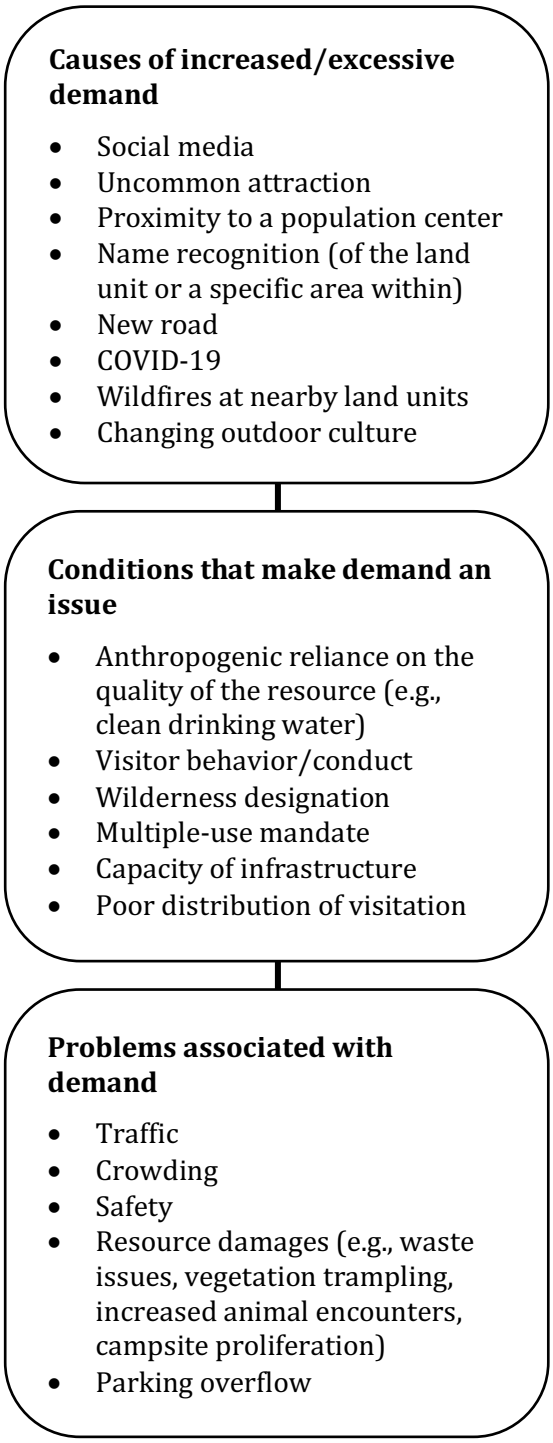
[8] If a permit is applied to an area differently based on the time of year (e.g., off-season versus peak-season at Mount Rainier NP), this was counted as two separate programs.

Regarding 12 of the featured programs, managers referred to conditions that made demand an issue. The most notable of these is the Wilderness Act — the legal condition that requires wilderness areas to retain a certain "character," solitude being an example of this. For eight of the featured cases, wilderness designations and the need to maintain wilderness character were the reason why the number of visitors and the impacts associated with demand became problematic. Additionally, managers for three programs referred to visitor behavior as something that made high visitation an issue. Furthermore, at Gifford Pinchot and Coconino NFs, the capacity of existing infrastructure prevented their ability to accommodate demand. Both of these units now have a permit system that specifically addresses the number of vehicles, keeping that at the current infrastructural capacity. Figure 9 provides a list of all conditions.

Figure 9: Program rationale



III. Problems associated with demand

Resource damage was by far the most frequently cited problem associated with demand and a major motivator for management intervention. For 12 of the featured programs, managers referred to some kind of resource impact as a result of increasing/excessive visitation. Specific resource damages varied significantly among land units. Campfire rings, waste issues, and campsite proliferation were all common rationale for initiating a permit program. For White River NF, campsite impacts were their primary biophysical concern; this led the forest to utilize designated campsites in their program.

For five of the permit programs, crowding was a major concern; this concern was not always associated with the conditions of the Wilderness Act. Additionally, concern for the public's safety was a rationale for four of the programs. At Denali NP, they were seeing an increase in the number of negative bear encounters. Figure 9 provides a list of all problems included in the programs' rationale.

5.2.3 Demand

High visitation, or demand, and its associated impacts, as discussed, are generally the central motivator for implementing a permit system. That said, it became apparent in interviews that demand can be a very fluid concept — demand is not necessarily flat, unchanging, or evenly distributed across an area. This is true before and *after* a permit program is put in place. Before a permit program is implemented, demand is close to synonymous with visitation; after a quota is

implemented, demand can exceed the number of people actually visiting. In either case, the temporality, geographical distribution, and level of demand can have a major influence on the design and success of a permit system.

For new permit systems, demand was shown to often affect a program's starting characteristics. Mount Rainier NP, for instance, was able to start with only first-come-first-serve walk-up distribution for their peak-season program because the level of demand was not exceeding availability. Another prominent aspect of demand for establishing a permit program is understanding when the peak season occurs. This is a major guide for most, if not all, peak-season permit programs.

Changing demand has also frequently been a reason why permit systems have changed over time. Even though existing systems already have a quota in place, depending on the program's design and what specifically is changing in regards to demand, managers may find that a program is not meeting the park's needs. Mount Rainier NP's peak-season permit program, specifically its permit distribution, has evolved significantly due to the growing **level of demand** for a permit. This increase in demand didn't necessarily affect park resources (due to the existing quota), but it did affect the management burden associated with implementation. For example, their lottery was initially implemented to accommodate the number of fax reservations coming in — it became difficult for staff to process these in a first-come-first-serve manner.

> "Demand continues to increase. We had more visitor nights in the wilderness this year than any previous year that we've recorded for. And we expect that to continue.
> – *Mount Rainier National Park*

Beyond the changing level of demand, shifting distribution can also challenge the efficacy of a permit program. Sequoia and Kings Canyon NPs are starting to struggle with visitor impacts again (i.e., the permit system is losing efficacy) because the **geographical distribution of demand** is changing. They have been finding that more people want to hike the name-recognizable regional trails. Because their system is based on the number of people starting at a specific trailhead each day, visitors are beginning to use a variety of trailheads, including ones not at these parks, to merge onto specific regional trails.

Another aspect of demand shown to influence programs is its **temporality**. The window in which the peak season occurs can change. Okanogan-Wenatchee NF initially shrunk the window in which their permit program was applied because there was often too much snow during the May and October ends of the permit period. Warmer climate conditions expanded the camping window leading to a rush of people camping in the area once the permit window ended. This can also be considered a 'balloon effect.'[9] As a result, the land unit expanded the permit window back to its original dates to cope with the changing temporality of demand. The temporality aspect can be applied to weekly fluctuations in demand, as well. It is generally assumed that weekdays receive lower demand than weekends. Sequoia and Kings Canyon NPs are finding that it can be an issue if this fluctuation doesn't happen — in certain areas, the quota is being maxed every night of the summer which is having negative cumulative impacts.

[9] The term "balloon effect" was also used by managers to describe the displacement of excess visitors when a visitor-limiting permit program is implemented. This is discussed in section 5.4.1.

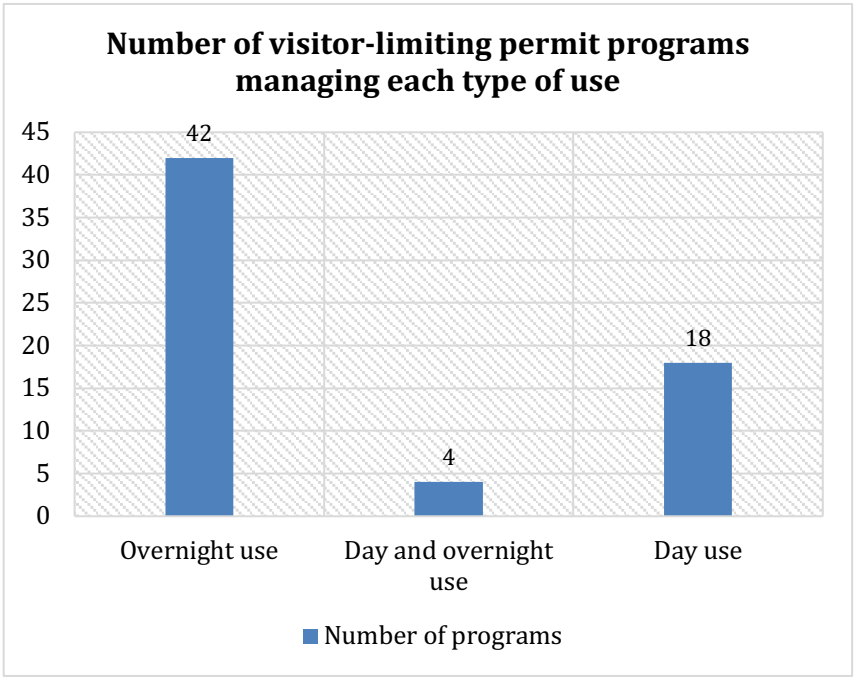
5.3 Program design — the system characteristics

5.3.1 Type of use

As stated previously, types of use that define a permit program can be sorted into three categories: day use, day and overnight use, and overnight use. This highly simplifies what is being permitted — day use can include anything from timed vehicle entry to hiking Half Dome in Yosemite. Nevertheless, these three categories offer a starting point from which to discuss types of use.

This study identified 64 different relevant visitor-limiting permit programs.[10] Out of these programs, 42 manage overnight visitor use only (Figure 10). Of the 15 programs for which more data was gathered through interviews, 11 were for overnight use and four were for day use. Very few programs apply to both day and overnight use as usually these two types of use are managed differently. For example, Deschutes and Willamette NFs manage day use and overnight use through two programs with different characteristics in response to the differing needs of these types of visitors. Having two different permit programs to manage day and overnight use for the same area is also uncommon.[11] The Deschutes and Willamette NFs' permit programs were the only of this kind identified by the study.

Figure 10: Types of use



With this in mind, an issue that can be experienced by land units that only limit overnight use is the impact of day use visitors. At Okanogan-Wenatchee NF, the manager interviewed identified their lack of visitor limits for day use as an impediment to the efficacy of their existing permit program. While initially the program was successful in limiting resource damage, with a significant rise in day use starting in the 2000s, it has become "hard to see the success story behind the overnight permit system." The number of day use visitors has also affected overnight visitors' experience. The manager at Okanogan-Wenatchee NF said, "I get a lot of low star, low bar comments like 'This is supposed to be a solitude experience. I paid for a permit. It's limited entry. Why is there a thousand people?'" Additionally, day visitors

[10] See Chapter III for information on what programs were excluded.

[11] "Same area" is a somewhat ambiguous term; in this case, it's meant in the sense that Deschutes and Willamette NFs have a day use and an overnight use permit program, both of which apply to the same grouping of wilderness areas, in other words, the "same area."

sometimes try to thru-hike in one day which extends the presence of day-use visitors into the night, further disturbing backpackers that are there for solitude. North Cascades NP has had some conversations about limiting day use in certain areas of the backcountry where visitation levels have gone beyond what the resources can reasonably handle. Mount Rainier NP and Arapaho and Roosevelt NFs both noted that the majority of impacts in overnight-use-limited areas are caused by day users. That said, managers at these units did not suggest a need to limit day-use visitors.

There is often a connection between the type of use being permitted and the permitted area, itself. Within four of the featured programs' permitted areas, land units adjusted the allowable uses both upon and after instating a permit program. Coconino NF decided to ban all overnight use at Fossil Creek for purposes of simplicity when implementing the permit program. Arapaho and Roosevelt NFs banned overnight use in a specific backcountry zone. Conversely, Sequoia and Kings Canyon NPs added zones for overnight use. They also added stipulations to two popular trails regarding which could be used as a thru-trail. Cleveland NF added a formal trail to Cedar Creek Falls which then defined the permitted area.

5.3.2 Time of year

There are two broad windows in which land units tend to apply a quota-based permit system. The first is during the peak season which is generally during the summer months and can extend into late spring and early fall depending on a land unit's climate. Twenty-eight of the 64 identified permit programs were found to apply just to the peak season. A visitor limit can also be applied to the entire year. This could mean the permit program is the same year-round, or there is a different peak-season and off-season program. Twenty-four permitted areas have the same program year-round; six permitted areas have separate peak and off-season programs (meaning 12 total programs).

Peak-season

Peak-season is the time of year in which demand is the highest. This could also be considered the level of demand that initially prompted the permit program. While this reduces the management burden in the off-season, it also relies on a certain level of predictability regarding when demand exceeds the level that can be accommodated (i.e., when peak season occurs). As with the case of Okanogan-Wenatchee NF, the peak-season permit window may need to be shortened or expanded based on climate conditions. This was a common theme among programs that only apply a quota-based permit in the peak-season.

Deschutes and Willamette NFs essentially moved the permit window so that their programs started and ended later. They found that the season started too early as people were rushing to get permits for areas that weren't accessible until late June which led to many frustrated visitors. Arapaho and Roosevelt NFs have faced similar challenges as the snow doesn't melt in some areas until July. While the peak season may start for one part of the wilderness in June, areas at higher elevation may not be desirable to the average visitor until later into the summer.

Deschutes and Willamette NFs also had the same 'balloon effect' as Okanogan-Wenatchee NF where there was an "incredible pulse of use immediately after the permit system ended" — this ultimately undid some of the benefits they had started to see from managing use during the permit window.

Some managers noted that there are varying factors as to why the peak-season takes the shape it does. While climate plays a major role in defining the window of high demand, the school year ending and changing outdoor culture can also impact this. Gifford Pinchot NF also noted that their permit program ends in early September now partly because of when the hunting season begins. At this time, the area tends to be used differently by different visitor types than those who go to the Lewis River Recreation Area for summer recreation.

It is worth mentioning that some land units that apply a quota only during peak-season still require visitors to obtain a permit for trips in the off-season. Sequoia and Kings Canyon NPs are an example of land units that do this. That said, this is beyond the scope of the study.

All year

The other 'window' in which land units may apply a quota-based permit system is all year. In other words, the quota exists in perpetuity. There are two ways in which this can occur. The first is by using the same permit program no matter the season; the second is by creating two similar, yet different, permit programs, one for the peak-season and one for the off-season.

A commonality between these two ways of applying the program is that staff tend to pay little to no attention to the quota in the off-season because there is generally no need to. This lenience, however, is not the case if the program is administered online in which the quota is automatically enforced.[12] Denali NP, which implements the same program year-round, noted that they have started paying attention to the quota, ensuring it is not surpassed, in the shoulder seasons as camping during those times has become more popular.

Denali NP's experience aligns with the rationale behind White River NF's all-year permit program — that is, temporally fluctuating demand is not an issue when the quota is already in place. For units that have a separate quota-based peak and off-season permit program, the off-season program may or may not be able to respond effectively to changing demand. For instance, some off-season programs, while still technically having a quota, allow for the self-issuing of permits. North Cascades NP had at one time distributed permits via self-issue when offices were closed (not necessarily just in the off-season), but they found that with increasing demand, there were people not paying attention to what camps were already at capacity, ignoring the quota. They eventually had to alter this system in response to changing demand.

One reason why a unit may use two different programs for peak and off-seasons is because the peak-season tends to have more centers open and staff available to implement a permit program. The window of Mount Rainier NP's peak-season permit program, for example, coincides with when wilderness information centers are open and staff are available to facilitate permit distribution.

5.3.3 Distribution

The following three characteristics are all distinct, but heavily-related, components of the distribution process — that is, how a program chooses to allocate permits within a program. For this reason, I have grouped these findings together under the umbrella of "Distribution."

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[12] An exception could be if a land unit does not input a quota in recreation.gov on dates that occur in the off-season.

Window of request

The window(s) of request, as referred to previously, is defined by the date upon which permits become available — the time thereafter being the 'window' in which the public can reserve or apply for a permit. These windows vary significantly among permit systems, and there is often more than one per program. Multiple windows tend to be used to balance visitors' preferences. Among the managers interviewed, there was a notable amount of consensus regarding the benefits and consequences of the different windows. Here, I divide the windows of request into three groupings: far-in-advance (more than one month from trip), close-to-date rolling window (between 24 hours and one month from trip), and day of/day before (within 24 hours of trip). The chosen release date within a window of request affects how much the positive and negative implications are felt. If a land unit is using more than one window, they likely overlap as generally permits, including those released pre-season, can be reserved up to the day of a trip.

> "For every letter we got saying, 'I want to be spontaneous,' we got another letter saying, 'I want to plan ahead.' It was really trying to balance these two.
> – *Deschutes and Willamette National Forests*

Far-in-advance window

The 'far-in-advance' window of request refers to a pre-season release of quota and/or rolling windows in which quota is released a specified length of time from each day, week, or month of the season(s) in which the permit is required. An example of this would be the six-month rolling window distribution system at Sequoia and Kings Canyon NP; each day quota is released for the corresponding, six-months-out starting date during the permit season. There are other rolling systems that, for example, release all permits for an entire month on the first of the preceding month. Pre-season is simpler in that a date is chosen prior to the start of the time in which a permit is required and a certain portion[13] of the quota for the entire season[14] is released all at once. Six locations said that a benefit of far-in-advance windows is that people who are coming from out-of-state or who need to plan are able to do so. Many people also like to have the certainty of knowing they will have a permit ahead of their arrival.

This type of window in particular can be affected by the time of year in which a program is implemented. Specifically, if a program applies to the entire year, the pre-season release of permits may happen three or four times per year. White River NF is one example. Cleveland NF takes a different strategy in which they release the permits for the entire year on December 1 of the prior year.

While far-in-advance windows of request do benefit certain populations, a couple managers mentioned that they can disadvantage locals or those who are more spontaneous or impulsive. Managers of seven of the 15 featured cases also referred to issues of equity; not everyone has the ability to plan months into the future or log onto recreation.gov at a certain time to reserve permits. Additionally, an observation that came up in a couple interviews is that when visitors reserve permits so far ahead of time, it can amplify the issue of no-shows, no-shows being permits that

[13] This could be some or all of the quota.
[14] The term 'season' when used here refers to a general duration of time during which the permit is required. This commonly is the peak-season, or summer.

were reserved but no one showed up to use them. Recreation.gov does offer some means to potentially mitigate no-shows in such a situation, but these have not necessarily been effective nor desirable solutions.

Close-to-date rolling window

Another window of request option is the close-to-date rolling window. This functions the same as the far-in-advance rolling window, but it grants those who can't plan far ahead to access permits. It can also allow the weather forecast to factor into permit reservations. At Arapaho and Roosevelt NFs, offering a 3-day-advance rolling window was their way to make up for no longer having day-of distribution. One consequence of a close-to-date rolling window is that if someone is planning a multi-day trip, more quota only gets released one day at a time — beyond the first day of the trip, only what's remaining of quota released in other windows would be available for reservation. Visitors still have the benefit, though, of knowing they have a permit ahead of time.

Day-of / day-before window

The final window of request identified by this study is day of or day before. If day-before reservation is available, it seems to generally only be offered in conjunction with day-of distribution. This study discovered the day-of/day-before release of permits as something that only seems to occur in person; this type of distribution can also be referred to as 'walk-up'.[15] Because this window of request occurs in-person, it can be challenging for some units to implement.[16] Despite the challenges, when walk-up distribution is utilized, there are a variety of benefits. Mount Rainier NP said that walk-ups can help maintain the spontaneity of a wilderness experience, and that releasing quota the day of allows staff to accommodate people who have already made reservations and have issues with their itinerary; at a location with designated sites, this can prevent a domino effect of problems in which changing itineraries in the absence of open quota could impact other visitors at their sites. Walk-ups also tend to benefit locals and can allow for the redistribution of no-show permits. Denali NP said that the primary consequence of the day-of release of permits is that visitors have no way to know or ensure their trip route ahead of time.

For the programs that apply to the off-season, walk-up permit distribution is common; in these cases, it is often the only window of request.

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If a unit does choose to utilize more than one window of request, they will need to decide what portion of the total quota to distribute during each window. For instance, North Cascades NP distributes roughly 60% through advance reservation and the early-access lottery while the remaining 40% is distributed through day-of/day-before walk-ups. A fixed percentage is not always used, though. Some units adjust the amount distributed in each window based on the individual quotas for trailheads or destinations. For the 2021 season of the Deschutes and Willamette NFs' day-use permit program, depending on the trailhead, 20-50% of the quota was released pre-season, and 50-80% was released during the 7-day-advance rolling window. This variation was attributed to the fact that some quotas are very small — given the quota is based on the number of people

[15] Permits that have already been released are generally still reservable online the day of a trip.

[16] This is further discussed in the "Mode of distribution" section.

(rather than groups), only a couple of quota spots being released pre-season would make it hard for a group to reserve during that window of request.

There are also cases where specific quotas, tied to trailheads or destinations, are only available through one window of request whereas others in the same permit program may be offered through multiple. Sequoia and Kings Canyon NPs and Rocky Mountain NP are two locations that have specific trailheads or sites that are only available through walk-ups.

Type of distribution

There are two main types of distribution used by land units: first-come-first-serve (FCFS) and lottery. Of these two, the type that a land unit chooses for their permit program was shown to be heavily dependent on the level of demand experienced by the program area.

First-come-first-serve distribution

FCFS distribution tends to be the default starting point for permit programs. If demand exceeds what can be more easily managed through this type of distribution, then locations may switch to a lottery for at least a portion of their distribution. This is what occurred at Mount Rainier NP. Rocky Mountain NP indicated that a lottery was something they would consider upon demand exceeding supply (which hasn't happened yet). There are examples, though, of places that have high demand for certain locations within a program area but haven't instated a lottery, Sequoia and Kings Canyon NPs being one example.

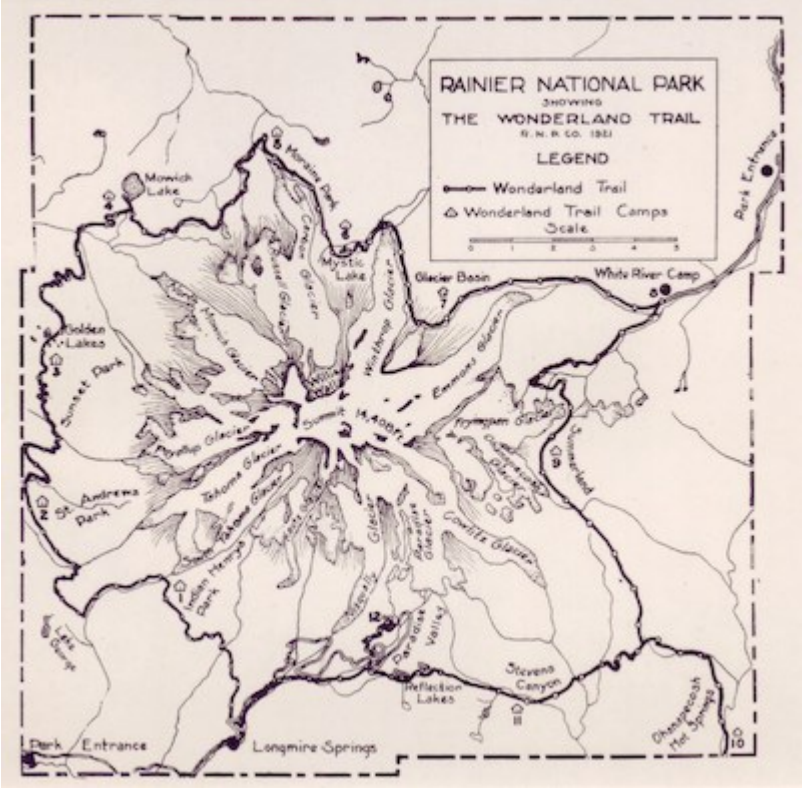

Figure 11: Map of the Wonderland Trail in Mount Rainier NP (NPS Archive, n.d.)

The primary benefit identified for FCFS distribution is that it is generally simpler to implement than a lottery. This was a reason for White River NF first implementing their permit program with FCFS distribution, with the idea that they would wait and see if demand would prompt the need for a lottery. Stemming from this, the consequences identified for using only FCFS distribution are largely related to the level of demand an area experiences. A common reality of FCFS systems in conjunction with high demand is that upon releasing permits for reservation, quotas can be maxed within minutes. When this occurs, land units can decide whether or not it's a concern. Sequoia and Kings Canyon NPs see it primarily as an issue for visitors, an issue that is mostly based on

perception. Before distribution moved online and people faxed in their applications, some quotas would still be maxed immediately, but visitors would not be able to see the real-time availability, so it was not perceived as problematic.

Mount Rainier NP has experienced more issues with FCFS distribution because of the in-high-demand Wonderland Trail itinerary, shown in Figure 11. This itinerary requires visitors to reserve a continuous connection of campsites to make the full loop. If there were a "free for all" via FCFS distribution, someone might be halfway through planning their trip on recreation.gov and find that there are not any campsites available on the right day at the necessary location. There is also some concern regarding the server's ability to handle the number of people that would be logging on at one time to reserve their permit in a FCFS scenario.

Lottery distribution

Of the 64 permit programs identified by this study, 10 of them use a lottery in conjunction with FCFS distribution, and two of them use only a lottery for distribution. Managers of three of the programs that utilize a lottery/FCFS combination were interviewed; none of the programs that only use a lottery were covered by this study. For this reason, even the programs identified as only using a lottery distribution may have an unadvertised FCFS in-office redistribution of no-show permits.[17] When FCFS distribution is used in conjunction with a lottery, the FCFS component can act as a means to distribute any unclaimed permits leftover from the lottery. FCFS is almost always used if a unit offers walk-up permits; the exception to this being the walk-up lottery at Okanogan-Wenatchee NF. Lotteries tend to occur pre-season.

There are two primary types of lottery distribution. For both, there is a window during which someone can submit an application. For the traditional type of lottery, the application visitors submit includes a ranking of their desired itineraries or locations and dates.[18] The other type of lottery is called an "early-access lottery'' in which, rather than winning their desired trip, visitors are allocated a time when they can log on to recreation.gov for 'early-access' to reserve a permit. Both lotteries are ways to cope with high demand.

Lotteries do come with a variety of consequences or challenges, the primary being that they can be difficult to manage. There are several particularities of a lottery that managers may need to consider. The first is that, in the absence of limitations, people are incentivized to submit multiple applications to increase their odds of winning. North Cascades NP had an extreme case in which an individual submitted dozens of applications; the manager said the applicant "spent hundreds of dollars, and he got all the sites he wanted, and we said, 'Do you really want to go on 30 trips?' He was like, 'No I just wanted to go on these two,' but he wanted to increase his odds." This kind of issue can be prevented by putting limits on the number of applications people can submit, something that Okanogan-Wenatchee NF has incrementally made more restrictive. The manager interviewed at that forest referred to the significant amount of effort that goes into ensuring that applicants abide by these rules around limits. Additionally, a lottery can encourage larger groups to

[17] This is not a statement of likelihood or opinion; I am merely identifying a limitation of not being able to verify information in an in-depth interview setting.

[18] What a visitor ranks depends on the other characteristics of the program. For instance, a location that uses designated campsites would require a visitor to create full itineraries for their first, second, third, etc. choices. A location that has a starting-point quota would only need applicants to submit their possible desired starting points.

apply or result in larger groups winning permits as each member of a group can submit the maximum number of applications, increasing the group's odds of winning.

While most of the consequences and benefits of a lottery apply to both traditional and early-access lotteries, Mount Rainier NP did mention that with the early-access lottery, because applicants are in it to win time slots, "you might win the lottery and still not get your trip." This comes with the challenge of determining how many people should be allowed to win the lottery, providing enough opportunities while minimizing the number of people that may come away disappointed with what they ended up with.

Mode of distribution

The mode of distribution, or platform/setting through which permits are distributed, can take on many different forms. Although, online and in-person distribution are by far the most common. Fifty-four of the 64 programs offer some or all permits through an online platform; 28 offer some or all permits in person.[19] Fax and mail used to be the stand-in for what is now online distribution — they were the primary ways for land units to offer advance reservation. Reservations via phone are currently the third most common mode of distribution; that said, this form is only used by five programs.[20] Phone distribution tends to be an auxiliary form of distribution. For example, North Cascades NP distributes permits for their cross-country zones in person or over the phone, rather than online, because they want visitors who are going on more challenging trips to talk to a ranger first.

Because they are the most common, below I outline findings regarding online and in-person distribution.

Online distribution

Before diving into online distribution's benefits and consequences, it would first be pertinent to start by talking about the online reservation platform most often used by land units — recreation.gov. The National Park Service has made a big push for their land units to switch to this website. This is a switch that a couple of the featured permit programs have made in the past few years. There are some commonalities among land units' experiences with the platform. The first is that its ability to provide the kind of reservation system needed for wilderness permit programs has evolved over time, for the better. The new contractor has been good at working with units and accommodating their preferences. Yet, there are still some limitations in that it can be difficult to build nuanced reservation systems, and the site currently has limited ability to disseminate spatial information for the wilderness or backcountry as these areas are much more different spatially than a standard campground.

Not all programs started out online with recreation.gov; some used their own in-house online platform. Given this perspective, Rocky Mountain NP said that a benefit of moving to a new platform has been that people can see availability easily; however, the website also isn't as specialized to the unit's needs.

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[19] The 28 does not include programs that just have in-person permit activation but no in-person distribution of permits.

[20] It may be unofficially used by more.

All of the permit programs in the study except for Denali NP distribute permits online. Managers of three featured programs talked about how online distribution can reduce the management burden; one manager said it can accommodate a level of demand that other modes could not. Online distribution has also made rolling windows possible as well as the processing of refunds. Additionally, more rangers can be in the field enforcing the system rather than being in the office processing requests or distributing permits. White River NF mentioned that it was a difficult decision to have the program be entirely online, but given their limited ranger personnel, they wanted as many staff as possible in the field. In an intersection with advance-reservation windows of request, another benefit of distributing online is that people are able to know they have a permit ahead of arriving.

The managers interviewed referred to several consequences of distributing online as well. Three of the interviewees mentioned the loss of education that comes with a lack of in-person interaction. This can impact the reasonability of visitors' itineraries in accordance with their skill level and experience. Related to this, some managers have noticed that it can be difficult for the public to fully understand the geography/topography of an area when looking at maps online. There are also safety concerns that come with a loss of education. Arapaho and Roosevelt NFs said that in the Rocky Mountains, along the Continental Divide, afternoon storms frequently occur. If hiking a route crossing the divide, visitors need to know to start hiking at a certain time, so they aren't at the pass when the lightning storm begins. Having an in-person interaction with visitors had allowed the forests to ensure visitors knew this information — the manager said that people often miss important information when it is only presented to them online. An additional challenge with communicating information via an online platform is that not everyone has the same level of familiarity with terminology. An example the manager used was "tree down." Someone may deduce what this means and still not quite understand the significance of it. There have also been problems with people not understanding how the permit system works when they are reserving permits online — this has been the source of errors in some cases. Okanogan-Wenatchee NF added that with a loss of in-person interaction, there has been a reduction in wilderness stewardship, causing more resource damage.

The managers interviewed have implemented a number of at least partial solutions to mitigate some of the challenges with online distribution. One solution is to require people to talk to a ranger in person or over the phone if they want to do a more challenging trip, reducing some of the online education burden. This is what North Cascades NP did, as referred to above. This is along the lines of reserving certain quotas to be released for day-of walk-ups. There is also the option of requiring all visitors to activate their permit by talking to a ranger either in person or over the phone. This can help maintain some of the education involved with in-person distribution.

There are other ways to cope with the loss of education which don't involve an in-person aspect. For areas with designated sites, a strategy that Mount Rainier NP used when they went briefly entirely online was to leave some quota unfilled to allow for people to adjust their itinerary in the field as needed. Another tactic that recreation.gov accommodates for an itinerary-based permit is to limit the destinations visitors can select each night based on the distance it would be from their previous destination. This can prevent unreasonable itineraries. Land units can also provide educational videos, either mandatory or non-mandatory. In White River NF's experience, the video has not needed to be mandatory for people to still watch it. Hiring more rangers to help inform and educate visitors in the field is another strategy.

In-person distribution

In-person distribution was shown to have many benefits. Seven of the 15 featured case studies have some level of in-person distribution. A theme regarding the benefits of in-person distribution is that it helps ensure visitors plan a trip that matches their skill level and interests and that they receive necessary education. This is owed to the fact that, in person, visitors have the advice and guidance of rangers. Mount Rainier NP referred to the importance of this as visitors need to be able to stay on itinerary, so they don't impact other visitors at designated sites. Sequoia and Kings Canyon NPs offer certain locations only in person because of their less desirable nature — in-person distribution can help guarantee that people's expectations align with the trip that they've planned. Additionally, Denali NP which temporarily used entirely email for reservations during COVID-19 (2020-2022) has otherwise always had only in-person, day-of distribution. They found that in-person distribution allows for more efficient communication between the staff and visitors. Sequoia and Kings Canyon NPs also said that offering permits in person was a way to cope with the limitations of recreation.gov in accommodating variations within a single program. This is especially relevant for their permit program due to its destination quota among an otherwise starting-point-based system.

Managers interviewed mentioned two primary consequences of in-person distribution. One is that it takes a lot of staff time. National forests especially referred to a lack of resources and few staff as a key issue. Furthermore, a certain amount of infrastructure is required for in-person distribution. Coconino NF cited this as a challenge for offering permits in person — there are no Coconino-associated visitor centers near the program area. Another potential challenge is that in-person distribution cannot necessarily accommodate high demand in the absence of other modes of distribution.

Tangentially related to the in-person-mode of permit reservation is when land units require visitors who have already reserved their permit to meet in person with a ranger to activate it. The above discussion on in-person distribution specifically relates to when new quota is released for only in-person distribution; in-person activation of a permit can have some overlapping benefits and consequences, but they are not all the same. For example, when visitors only activate their permit in person, they already have their trip route; there isn't the benefit of getting advice from rangers. Nevertheless, Sequoia and Kings Canyon NPs and Mount Rainier NP use in-person activation to verify that visitors' trip routes and skill levels align. If permit activation is used in conjunction with a day-of release of quota, unclaimed quota can be used to make some adjustments. Okanogan-Wenatchee NF, when the unit was still requiring in-person activation, received a lot of benefit from having an in-person interaction with all users in order to provide education regarding stewardship.

Another benefit of in-person activation is that it allows for the verification of no-shows which can subsequently be redistributed. Sequoia and Kings Canyon NP found that this is something that users familiar with the park tend to enjoy.

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It is also worth noting that the mode of distribution tends to be significantly related to the window(s) of request used by a permit program. For instance, during the COVID-19 pandemic when many visitor centers closed, at several land units day-of distribution was temporarily shut down because in-person distribution was not occurring.

5.3.4 Quota

The quota could be considered the capacity implemented by a permit program, the 'capacity' being the number of people or vehicles that can be in a specified location at a specified time without causing excessive visitor impacts. However, it was found that having a quota does not inherently entail determining the capacity of the program area. In regards to the number of designated campsites, and by extension, the limit on the number of groups, a manager at Mount Rainier NP said, "How did we come up with these numbers? And it tends to be whoever was working at the time said, 'well, we need this many, and let's add a couple more.'"

> How did we come up with these numbers? And it tends to be whoever was working at the time said, 'well, we need this many, and let's add a couple more.
>
> – *Mount Rainier National Park*

Whether or not a strict 'capacity' has been established, land units have tended to adjust and adapt their permit program's quota in response to observed site conditions. For instance, Cleveland NF halved the quota available in response to the COVID-19 pandemic. At White River NF, as a result of moving one of the designated sites to a lower-capacity location, they reduced the allowable group size for that site. This, however, did not affect total number of groups allowed in the zone. Additionally, some managers have made the intentional decision to put their quota(s) above or below the level of use that can be reasonably accommodated. Offering more quota than the acceptable level of use is a tactic that some locations use if they have issues with no-shows. This is the same kind of logic that airplanes use when over-selling seats. When a program offers less quota than the acceptable level of use, this can be a way to leave room for error. Mount Rainier NP has done this as a way to allow room for adjusting itineraries in the field, a need that was particularly relevant when in-person distribution had stopped during the pandemic.

A quota on its own is not a characteristic of a permit program; instead, several interrelated characteristics compose the quota. Essentially, a quota is given meaning by the location in which it's applied to, the units through which it's defined, and whether there are designated sites. Quota-related characteristics are perhaps the messiest to define and discuss due to their complexity and nuance. In any case, categorizing the quota into different characteristics offers a lens for studying and ultimately applying it.

Quota unit

In the process of defining a quota, the quota must be associated with a 'unit'. This unit is not always the same unit that was used to define the capacity. In relation to visitor limitations, this study identified three units of measurement that locations have used — the number of people, groups, and/or vehicles.[21] The quota unit was not a characteristic that came up in every interview, nor when it did come up was there necessarily a definitive rationale for choosing one unit over another. At the same time, there were some cases where there was either clear rationale or clear impacts

[21] A per-person quota is the reason why the words "quota" and "permit" cannot always be considered synonymous. If a group of five reserves quota, they would be reserving five quota spots, but likely only receive one permit.

based on the chosen unit. For this reason, this section is organized through a series of examples rather than a list of benefits and consequences for each type of quota unit.

Okanogan-Wenatchee NF's program is one such example where clear impacts were seen as the result of the quota unit chosen. When the Alpine Lakes Area Land Management Plan was written, it defined a specific capacity for the number of people that could be present in each zone at one time. The unit then worked backwards from this number to identify the number of people that could be allowed entry into their destination zone each day; using the maximum group size of eight people, this was then converted into the number of groups, identifying the group-based quota (e.g., 16-person daily quota becomes a 2-group daily quota). The land unit found that for the Core Zone, this quota allowed for only a couple groups to enter each day due to the low capacity of the area. The Core Zone, however, tends to receive relatively small groups. If only two group permits were available and there were two people in each group, only four people would be entering the zone despite the fact that sixteen people could enter while still minimizing resource impacts. The manager at Okanogan-Wenatchee NF said, "we always had way too many group permits available up there for that reason." Compensating with a higher number of group permits, though, meant the unit could not as easily control the number of people to ensure visitation was staying within the limits of capacity. As a result, the impacted area was not meeting wilderness standards, nor was resource damage being effectively mitigated. When recreation.gov switched contractors towards the end of the 2010s, the land unit was able to specify that just the Core Zone would be managed through a per-person quota. This person-based quota has allowed the forest to maximize the number of visitors present in the zone while minimizing resource damages through greater control over visitation levels.

White River NF, like in most zones in Okanogan-Wenatchee NF, implements a per-group quota. A key difference between the two land units, though, is that White River NF has designated campsites. The per-group quota identified for the permitted area is based on the number of acceptable campsites. However, the forest found that at 20 campsites, with their current maximum group size of 10 people, that would put them at a higher allowable visitation level (200 people) than the zone had yet experienced. In this case, they established group size limits for each site based on its size. When the land unit expands its permit program to apply to other zones, in the zones that don't have designated sites, they intend to have a small-group permit and a large-group permit to "turn the faucet down in a different way in those areas."

For Deschutes and Willamette NFs which don't have designated campsites, their per-group quota is a way for them to align the number of groups camping with the number of acceptable campsites. One of the managers emphasized, "Really, whether there's one person using that campsite or six people using the campsite, that campsite is the biggest impact to that area, and people tend to camp as a group."

Denali NP's program is different in that the backcountry is mostly trailless — there aren't necessarily specific 'acceptable campsites' that the park is wanting groups to stay at.[22] The program has a per-person quota; the manager interviewed expressed, "the more people walking around a campsite, the more vegetation damage you're going to do, the more impacts you're going to have."

[22] In one high-use zone that has a trail going through it, they are starting to see more camping impacts. In this area, they sometimes suggest visitors look for certain (unofficial) campsites.

The rationale for the quota unit used for day trips can be somewhat different; Deschutes and Willamette NFs noted that the type of use played a role in the day-use program having a per-person quota. Having this type of quota can maximize the number of day visitors, giving more opportunity and flexibility to people. In contrast, Cleveland NF uses a group-based quota. The land unit emphasized the benefit that a group of people can visit without worrying about having reserved the correct number of quota spots. The manager said that having a group-based quota was with the intention of accommodating "the number of people that fit into the average car." This ties into the programs that are based on the number of vehicles. Vehicle-based quotas are almost always applied to day use. The two vehicle-based programs in this study are at Coconino NF and Gifford Pinchot NF. Both of these areas are ones where the capacity of parking lots was a major concern, and the number of parking spaces was a clear capacity that could be implemented.

While this study identified these three clear quota units — people, groups, and vehicles — there are some programs which combine two of these. As in the case of Okanogan-Wenatchee NF, this combination can mean that varying zones within the permitted area have quotas based on different units. However, there are also cases where units are combined within the same quota location. For example, a couple permit programs have designated 'camping areas' (which function like designated sites) in which the quota is based on whichever limit is reached first, the number of people or the number of groups. This 'whichever-maxes-first' tactic is common among the programs that combine units in this manner. Because no such programs were interviewed, I can only offer speculatory analysis which is included in Chapter VI.

Quota location

The quota location refers to the area or point where a quota is applied; this was shown to be heavily related to the type of use being permitted. Quotas can be applied to a destination, starting point, or a whole area.

Destination quota

Destination quotas/permits are also often referred to as itinerary-based permits. These types of permits dictate, in some form, a visitor's destination; for overnight use, this destination is the location at which visitors are supposed to stay the night, or camp. The destination tends to be defined by a zone and/or site. Zones are often established in backcountry or wilderness areas; they can be used to determine geographically appropriate capacities within the program area. While destination-based quotas technically could be applied to day use, none of the day-use programs identified by the study utilized this type of quota location (Figure 12).

> "Last summer, when there were fires in the park, and we had to close certain areas, the permit system allowed us to really easily track who's out and when they're supposed to be back.
>
> – *North Cascades National Park*

A benefit of having destination-based permits is that rangers are able to know where visitors are in the case of an emergency. North Cascades NP said, "last summer, when there were fires in the park, and we had to close certain areas, the permit system allowed us to really easily track who's out and when they're supposed to be back." Destination quotas also may be necessary for the landscape, to help control use patterns. At Sequoia and Kings Canyon NPs, the destination quota is in place at an area with no soil — partly to manage capacity at that specific location because of the need to provide some infrastructure like outhouses.

There are a few downsides associated with destination quotas. One is that they require visitors to stick to an itinerary. As one manager stated, "It can turn a leisurely exploration into a death march to the next camp." At Okanogan-Wenatchee NF, visitors can only stay in one zone for their entire trip, but because it can be difficult to get to the Core Zone, users with Core Zone permits can stay in other zones which can prevent a "death march" scenario. Destination quotas can also alter the wilderness experience, preventing unconfined recreation.

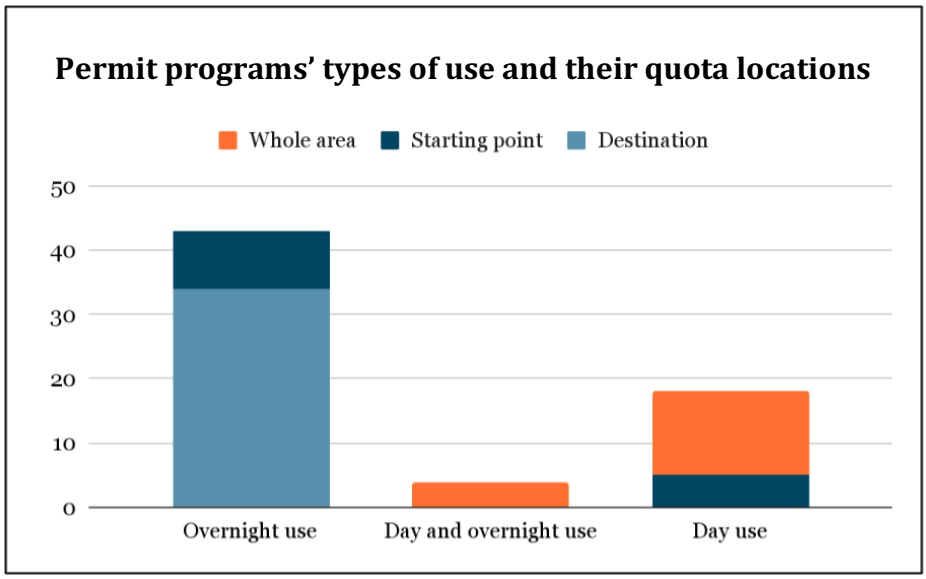

Figure 12: Permit programs' types of use and their quota locations

This type of quota location can be highly complex especially for large areas. Sequoia and Kings Canyon NPs described the potential complexity as being "off the charts," given the size of the area and the number of regional trails going through the units.

Starting-point quota

Starting-point quotas place a limit on the number of visitors at a trailhead or parking lot, generally speaking. They can apply to day and overnight uses. Nine of the 42 overnight-use permit programs and five of the 18 day-use permit programs use a starting-point quota (Figure 12).

> Our intent with that [trailhead quota] was to try to essentially do all the confining before your trip started, but once you're in the wilderness, once you had gone through that trailhead, you were free to travel wherever you wanted.
>
> – *Deschutes and Willamette National Forests*

Gifford Pinchot NF specifies the parking lot at which visitors must park in the Lewis River Recreation Area. This distributes visitors and prevents people from all parking at the most popular location along the river. For wilderness areas, managers of five of the featured programs noted the high quality of wilderness experience and freedom that comes from only dictating visitors' starting point. One added that this type of system can be simpler to administer and is generally easy for the public to understand.

With starting-point-based permit programs, specifically in wilderness or backcountry areas, managers have to predict where users are going to end up in order to make an appropriate quota for the trailhead. Deschutes and Willamette NFs have starting-point-based programs, but they determined their trailhead quotas using an extensive campsite inventory in conjunction with historical use patterns. This, however, leads into one of the consequences of this type of quota — that is, user patterns change over time. This is an issue that Sequoia and Kings Canyon NPs are experiencing; while visitors are starting at a variety of trailheads, their use is concentrating on name-recognized,

bucket-list trails. The manager interviewed emphasized that the system is no longer working as it should because of this.

There are some potential solutions to some of the issues that come up with starting-point quotas. One is to be adaptive, to respond to changing user patterns and implement a plan that allows for this. Another is to keep the quota at less than the identified capacity, so that not all acceptable campsites are occupied; this leaves some room for error in predicting user patterns. Lastly, an idea that Sequoia and Kings Canyon NPs have considered is to create more than one type of entry quota — one for local trips and one for regional trips to better manage the different user groups.

Whole-area quota

A whole-area quota is the third type of quota location identified. "Whole area" means one quota is applied to the entire program area. This study identified 17 whole-area-based permit programs; many of these related to vehicle-entry permits which were not a priority focus of the study (see Chapter III). This type of quota location was prominent among combined-use and day-use permit programs (Figure 12). Cleveland NF is the only whole-area-based program for which an interview was done. As a result, this study did not gather enough data regarding this characteristic to provide much in the way of grounded findings. Chapter VI includes some observations and speculatory explanations for why this quota location is used instead of one of the other two.

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The days of a trip for which a visitor must reserve quota is a key facet of the quota location. There are two primary options for multi-day trip planning — visitors either need to reserve quota just on their date of entry or for every day of their trip.

Having visitors reserve quota for their entry date only is most commonly used with starting-point-based quotas. The entry-date-only approach can allow visitors more flexibility; it can also prevent no-shows from impacting visitor opportunities beyond the first day. However, this method can make it more difficult to monitor and control visitor use patterns.

The other option, having visitors reserve quota for every day of their trip, is most often used with destination-based quotas. Deschutes and Willamette NFs, when they required this, found that people were overbooking their trip length. It also caused no-shows to make a greater impact by taking away opportunities from other visitors — if a no-show happens under the current (entry-date-only) system, the impact is confined to one day. Furthermore, when visitors need to reserve quota for every day of their trip, this can cause issues for trip planning if the middle days of a desired itinerary do not have any availability.

Designated sites

Designated sites are included as their own characteristic because, while they are almost always associated with destination quotas, this is not an inherent association. Of the programs identified by the study, 34 of them have designated campsites in all or some zones; 30 of these programs use entirely destination quotas. When designated sites are used, they essentially define the quota. These sites may or may not be dictated on a visitor's permit.

In the program areas that have designated sites in only some zones, these sites feature in two diverging ways. In some cases, such as Arapaho and Roosevelt NFs and Sequoia and Kings Canyon NPs, the designated sites are not a defining feature of the permit program and could even be considered an exception to the norm. In such instances, there is generally a specific reason why those areas have been chosen to have designated sites. At Arapaho and Roosevelt NFs, the zones with designated sites are usually relatively small and, in most cases, include a lake. They have found that there can be a lot more resource damage around lakes; the designated sites help manage this. At other locations, including Mount Rainier and North Cascades NPs, designated sites are a defining feature of the programs — the areas without designated sites are the exception. In the programs where this is the case, the zones without designated sites are often called "cross-country zones" and are in some ways a means to still intentionally provide unconfined recreation, as is the rationale for the program at North Cascades NP.

This study identified numerous benefits associated with using designated campsites. Managers for eight of the featured programs said that designated sites reduce campsite proliferation and concentrate impacts. As North Cascades NP put it, "having people camp in one spot and have that be the kind of sacrificial area, per se, was the initial idea of the program." Some locations offer minimal infrastructure in order to further concentrate or control impacts. Rocky Mountain NP, for example, offers a tent pad at sites, and Mount Rainier NP provides outhouses. Designated sites also ensure people are camping in sustainable locations (e.g., 100 feet from water). Other land units indicated they now spend less time restoring sites and that rehabilitation has become easier. In the past, White River NF had to rehabilitate some areas after every peak season; upon implementing the permit system, a "massive rehab effort" was undertaken which has had a lasting impact. While somewhat of a niche benefit, Sequoia and Kings Canyon NPs have also found designated campsites to be useful for separating user groups, particularly in an area adjacent to one of the High Sierra camps.

> Having people camp in one spot and have that be the kind of sacrificial area, per se, was the initial idea of the program.
> – *North Cascades National Park*

Visitors can also receive some benefit from using designated sites. North Cascades NP said that it guarantees users will have a spot to camp, especially since their terrain can be pretty limiting. If a program chooses to designate a specific site on a visitor's permit, visitors are able to ensure they will get a spot they want ahead of arriving. White River NF described visitors, prior to the permit program, "racing up the valley to get their site." Denali NP said that if designated campsites were implemented, it could serve the inexperienced user group who would benefit from some additional infrastructure. Mount Rainier NP provided this as a reason why they do not openly advertise the trailless cross-country zones — they don't want people who need some structure and support ending up camping in an area that requires greater skill and knowledge of wilderness stewardship.

Several consequences or challenges can result from incorporating designated campsites. One challenge is that the land unit becomes responsible for the state of the site, an example being the presence of hazard trees, and maintaining any provided infrastructure. Additionally, having an itinerary can detract from the wilderness experience by reducing flexibility and freedom. Mount Rainier NP also stressed the domino effect that can occur when visitors get off itinerary.

> "We absolutely depend on rangers in the field to resolve issues with people's itineraries and help people when they get off their itinerary, to rewrite their itinerary, figure out a way to

> accommodate them without them bumping out somebody else from their campsite and keep them from having to camp in a meadow or in an undesignated site."

Another challenge that can come from designated sites is determining how to spatially distribute them in such a way that bottlenecks are avoided. Mount Rainier NP has especially dealt with this issue since many of their prospective visitors are focused on completing the Wonderland Trail circuit.

It is also worth noting that some permit programs require visitors to stay in 'camp areas.' More than one group can camp in these areas. No program with camp areas was featured in this study, but Chapter VI provides some speculative implications.

5.3.5 Cost

The final characteristic identified by this study is the cost of a permit. The fees that programs charge can vary significantly. For instance, Denali NP charges nothing for a permit whereas Olympic NP charges $6 plus $8 per person per night. For any land unit that uses recreation.gov, a reservation fee is associated with the permit. This fee is charged and retained by recreation.gov and does not contribute to program administration. The reservation fee can be negotiated and varies depending on the activity. Depending on the agency, a land unit may have little control over whether or not they can charge anything beyond the reservation fee.

Deschutes and Willamette NFs had intended to charge a fee, but their proposal was denied by the Resource Advisory Council; the Council felt that the staffing and services on which the revenue would be spent did not provide enough benefit to the public to merit charging a fee. The fee was "part of what drove the design and the overnight quota, thinking if people are paying a fee, they'll plan their days pretty close to what their trip is." Because the system had already been designed, the first year of implementation used this system that had been based on charging a fee. As a result, for the following season, the land unit found they needed to adapt certain characteristics to be more effective or appropriate for mitigating no-shows in the absence of a fee. That said, Mount Rainier NP is beginning to find a fee is not enough to discourage many of their users from reserving quota they don't intend to use.

Beyond preventing no-shows, fees can greatly benefit a land unit's ability to effectively administer a permit program. This was a point that Okanogan-Wenatchee NF emphasized. Some interviewed managers also mentioned that charging a fee for a permit is a reality of how federal budgets are structured. A manager at Mount Rainier NP said, "I think that, in general, the agency's moving toward more of a fee-funded approach, and I wouldn't be surprised if 10 years from now, or five years from now, we have a per-person, per-night fee and less of that appropriated base money." Land managers can be in a complicated position when they choose to implement a fee — that is, the funds are needed to successfully manage the land unit, but nobody really wants to (or always can) pay. Okanogan-Wenatchee NF described the public's response to charging a fee:

> "I'm constantly being berated and get nasty emails all the time about how terrible the system is and how unfair it is and how I shouldn't be charging and so that's a challenge for me. I don't think people understand what goes on behind the scenes to implement the system and to keep the Enchantments looking good. And I need that funding to fly toilets out because it costs me $12,000 to fly out human poop."

Managers have many concerns regarding the equity implications of a permit's cost and "pricing people out." This is discussed more in section 5.4.3.

5.4 Implementation

The implications of implementing different program characteristics have been assimilated throughout this entire chapter. This final section identifies and further develops some of these themes of implementation — particularly those that were prominently discussed during interviews.

5.4.1 Initial implementation — the pilot period

Six of the featured permit programs in this study began in the 2010s and '20s, meaning that several of the interviewed managers of these programs were involved with designing and implementing their respective system; this in some cases, provided particular nuance to the conversation and insight that might prove valuable for others in similar positions. Additionally, at the end of every interview, managers were asked "If you were to give advice to others considering a permit program, what advice would you give?" Some of the answers to this question, along with their context, are incorporated below.

Deschutes and Willamette NFs and Gifford Pinchot NF are the land units still in what one could consider the 'initial implementation' phase, having first implemented their programs in 2021. They expressed similar attitudes towards this stage, namely that the first year was a learning experience, and they had expected there would be some issues to resolve. Deschutes and Willamette NFs went into the first year "knowing that there would be things that surprised us and ways that people use the permit system that we wouldn't necessarily see and know until we had at least a year under our belt." For their permit programs, the issues were obvious pretty quickly, resulting in some big changes to the system for this coming season.

> "I think one of the things that I learned is some of the very early decisions in developing a system or a program — I don't know that I necessarily could fully see what that small decision was actually going to mean at the end.
>
> – *Deschutes and Willamette National Forests*

In terms of foundational elements to the process of designing and implementing a permit program, a few managers referred to the importance of considering what management plans and legislation say about their responsibilities for an area and their priorities in implementing the program. Additionally, Sequoia and Kings Canyon NPs underscored the importance of thinking about the long-term success and applicability of the permit program and to build flexibility into the management plan. This flexibility could mean listing in the plan potential actions that could be taken if the permit program, in its original form, is no longer promoting desired conditions. The manager at White River NF expressed how the adaptive management plan out of which the permit program was born has provided the ability to respond to any issues that come up.

Regarding the process of choosing what form the permit program takes, some common practices in the design process can inform decision-making or influence implementation. The most prominent of these is taking advice from other land units that already have a visitor-limiting permit program. Gifford Pinchot NF, for example, used Coconino NF's permit program as one of their models, taking some of the lessons learned from Coconino NF's experience with implementation and applying it to their program. Taking advice could also involve looking to nearby land units if any have a quota-

based permit program. This keeps the region consistent which can help visitors more easily navigate the system. Deschutes and Willamette NFs found that introducing new versions of system characteristics (not found in any other permit system of this type) caused some confusion among those seeking to reserve a permit. Specifically, challenges arose from the units' decision to have visitors reserve quota, withdrawn from their original starting point, for every night of their trip.

The ways in which a land unit already manages certain areas can also inform decision-making. For example, Deschutes and Willamette NFs already had two small limited-entry areas in the wilderness areas; one of the managers said, "Based on the experience we had with those and managing those, we, in many ways, just took the systems and scaled them up drastically to the whole wilderness." White River NF offers another example of existing management impacting decision-making. The Conundrum Hot Springs Zone already had established designated sites at which visitors were directed to camp. It was logical for the forest to incorporate these sites into the permit program; they were already hardened, and visitors were used to them.

Implementing a relatively simple permit program initially and working up in complexity over time has also been common for land units. This could include expanding the program geographically, such as at Sequoia and Kings Canyon NPs where the permitted area grew zone-by-zone over the course of several years. It could also involve altering the system characteristics, for instance, adding more windows of request, implementing different types of distribution, etc. A manager at Gifford Pinchot NF observed that their permit programs tend to evolve from having a window of request that releases all the permits at once, pre-season, to more complex windows of request later on.

In choosing the permitted area, it can be important to keep in mind the 'balloon effect' — this is essentially the idea that when one location restricts visitation, visitors will 'balloon' out to other areas. The manager at Arapaho and Roosevelt NFs particularly emphasized this: "If you're looking at setting a permit system up, try to anticipate where that use is going to go. Where does that displacement go? Because it doesn't go away." Neighboring Indian Peaks Wilderness is James Peak Wilderness which does not have a limit on the number of visitors; the manager at Arapaho and Roosevelt NFs noted that the visitation the Indian Peaks system has 'displaced' likely goes to James Peak. The balloon effect can also occur within a single area. White River NF, for example, only restricts visitation within the Conundrum Hot Springs Zone of the wilderness area. The manager interviewed said that they have seen some people camping just below the permit zone boundary. As of yet, this has not had any major impacts, but it's something they are monitoring.

5.4.2 Common issue: no-shows

No-shows refer to those who reserve a permit, don't cancel it, and end up not going on their trip. This can be seen as an issue because it takes opportunities away from others who may want to access the space. Regardless, it is up to the land unit to decide if no-shows are something to be concerned about — the manager at Cleveland NF was relatively unconcerned about no-shows. They said that having a certain number of no-shows allows rangers to occasionally be more flexible with enforcement in the field. Mount Rainier NP noted no-shows as a major problem; the manager said, "We had a 50% cancellation or no-show rate with our reservations this year [2021]." Despite this rate, the park had "more visitor nights in the wilderness this year than any previous year that we've recorded." Because the park has visitors activate their permit in person and offers day-of, walk-up reservation, they are able to redistribute no-show permits, which results in the still exceptionally high levels of visitation.

Managers provided a handful of reasons for no-shows occurring. A lot of issues can stem from far-in-advance windows of request as it requires people to know their schedule often months ahead. North Cascades NP had originally offered advance reservations, but they found the no-show rate to be so high that for 20 years, up until 2017, they discontinued advance reservations. Additionally, for the far-in-advance window of request, a few managers noted people hoarding quota — they reserve quota for multiple weekends with the intention of only going on one trip. The manager at Mount Rainier NP thinks that one reason for this may be that visitors can then pick the weekend that has the best weather. When the cost of a permit is too low (for the purpose of preventing no-shows) or nonexistent, visitors have little disincentive to reserve more quota than they intend to use.

> People who get an Enchantments permit are more willing to kick it back into the system because they get a refund, so they're saving themselves $200, whereas the Deschutes, people are not motivated to cancel their permit because there's no fee.
> – *Okanogan-Wenatchee National Forest*

With some understanding for why people reserve quota they will not end up using, there is still the question of why people don't cancel once they know they will not be going on their trip. The primary theory is that people have no incentive to cancel a permit if there is little to no fee refund. The manager at Okanogan-Wenatchee NF referenced the Deschutes NF permit program, saying "People who get an Enchantments permit are more willing to kick it back into the system because they get a refund, so they're saving themselves $200, whereas the Deschutes, people are not motivated to cancel their permit because there's no fee."

There are a variety of solutions addressing no-shows that managers have either implemented or considered implementing for their programs. One idea, of course, is to charge a fee which can then be coupled with the offer of a refund. Prior to using recreation.gov, some programs that had a fee did not offer a refund. The manager at Arapaho and Roosevelt NFs mentioned a couple of other methods; though, they did not personally like them as options. One method is to limit the number of permits a person can hold. There is also the option that if someone doesn't cancel their permit and it's a no-show, all their following reservations will be voided. For a land unit that doesn't require visitors to activate their permit in person, the way of determining if someone is a no-show is to have them activate their permit online by printing or self-issuing. Other solutions include offering more quota for reservation than there is actual capacity, essentially 'overbooking' with the expectation that there will be a certain number of no-shows. Gifford Pinchot NF noted that continual evaluation is necessary with this solution as use patterns can change; with their climbing program, they've found that over time more people began to follow through with their reservations. Finally, land units can adjust their windows of request. Deschutes and Willamette NFs found that far-in-advance reservations were inappropriate for their day-use program and have shifted to close-to-date rolling windows.

5.4.3 Equity

Issues of equity can show up in many ways in a permit program. The findings presented here are by no means comprehensive, but it was a topic that came up in several interviews. From these interviews, there were some interesting solutions identified that are worth mentioning.

Perhaps the most obvious factor influencing equity is the cost of a permit. An associated fee can be a barrier to many people. Because of recreation.gov's reservation fee, having a fee cannot be easily

avoided. Land units often need to add on an administrative fee as well to cover the program's expenses. The manager at Mount Rainier NP illustrated part of the challenge of deciding how much to charge:

> "You can charge whatever you want for these permits, and you will fill your quota. But it's going to be a different group of people than if you didn't charge the fee. So just recognizing who we're advantaging and disadvantaging and make those tradeoffs with our eyes open."

To try reducing the inequities caused by charging a fee, Deschutes and Willamette NFs have made permits available for reservation at local libraries through libraries' existing service that allows people to get free passes and permits for a variety of attractions (museums, zoos, etc.). A manager at Deschutes and Willamette NFs said this program "was designed to provide an outside-of-recreation.gov, outside-of-a-cost-based-system opportunity for people to access the wilderness." They went on to say that the library initiative was a "great success the first year" and that they will continue to offer permits through the library system. It was also brought up that charging a per-person fee may be more equitable than a per-group fee — with a group fee, a one-person 'group' would pay the same amount as a twelve-person group meaning the cost of using the program is distributed unevenly among users.

Another concern regarding equity of access relates to the online mode of distribution which, of course, requires visitors to have access to the internet; there was varying agreement among managers as to whether or not this fosters inequity given the current prevalence of technology. In some instances, though, with online reservation, visitors are required to print their permit ahead of time; less of the public may have access to printers. This is another instance in which the libraries can mitigate some potential inequities. As the manager at Gifford Pinchot NF stated, "The libraries are more than books, libraries are community centers." The forest coordinated with nearby libraries so that staff can help the public make reservations and print them. Deschutes and Willamette NFs have also done trainings with library staff so people can use the library for help navigating the permit system (outside of the free permit offerings).

Additionally, several interviewed managers explained concern regarding inequities relating to windows of request. As referred to earlier, not everyone has the ability to know their schedule months ahead of time which can make far-in-advance reservations a barrier to many. Offering some quota as a close-to-date rolling window or day-of walkup can mitigate this point of inequity. Another issue regards whether people are able to log on at the time quota is released (if this is necessary to get a desired trip). Demand plays a prominent role in determining how much of an issue this is. Lotteries are one way to prevent needing to log on at a certain time.

A couple other equity-related solutions brought up during interviews include having informational materials available in Spanish and working with diverse partner groups, such as Latino Outdoors, to distribute program information. Another solution provided by a manager at Deschutes and Willamette NFs was applying the day-use permit program to only a specific number of the total trails. This leaves a large number of opportunities still available to people outside of the permit system.

5.4.4 Enforcement

Enforcing a permit program is a very broad subject, so here, I mostly focus on the findings that relate to the design of a program.

A major consideration for managers regards how the permits are checked by rangers in the field. At some locations, such as Coconino and Gifford Pinchot NFs, for day use, rangers can relatively easily check visitors' permits as they drive in. This does require some infrastructure which may not be appropriate to invest in at the beginning of a permit program. In wilderness areas, however, managers have to guess at where would be best for rangers to go to check permits. A few managers mentioned how people actually enjoy having their permits checked — with that comes a sense of satisfaction for following the rules and navigating the permit program.

Digital permits can be a challenge if visitors have not already downloaded their permit, and they are required to show it in (what is likely) an area without cell service. Printed permits can especially be a challenge if permits are distributed entirely online. The manager at Gifford Pinchot NF described visitors showing up without permits, not knowing about the system. If permits were still available for that day, "they had to drive back like 20 minutes to a place where they could get cell coverage, and then you had to have a computer and a printer." The forest has been trying to work through creative ways to provide visitors permits on-site as some sort of walk-up that doesn't involve them going to a separate visitor center.

A common enforcement practice that interviewees expressed is maintaining some flexibility in the first year or so after a new program or program characteristic is implemented. A manager at Sequoia and Kings Canyon NPs explained, regarding an adjustment made to the permit stipulations of two trails, "Last year was educational; this year, we're going to be a little bit more enforcement-based. We try to bring people along with us and realize it takes time for those kinds of things to percolate."

Beyond people knowing about and understanding how the system works, visitors tend to be more encouraged to evade the system when demand is high. For in-person distribution, one manager described long lines causing people to go on their trip without a permit. Okanogan-Wenatchee NF experiences an extreme amount of demand, and a relatively unique issue — those who win a group-based permit (i.e., not for the Core Zone) will sometimes sell spots on the permit, meaning they end up hiking with strangers. This has created some major challenges for management.

Chapter VI: Management guide to designing and implementing a quota-based permit program

Structure of guide

6.1 Introduction

As discussed throughout this report, a visitor-limiting permit program's design is composed of a number of key components, or system characteristics. When combined, these characteristics create a holistic program design that can have certain implementation implications. The goal of this project was to generate information that could aid managers in the process of designing their program, once they have decided a visitor-limiting permit program is a necessary intervention. The last few chapters have presented a lot of information; this management guide is intended to act as a guide from Point A, having the information, to Point B, using it. It is meant to work in conjunction with a comprehensive visitor use management planning process.

Not all of the information from the findings is included in this chapter, but throughout the chapter, it is noted where more information can be found, if needed. For reference, Appendix A presents all permit programs identified by this study along with their system characteristics. When initiating or adjusting a permit program, it can be immensely helpful to talk with other units. The dataset in Appendix A may provide relevant locations to contact for additional information about their program's design. The dataset also offers ideas and examples of how programs utilize the design options outlined in this chapter.

With the complete management guide in hand, managers should have an idea of the possibilities for program design, the implications of different designs, and how this information could be used to create a successful visitor-limiting permit program at their respective land unit.

6.2 Considerations in the design process

There is no one-size-fits-all permit program design. This section identifies the qualities and conditions that can cause variability among programs. These qualities include the site conditions, program rationale, and demand. Such qualities, once identified, can suggest how a program should be characterized, or at the very least, inform managers of some of the potential outcomes or challenges they might face with their design. Because it would be impossible to list every cause-and-effect relationship between a quality or condition and its effects on system characteristics, several questions for consideration are included under each subsection here. This is intended to help land units evaluate what their specific causes and effects might be.

6.2.1 Site-specific conditions

Site-specific conditions

- Ecosystems and environment
- Layout and location
- Land-unit operations

Site conditions are physical characteristics of a unit, in its form or operation. These conditions can either diminish or amplify the consequences or benefits of system characteristics or the entire system. They can also guide what is doable for program design. Site conditions are categorized into three types: ecosystems and environment; layout and location; and land-unit operations. The potential conditions within these categories are numerous, so a handful of examples are provided which are by no means an exhaustive list of possibilities. For each of these, there are related questions to consider and potential management options. More information on each example can also be found in section 5.2.1.

Ecosystems and environment

The ecological and environmental conditions of a land unit can impact how visitors interact with a space, how this interaction impacts the space, and what level of use restriction managers need to implement through the permit system. The following are some examples:

Landscape durability: The type of soil or vegetation in a permitted area may influence the level of use control necessary.

Question: Are there any especially-fragile locations in the permitted area that may require more intensive control on use?

- These areas could use designated sites (see Decision Tree 7) or restrict to only day visitors (no camping).
- Starting-point-based quotas may be less appropriate for fragile landscapes (see Decision Tree 6).

Climate: The length of seasons, the types of weather during each season, extreme or unexpected weather events, etc. are all potentially influential conditions. Issues can occur if visitors are not well-informed of what their trip will entail regarding climate. Depending on the climate a site experiences, this may be of more or less concern.

Question: What climate do visitors expect to experience? Are there weather events that may cause safety concerns? By what time of year does snow usually melt; how variable is this?

- Adjusting the mode of distribution is one way to ensure people receive necessary information (see "Mode of distribution" under 6.3.3).
- Areas where snowmelt doesn't occur until later into the season could be distributed as walk-ups up until snow has melted (see Decision Tree 4). On recreation.gov, a land unit can also adjust when quota at different quota locations becomes available (see Decision Tree 6).
- The time of year a program applies can be informed by climate (see 6.3.2).
- Itinerary-based permits (i.e., destination quotas or designated sites) can inform managers of where visitors are in the case of an emergency (see Decision Trees 6 and 7).

Elevation and terrain: High elevation and challenging terrain can impact visitors' experience if they are unprepared and underestimate the trip they've reserved.

Question: Is the elevation or terrain something that visitors may be unaccustomed to or underestimate?

- Designated sites can make this more of an issue as visitors may not be able to diverge from their itinerary without disrupting other visitors (see Decision Tree 7).
- In-person distribution means that staff can assist visitors in planning a trip that is reasonable for their skill level and experience (see Decision Tree 4).
- If using online distribution, finding ways to provide spatial and topographical information in a user-friendly manner is especially important (see Decision Tree 4).

Water features: Areas with water, often lakes, can be hotspots for visitor use and concentrated impacts. There may also be concerns regarding whether visitors are camping far enough from the water.

Question: Are there zones in which visitors tend to camp near water features? Are there areas in which there is a concern for the health of the ecosystem as a result of visitation?

- Designated campsites could be used if limiting visitation alone cannot mitigate visitor impacts (see Decision Tree 7).

Waterless areas: Visitors may be expecting water at the location they reserve quota for, particularly if a waterless location is abnormal for the land unit. The implications of visitors not knowing an area is waterless span anywhere from disappointment to safety issues.

Question: Are there any waterless areas? Would visitors normally go to this permitted area expecting to be within reasonable distance of a water source?

- The quota for these locations could be distributed in person, or information about the lack of water will need to be readily communicated online (see Decision Tree 4).

Layout and location

The layout and location of a land unit can impact how users move through an area (where they are coming from and where they are going), how challenging management may be, and what enforcement might look like. The following are some examples:

Roads: Both the location of roads and the points at which people access a permitted area can influence enforcement if using a per-vehicle quota.

Question: If a quota based on the number of vehicles is being considered, are there multiple access points to the permitted area? If there is a main road, is it used as a through-road?

- Having a clear location at which most or all vehicles enter the permitted area can allow rangers to more easily enforce the permit system, particularly if it is not a through-road.

Nearby land units: Nearby land units may provide insight into how to design a permit program if they already have one or impact the efficacy of a permit program if visitors are entering the permitted area through other units.

Question: Are there nearby land units? Do they have their own visitor-limiting programs? Are there shared trails through which their visitors could enter the permitted area?

- If there are shared trails, collaboration can be important, especially if a land unit seeks to apply the visitor limit to those crossing between land units.
- If a nearby land unit already has a permit program, implementing a new program with similar characteristics can help reduce logistical confusion for visitors (see 5.4.1).

> Think about a regional perspective… how your system interacts with visitor controls on adjacent land management units.
>
> – *Sequoia and Kings Canyon National Parks*

Size of the area: Depending on the size of the permitted area, a system may be more complex or challenging to implement. Additionally, the size of individual zones within the program area can impact what management tools are necessary.

Question: How large is the intended permitted area? Do the zones in the permitted area vary greatly in size?

- Small areas can be much less complex to implement. For a large area, it may be beneficial to start with a couple of zones or trailheads and slowly expand to the full, intended permitted area over the course of several years (see 5.4.1).
- Larger zones may be able to better handle dispersed camping (see Decision Tree 7).

Land-unit operations

A permit program has the potential to impact other operations and conversely, other operations can impact the permit program. This should be a consideration for permit program design. The following are some examples:

Visitor services: In some cases, visitors may need to arrange other services at a land unit in order to be able to arrange a trip in the permitted area. This could involve navigating a bus system or reserving parking passes.

Question: How might other visitor services (e.g., bus system, vehicle-entry permits, etc.) interfere with the permit program, and vice versa?

- This may affect by what time visitors need to secure their permits, hence an important consideration for choosing a window of request (see "Window of request" under 6.3.3). Collaboration with other programs operating at the unit may be necessary.

Visitor activities: Different user groups (besides the 'typical' visitors) may use an area at different times of the year or in the same season as other user groups. It may be important to consider how the permit program could impact the ways groups use the system or area.

Question: Are there different user groups, besides the 'typical' (e.g., backpackers and hikers), that use the permitted area? When? Could there be any conflicts with other users? Would they be using the permit system?

- Time of year, windows of request, designated sites, etc. could offer options for mitigating any issues (see Decision Tree 1, 2, and 7).

6.2.2 Program rationale

While the rationale for implementing a permit program is almost always going to stem from increasing, unsustainable visitation, looking at the reasons why this level of visitation is an issue in the first place may help inform the design of the program. There are two parts to looking at program rationale. First, there are some conditions that lead demand to be an issue; second, there are the actual problems associated with demand. Below, are guiding questions and some examples of such conditions and problems with explanations of how they might impact a permit program's design and implementation.

Conditions that make demand an issue

Conditions as a program rationale can be anything that makes demand itself an issue or explains why the problems associated with demand are in fact problems (see 5.2.2). The following are some examples:

Conditions that make demand an issue

Questions to consider: What conditions of the permitted area have led to demand and the problems associated with it to be considered issues? How might these conditions inform appropriate management interventions?

Examples:

- Wilderness designation
- Capacity of infrastructure
- Poor distribution of visitation

Wilderness designation: For a wilderness area, its associated management guidelines may be influential factors in what design is best for an area. The Wilderness Act's emphasis on solitude and maintaining natural wilderness character may inform the acceptable quota levels and locations of designated campsites; the Act also emphasizes visitors' ability to experience an "unconfined type of recreation" (Wilderness Act, 1964). Starting-point quotas are the least confining; though, they may not always be an appropriate option (see Decision Tree 6).

Capacity of infrastructure: In many cases, the capacity of infrastructure (e.g., parking lots, restrooms, etc.) may cause demand to become a problem. If the capacity for vehicles is identified as a rationale for the permit program, a per-vehicle quota may be a logical option (see Decision Tree 5).

Poor distribution of visitation: The rationale for a permit program may not always be that demand for an entire area is too much, but if demand tends to concentrate in specific spots, a permit program focused on distribution may be the solution. Most permit program designs are distributional. The exception would be a program with a whole-area quota (see Decision Tree 6). Starting-point quotas and destination quotas have slightly differing distributional qualities (Figure

20). Designated sites could be used to further guarantee distribution within a single zone (see Decision Tree 7; Figure 22).

Problems associated with demand

The problems associated with demand are essentially the most direct impacts of visitation (see 5.2.2). The following are some examples:

Problems associated with demand

Questions to consider: What problems have occurred as a direct result of demand? Which are the most important? Are there any areas in which these problems are particularly relevant? What would be the most appropriate program characteristics based on these issues?

Examples:
- Lack of safety
- Resource damages

Lack of safety: When the vehicle infrastructure is beyond capacity and there are issues with traffic or parking overflow, unsafe conditions may develop in which, for example, ambulances aren't able to reach their destination. A per-vehicle quota may make the most sense in this case, but a per-group quota could also be effective since groups often travel together (see Decision Tree 5).

Resource damages: Resource damages associated with demand is a vast category of sub-problems. Knowing the kinds of resource damages experienced and where they occur can help inform what level of management is necessary and in what parts of a permitted area. For instance, if camping impacts are a major rationale for implementing the program, a solution may be designated campsites (see Decision Tree 7).

6.2.3 Demand

Components of demand

- Level
- Distribution
- Temporality

High visitation or demand is generally what prompts the initiation of a permit program. Once a permit program is implemented, while visitation will lower to match the quota, demand will likely only continue to increase. There are three components of demand that should be considered when designing a permit program: temporality, geographic distribution, and level of demand. It is essential to continue monitoring these components after a program has been established. Under each component, questions are provided to guide managers in considering how demand might impact or inform their permit program. Management options are provided following the questions. The rationale and explanation for these options is not included here, but references to additional information are provided. More information about the components of demand can be found in section 5.2.3.

Level of demand

The level of demand is the most ambiguous of the components — what is considered high demand at one unit could be considered low at another. There are certain indicators, though, as to what level of demand merits certain system characteristics or when demand might be increasing to a point that a program's design needs to change.

Questions to consider

When developing a new program:

- Does the total level of demand exceed the (soon-to-be-implemented) total quota available?
- If the unit were to offer some or all permits as day-of walk-ups, what is the anticipated number of people that would show up on a weekday or weekend? Given the existing infrastructural capacity and number of staff, is this a number of people that could be handled in a timely manner?

When modifying an existing program:

- Does the total level of demand exceed the total quota available?
- If using first-come-first-served distribution, are visitors having any issues reserving complete itineraries?
- If using an in-person mode of distribution, with the current infrastructural capacity and number of staff, are visitors being helped in a timely manner?

Management options

Low demand:

- First-come-first-serve distribution, in-person distribution, and day-of/day-before walk-ups would all be appropriate system characteristics (see 6.3.3).

High demand:

- Lottery distribution, online distribution, partial in-person distribution, far-in-advance and/or close-to-date rolling windows, partial day-of/day-before walk-ups would all be appropriate options or adjustments to make (see 6.3.3).

Distribution of demand

The distribution of demand refers to how demand can vary geographically within a single permitted area. For instance, a lake might be a hotspot for visitation while another area may, by comparison, only receive a fraction of the demand. While the "level of demand" looks at the total demand for the entire permitted area, the distribution of demand adds some complexity. The following questions are meant to guide managers in determining how the distribution of demand can inform program design or adjustments.

Questions to consider

When developing a new program:

- What areas receive the most visitors and/or the most visitor impacts?
- Do these visitation hotspots need any rehabilitation?
- Do visitors concentrate at destinations reached by many different trailheads?
- Do visitors concentrate at trailheads that lead to many different destinations?
- Are camping impacts concentrating in certain areas?

When modifying an existing program:

- What areas (trailheads, destinations, or whole itineraries) are in the highest demand? Has this changed since the program was first implemented?

- Where are desired conditions not being met; why? Does the distribution of demand play a role? How is the current system failing to distribute visitors effectively?
- If using a starting-point quota, is this effective in diffusing visitors throughout the permitted area?
- If using first-come-first-serve, far-in-advance distribution, are there certain locations being fully reserved immediately?
- If using a destination-based quota, are there any popular itineraries that might be a challenge to reserve completely?

Management options

Any of these options may be implemented in a targeted portion of the permitted area or the whole area. Note: whole-area quotas are not appropriate in program areas with distributional concerns.

Areas with concentrated demand:

- Implement a starting-point or destination quota depending on how demand is concentrated (Figure 20).
- Utilize designated campsites to distribute visitors within a destination zone (see Decision Tree 7).
- Limit the type of use in an area (e.g., no camping).
- Implement a lottery in situations where visitors are trying to get a popular itinerary (see Decision Tree 3).

Areas with non-concentrated demand:

- Implement a starting-point quota which is generally considered less restrictive than a destination quota (see Decision Tree 6).
- Dispersed camping may be a successful option (see Decision Tree 7).

Temporality of demand

The temporality of demand refers to how demand appears and shifts over the course of time. This generally is thought of in terms of seasons; for example, summer is usually considered the 'peak season.' However, demand may also shift day-to-day in an area. The following questions are meant to help guide managers in evaluating how the temporality of demand can influence their permit program.

Questions to consider

When developing a new program:

- When is the peak season? Is it easily defined or does it frequently shift?
- With currently-identified, not-yet-implemented quota(s), could the cumulative impacts of visitation become an issue if the quota is frequently filled?

When modifying an existing program:

- If the permit program is only applied during the peak season, does the window in which the program is in place align with current visitation patterns?
- Are there any areas in which the quota is consistently being maxed? Is this causing cumulative impacts that were not anticipated when the current quota was established?

Management options

- Adjust the time of year — this could mean shifting when the peak season is in place, expanding the permit program to be all year, or creating a separate off-season permit program (see 6.3.2).
- Adjust one of the quota characteristics or reduce the quota for areas with cumulative impacts (6.3.4).

6.3 Program design — the system characteristics

The considerations outlined above (site conditions, program design, and demand) are important to bear in mind when moving into choosing elements of a program's design. It is likely more considerations will become clear once the design process begins. This section is structured to provide the necessary information about design options and aid in decision-making. This involves looking at the implications of implementing a given characteristic. These implications may matter more or less depending on the above considerations and the individual unit's priorities.

The format and information provided for each subsection varies depending on what is relevant or available from the research conducted. Every subsection includes an "Interactions with other characteristics" portion; this offers important information for understanding how one design choice might affect or inform another. The decision trees, when provided, include questions to consider for choosing a design option as well as the implications of each option. While the decision trees are at the end of each subsection, the implications they present offer important context for other information under each characteristic's subsection. Also included is a list of decisions that need to be made regarding each system characteristic. For more information, the corresponding sections in Chapter V provide rationale, explanations, and examples.

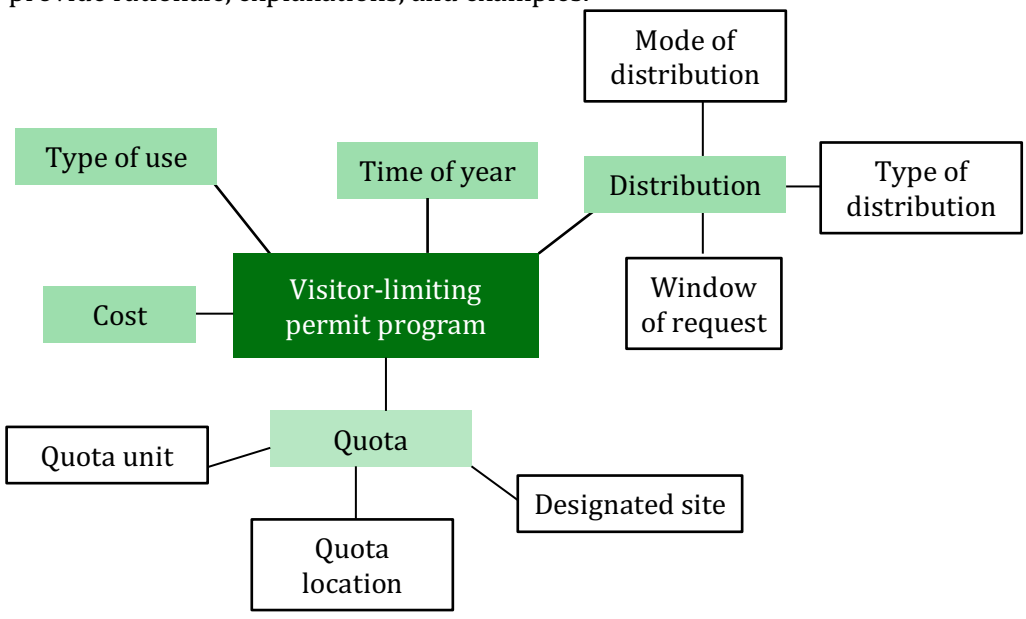


Figure 13: Components of a visitor-limiting permit program

6.3.1 Type of use

This characteristic defines the use that is managed by the permit program. Type of use can be anything from backpacking to timed vehicle entry. Broadly speaking, type of use falls into one of three categories: day use, overnight use, and a combination of the two.

The type of use permitted can influence what design is best given the differing needs and tendencies of different user groups; this is why day use and overnight use are not often easily combined within the same program (see 5.3.1).

Decisions to make
☐ What type(s) of use will be permitted?
☐ If more than one type of use, do two separate permit programs need to be created?
☐ What are the allowable uses throughout the program area? Will they be restricted in any locations?

Interactions with other characteristics

Time of year: The months in which the targeted type of use has the highest level of demand define the peak season.

Window of request: For overnight use, visitors may be more inclined to reserve their permit far in advance and commit to using it. With day-use visitors, it may be better to do close-to-date rolling windows or day-of walk-ups to prevent a high no-show rate.

Quota unit: The targeted type of use may determine what quota unit is best. Vehicle-based quotas are common for day use at recreation areas, driving on certain roads, or entry into parks. Group-based quotas are common for overnight use since individuals in a group tend to camp together — if the number of sustainable campsites has been identified and that number was a factor in determining the quota, a per-group quota can ensure the number of groups matches the number of sites.

Quota location: Destination quotas may make more sense for overnight use than day use since day use doesn't cause the same level of destination-based impacts. Destination and starting-point quotas are commonly used for overnight use; day use is typically managed through whole-area and starting-point quotas.

Designated sites: In the current manner in which these are applied, designated sites only apply to overnight use.

Questions to consider

- Would limiting only overnight use prevent the desired conditions from being achieved? (see 5.3.1)
- If planning to limit day and overnight use, is it possible to successfully do this under the same permit program (i.e., same system characteristics)? Do two differently-characterized programs need to be created, so day use and overnight use can be managed separately?
- Are there any areas within the targeted permit area where the allowable uses might need to be restricted (e.g., creating a no-camping zone) or where restricting the allowable types of use might make it easier to implement the permit program? (see 5.3.1)

6.3.2 Time of year

All permit programs have a time of year in which they are applied — this is the "time of year" characteristic. The time of year a program is implemented is based on the needs of the park and the length of its peak season. It can also be required that visitors need a quota-based permit at any time throughout the year.

Design options

Decisions to make
☐ To what time of year will the permit program apply?
☐ If year-round, will there be separate peak and off-seasons?

Peak season: A peak-season permit program applies the quota to the time of year in which demand is highest. The peak season likely has the level of demand that originally prompted the initiation of a visitor-limiting permit program.

All year: An all-year permit program applies the quota to the entire year. This can be done through one permit program or two separate programs (off-season and peak season) with differing characteristics. Either way, in the off-season, or period of lowest demand, land units generally only need to pay attention to the quota in the shoulders of the peak season. Having a separate off-season program is often because there is little need to monitor the quota. The change in demand also lessens the management burden of certain characteristics (making them more viable for implementation), and less staff and infrastructure may be available.

Interactions with other system characteristics

Type of use: The months in which the targeted type of use has the highest level of demand define the peak season.

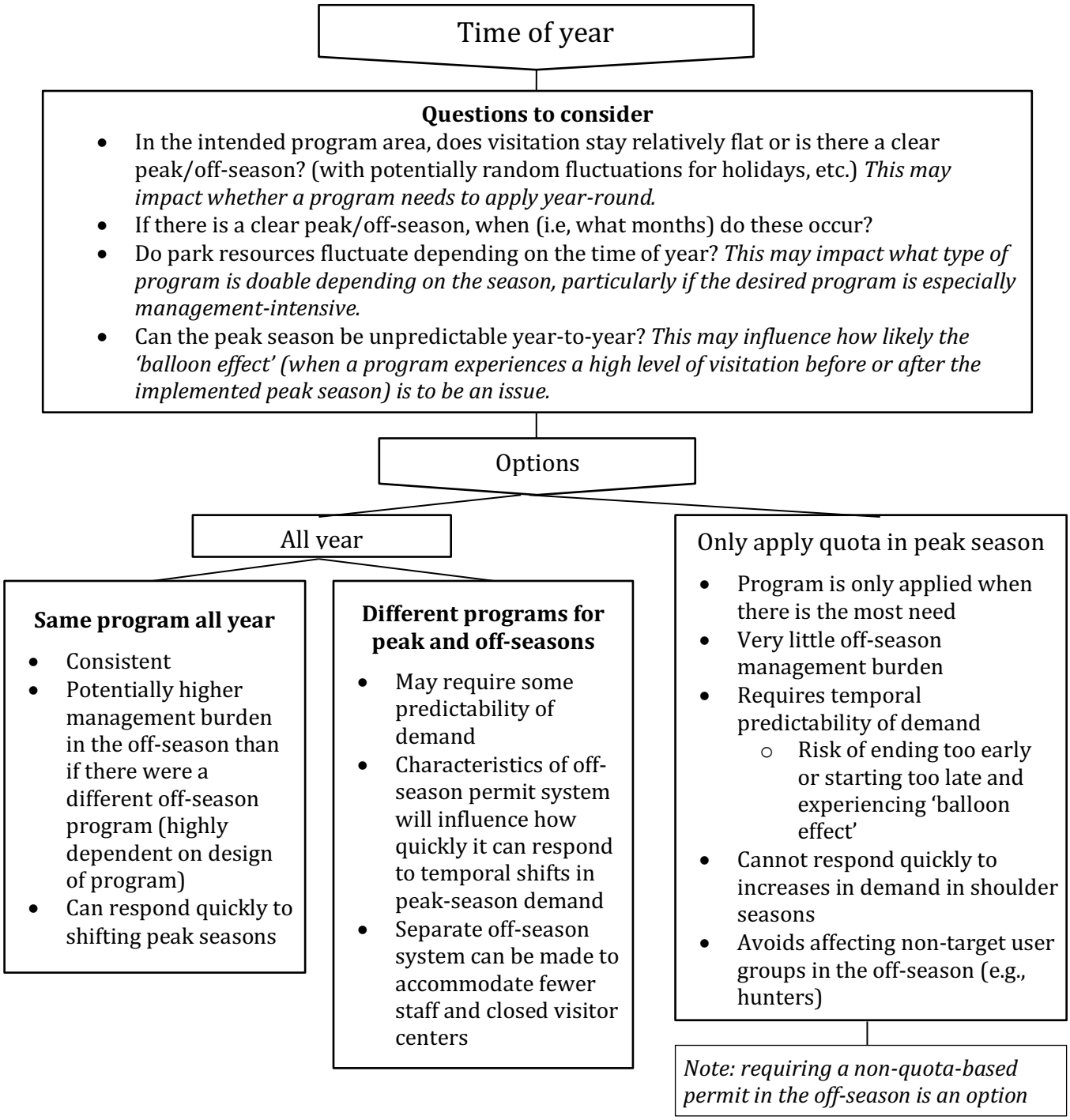
Window of request: Multiple windows of request are likely only necessary or preferable for the peak season during which a higher level of demand needs to be accommodated. During peak season, far-in-advance windows of request may be combined with close-to-date rolling windows or day-of/day-before distribution in order to mitigate some of the consequences of offering permits months ahead of time. Most of the consequences of far-in-advance windows are nonexistent in the absence of high demand, such as in the off-season. Day-of windows of request may be more feasible given the generally low demand of the off-season; however, available staff and resources can impact this. Additionally, with an all-year permit program (same characteristics year-round), it is important to consider what windows of request will work in perpetuity and at what intervals they will be applied. For instance, every four months more permits could be released for the following four months. Permit release dates need to take into account changing usership based on the season (e.g., hunters might need a different release date than what works for backpackers and hikers).

Type of distribution: Lotteries are most necessary in the presence of high demand (i.e., in the peak season). First-come-first-serve distribution can work well year-round, but may be overwhelming to administer in periods of high demand.

Mode of distribution: The management burden of in-person distribution is lessened in the off-season. As a result, it could be the only mode of distribution in the off-season. Online distribution, whether distributing a portion or all of the permits, may be necessary to accommodate the peak-season level of demand.

Cost: Some programs reduce the cost of their permits in the off-season.

Figure 14: Decision tree 1



6.3.3 Distribution

Distribution — how permits are distributed — is a key facet of a permit program. While distribution itself is not a characteristic, it encompasses a grouping of three highly interrelated characteristics. These include the window of request, type of distribution, and mode of distribution.

Window of request

The window of request characteristic refers to the date(s) upon which permits are released and the following period of time in which the public can reserve, apply for, or request a permit. Windows of request can be rolling, which is when permits for a certain period of time (day, week, or month) are released continually at a specified distance from the start of the said period of time. Windows of request can also be fixed, meaning that permits are released for the entire season on a certain date.

Decisions to make

- ☐ During what window(s) of request will permits be distributed?
- ☐ If using a rolling window, for what periods of time will permits be released?
- ☐ What date(s) will quota be released?
- ☐ If more than one window, what portion of quota will be distributed in each?

While using a rolling or fixed window likely does have some impacts, the most important aspect of a window is the length of time the release date occurs from any given start date for a trip. The design possibilities for windows of request fall into three categories: far-in-advance windows, close-to-date rolling windows, and day-of/day-before windows.

The implications of the window of request utilized are highly dependent on the level of demand a program receives. For example, implementing a far-in-advance window of request only disadvantages people who can't plan far ahead *if* all the permits get reserved 'far in advance' (see 5.4.3). With this, the negative implications of a release date matter a lot more when a unit faces high demand. For this reason, it may help a high-demand permit program to combine windows of request. In doing so, the negative implications of one type of window of request may be counteracted by the positives of another.

Design options

It should be noted that the lines drawn between the different 'windows,' or design options, are relatively arbitrary but were necessary for the purpose of discussing their utilization and implications.

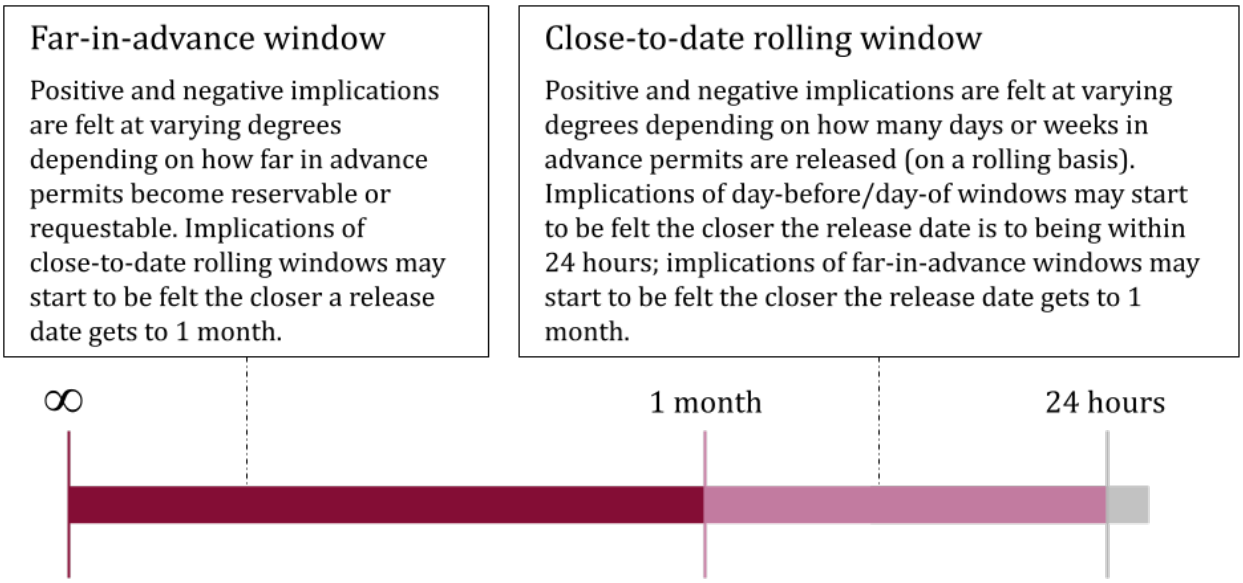
Far-in-advance window (1 month +): The far-in-advance window of request refers to any release date that occurs one month or more from the start date of a visit. These can be pre-season releases of permits in which, on a given date, permits for an entire season become available for reservation or request. There can also be far-in-advance rolling windows. For instance, the permits for an entire month could be released on the first of the previous month or permits could be released six months in advance for one day at a time.

Close-to-date rolling window (1 month - 24 hours): The close-to-date rolling window operates the same as the far-in-advance rolling window but closer to the start date of the specified period of time for which permits are being released. For example, permits for a single day at a time could be released continually seven days in advance.

Day-before/day-of window (within 24 hours): The day-before/day-of window refers to the release of quota within 24 hours of the start of a visitor's trip. If day-before distribution is being offered, it is essentially always in conjunction with day-of distribution; though, a unit offering a day-of window may not always allow visitors to come in the day before their start date to get a permit.

As stated above, the lines drawn to distinguish the different windows of request can be somewhat arbitrary. Figure 15 is meant to visualize the periods of time that define each window and how implications can vary within a single window.

Figure 15: Chosen permit release dates and window of request implications



If more than one window of request is chosen for a permit program, it needs to be decided what portion of the quota will be released during each window (see "Window of request" under 5.3.3). The following are different ways that this could be administered:

- Release a percent of the total quota during each window (e.g., 60% released far in advance and 40% released through close-to-date rolling windows)
- Release a varied percent of quota depending on each quota location (e.g., 50% of Trailhead A's quota and 30% of Trailhead B's quota are released far in advance)
- Release all of the quota for specific quota locations during a single window — this method is often combined with the second listed method (e.g., 100% of Trailhead A's quota is released day-of but only 20% of Trailhead B's quota is released day-of)

Interactions with other system characteristics

Type of use: For overnight use, visitors may be more inclined to reserve their permit far in advance and commit to using it. With day-use visitors, it may be better to do close-to-date rolling windows or day-of walk-ups to prevent a high no-show rate.

Time of year: Multiple windows of request are likely only necessary or preferable for the peak season during which a higher level of demand needs to be accommodated. During peak season, far-

in-advance windows of request may be combined with close-to-date rolling windows or day-of/day-before distribution in order to mitigate some of the consequences of offering permits months ahead of time. Most of the consequences of far-in-advance windows are nonexistent in the absence of high demand, such as in the off-season. Day-of windows of request may be more feasible given the generally low demand of the off-season; however, available staff and resources can impact this. Additionally, with an all-year permit program (same characteristics year-round), it is important to consider what windows of request will work in perpetuity and at what intervals they will be applied. For instance, every four months more permits could be released for the following four months. Permit release dates need to take into account changing usership based on the season (e.g., hunters might need a different release date than what works for backpackers and hikers).

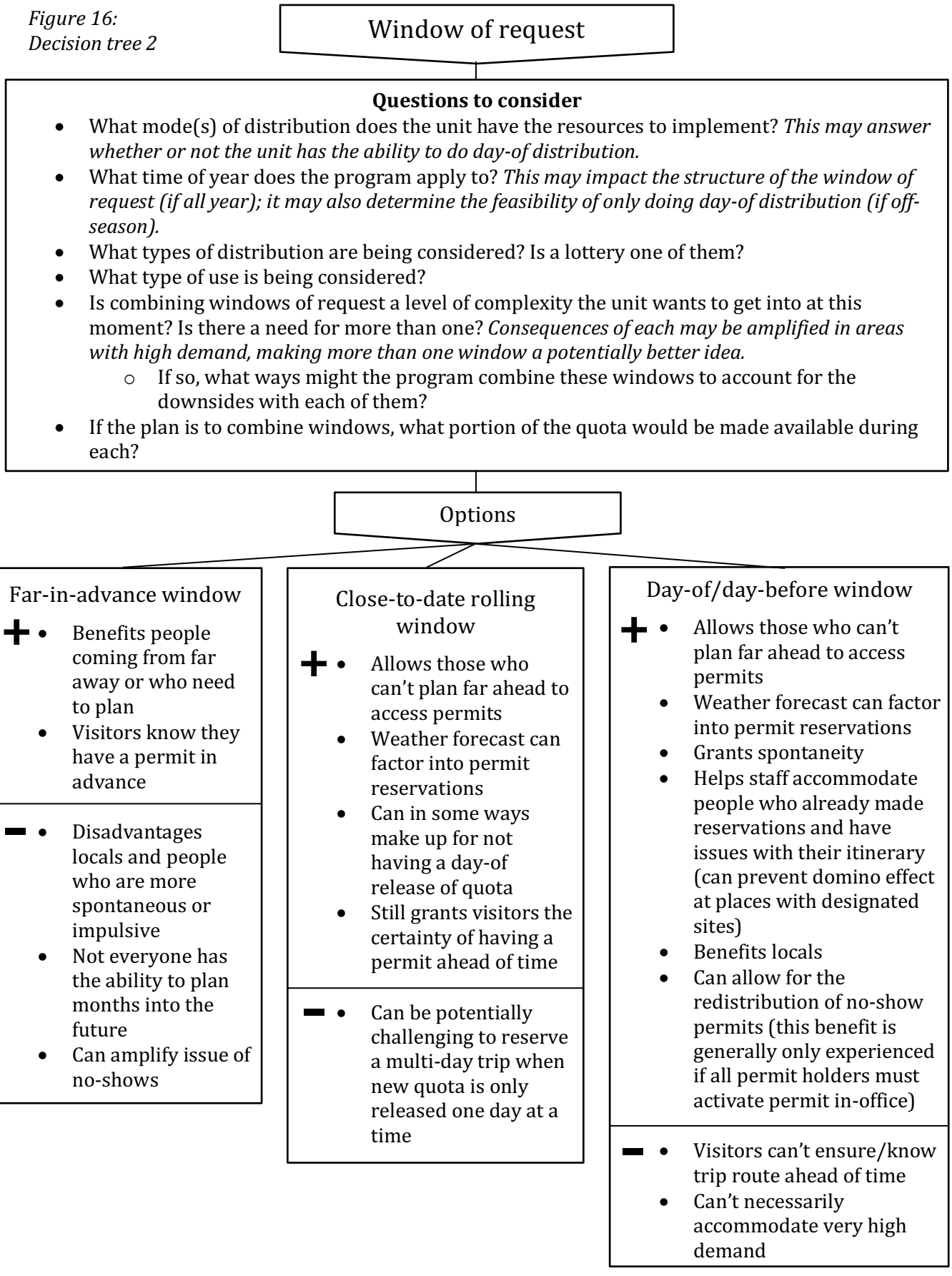
Type of distribution: Lotteries are most commonly conducted during far-in-advance windows of request. In some cases, day-of (in-person) lotteries could be and have been conducted. A close-to-date rolling lottery is another possibility. First-come-first-serve distribution is common no matter the window as it's often the default type of distribution.

Mode of distribution: Day-of/day-before distribution is nearly inherently conducted via in-person distribution; the term 'walk-ups' is used to refer to distribution that happens in person on the day someone starts their trip. Far-in-advance reservation is now almost always done online. Additionally, online distribution is what has made rolling windows possible — it would be very difficult to offer this kind of window of request through a different mode of distribution.

Quota location: If using multiple windows of request, the individual qualities of quota locations may factor into what percent of the quota is released during each window of request. For example, a land unit may make some quota locations only available via day-of walk-up distribution because they require a different skill level and the land unit wants to ensure users know what they may encounter (e.g., challenging terrain, changes in elevation, extreme weather, etc.). It may also be the case that a quota location has a small associated quota; in this case, it may be sensible to divide the quota differently than at other locations with larger quotas.

Designated sites: When designated sites are utilized, the quota being divided corresponds to actual campsites. Certain sites could be made available only during specific windows of request. This could, presumably, be made more complex by also varying for what dates sites are available via each window. For instance, a site could be made available only for advance reservation during the month of July, but during the month of August, the site could be available only via day-of walk-ups.

Figure 16:
Decision tree 2



Type of distribution

Decisions to make
☐ What type(s) of distribution will be used? In what window(s) of request will they be applied?
☐ If using a lottery, what type (i.e., early access or traditional) will be used?

The type of distribution defines how the permits are allocated, whether it's randomized like a lottery or it's first-come-first-serve. This characteristic, perhaps, interacts the least with on-the-ground site conditions. The implications of choosing one option over another have less to do with meeting desired conditions and more to do with visitor and management experience.

As with windows of request, the positive and negative implications of each design option can be amplified in the presence of high demand. Lotteries may be implemented to cope with some of the negative implications that come with FCFS distribution when there is high demand (see 6.2.3).

Design options

First-come-first-serve distribution: First-come-first-serve (FCFS) distribution is any form in which quota is released all at once. As a result, the earlier a visitor is to reserve, the more options they will have for their trip. In this sense, there is some competition for getting a permit. FCFS distribution tends to be the default starting point for permit programs.

Lottery: Lottery distribution is a form of allocation in which visitors submit an application and winners are drawn at random. For all lotteries, there is a window during which these applications can be submitted — rather than having the window be a single day in which applications can be submitted, there is often a longer period, typically between one week and one month. There are two main types of lotteries which are distinguished by what a visitor is applying for and winning. The first type is a 'traditional' lottery in which visitors apply for the trip they want, often providing first, second, and third choices. Each person who wins the lottery receives a permit for one of their trip choices. The other type of lottery is an early-access lottery; with this, visitors are applying to have early access to permits released for advance reservation. Each person who wins the lottery receives a time slot during which they can reserve their desired trip. The time slots are staggered, meaning those that win earlier slots are more likely to be able to reserve a trip they want.

If a lottery is implemented, it is generally done in conjunction with first-come-first-serve (FCFS) distribution. FCFS can facilitate the distribution of any leftover or no-show permits. Managers may also leave a percentage of the total quota available for FCFS in order to give opportunities to those who did not enter the lottery or who cannot plan far ahead (given that lotteries are often conducted pre-season).

Interactions with other characteristics

Time of year: Lotteries are most necessary in the presence of high demand (i.e., in the peak season). First-come-first-serve distribution can work well year-round, but may be overwhelming to administer in periods of high demand.

Window of request: Lotteries are most commonly conducted during far-in-advance windows of request. In some cases, day-of (in-person) lotteries could be and have been conducted. A close-to-

date rolling lottery is another possibility. First-come-first-serve distribution is common no matter the window as it's often the default type of distribution.

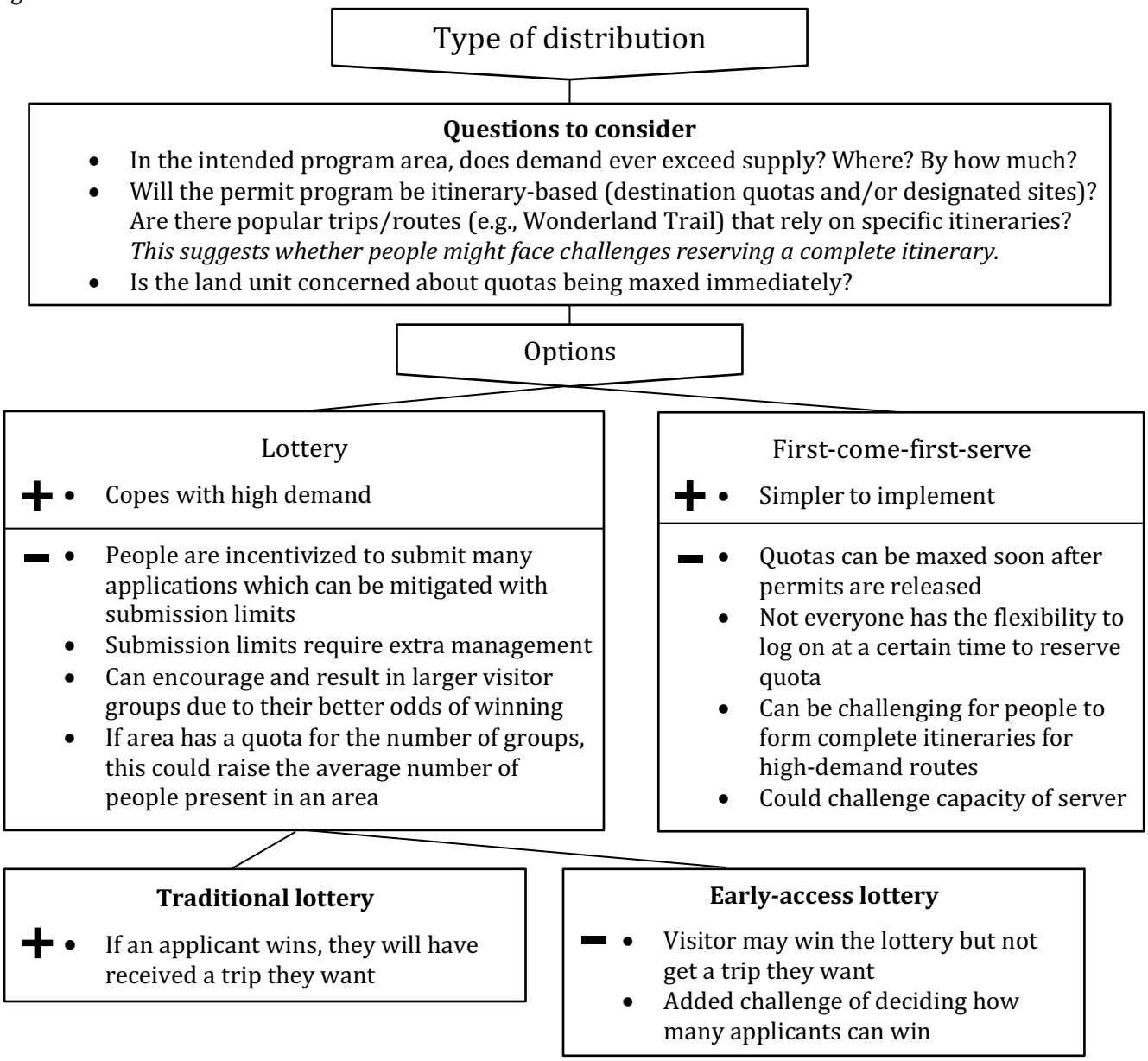
Mode of distribution: All modes of distribution can accommodate FCFS distribution (though there is some nuance to this, see Decision Tree 4). Lottery distribution is most commonly conducted online. There are exceptions to this, though, including a day-of, walk-up lottery conducted in person.

Quota unit: A lottery can favor larger groups — if each individual can submit at least one application, this can increase the odds of larger groups winning and could encourage larger groups to apply. If the quota is based on the number of groups, because groups can expand up to the maximum group size, the average number of individuals present in an area could potentially increase.

Quota location: A lottery may be necessary in the presence of high demand and destination quotas. Destination quotas are usually itinerary-based, so when permits are all released at once, high demand may make it challenging for users to form complete itineraries.

Designated sites: A lottery may be necessary in the presence of high demand and designated sites, particularly if users are having trouble making complete itineraries when permits are all released at once.

Figure 17: Decision tree 3



Mode of distribution

The mode of distribution is the platform or setting through which visitors reserve or apply for and receive their permits. There are a variety of modes including email, online, phone, fax, and in person. Online and in-person modes of distribution are most often used. Fax, email, and phone reservations were much more common before systems like recreation.gov became available. This section focuses on online and in-person distribution, with some mentions of phone distribution as an auxiliary method.

As with the other two distribution characteristics, demand plays a major role in determining the best design option for a particular permit program. This can influence the feasibility of using any non-online modes for distributing some or all permits.

Decisions to make

- ☐ What mode(s) of distribution will be used?
- ☐ Are there any quotas that will be made available only through in-person or phone distribution?
- ☐ Will visitors be required to activate their permit in person or online?
- ☐ Will no-shows be redistributed in person?

Design options

Online distribution: Online distribution most often occurs through the recreation.gov platform. While in-person distribution may have been the default mode in the past, online distribution is now a common starting point for land units. Recreation.gov does have some limitations, but over time, it has evolved to better accommodate the types of systems needed to manage wilderness use. As of now, it does not always accommodate very nuanced systems with variations of characteristics within the same program (e.g., combining starting-point and destination quotas).[23]

> "Know what recreation.gov can actually do, like what's in the realm of possibilities for the system that's going to make the permits available."
>
> – *Willamette National Forest*

In-person distribution: In-person distribution most often entails visitors going to a ranger station or visitor center. This mode requires a land unit to have enough staff and infrastructure close to the program area. In-person distribution could be considered the gold standard — ideally, many programs would offer this, but given agencies' funding situation, especially for the USFS, this is not always possible.

Permits are very rarely only distributed in person; there is often an online component. Conversely, programs that only distribute online are relatively common. As with windows of request and types of distribution, the positive and negative implications of either design option can be mitigated by combining them. Usually, when a program combines in-person and online distribution, a single mode is used for each window of request.

There is one exception to this — that is when permits are reserved online but must be activated in person on the day of a visitor's trip. In this scenario, some of the benefits of in-person distribution are still able to be applied to online reservation. Sometimes, permits may be reserved or activated over the phone, too; however, this is not usually a primary feature of a program's distribution, more so an alternative available option.

Interactions with other system characteristics

Time of year: The management burden of in-person distribution is lessened in the off-season. As a result, it could be the only mode of distribution in the off-season. Online distribution, whether distributing a portion or all of the permits, may be necessary to accommodate the peak-season level of demand.

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[23] It should be noted that the capabilities of recreation.gov are outside the scope of this study; this distribution platform could merit a research study of its own.

Window of request: Day-of/day-before distribution is nearly always conducted via in-person distribution; the term 'walk-ups' is used to refer to distribution that happens in person on the day someone starts their trip. Far-in-advance reservation, in present-day, is almost always done online. Additionally, online distribution is what has made rolling windows of request possible — it would be very difficult to offer them through a different mode of distribution.

Type of distribution: All modes of distribution can accommodate FCFS distribution (though there is some nuance to this, see Decision Tree 4). Lottery distribution is most commonly conducted online. There are exceptions to this, though, including a day-of, walk-up lottery conducted in person.

Quota location: A land unit may make some quota locations only available in person if, for example, a destination necessitates that visitors have a certain level of skill, and managers want to ensure visitors are prepared and capable. Such quota locations may be made available over the phone, too, which still ensures visitors talk to a ranger and receive the essential education, something which cannot necessarily be ensured through online distribution. If online reservation is being used, visitors could be required to activate their permit in person which still allows rangers to educate visitors about their selected quota location(s).

Designated sites: Just as certain quota locations may be made available only through in-person distribution, this can extend to designated sites.

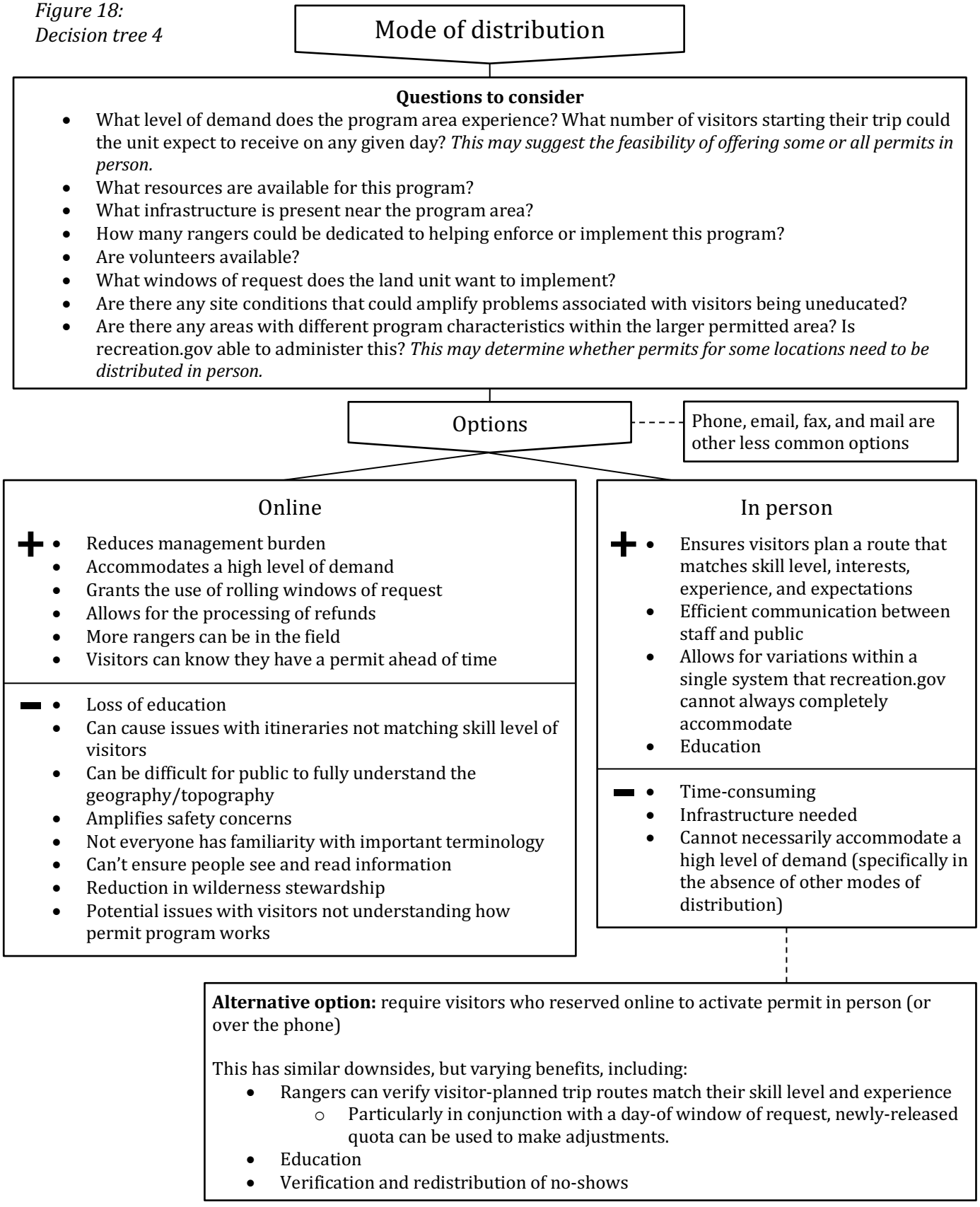
Cost: Recreation.gov charges a reservation fee. This fee is negotiable, and none of it goes back to the land unit. The absence of a fee may be a barrier to offering in-person distribution.

Potential solutions

Because online distribution comes with a variety of challenges, and in-person distribution isn't always possible, there are a number of solutions that can be used to mitigate some of the negative implications of online distribution. See "Mode of distribution" under 5.3.3 for some of the rationale/intentions behind these solutions.

- Leave some quota unfilled for in-the-field changes to itineraries.
- On recreation.gov, limit selectable destinations based on the distance from a visitor's destination selected for the previous night.
- Provide mandatory or non-mandatory educational videos.
- Place more rangers in the field.
- Require visitors to talk to a ranger over the phone or in person to reserve a permit for challenging locations or to activate their already-reserved permit.

Figure 18:
Decision tree 4



6.3.4 Quota

The quota is a foundational aspect of a visitor-limiting permit program — it is essentially the "visitor limit" part of the equation. Quotas are perhaps one of the least-fixed aspects of a permit program; they are constantly being adjusted and adapted in response to changing site conditions. The amount of quota offered can also be a strategic move. Managers can offer more or less than the identified acceptable level of use with the intention of creating certain outcomes. More quota will be offered if no-shows are an issue; less quota may be offered to leave room for adjustments in the field (see 5.3.4 and 5.4.2).

A quota, itself, is not considered a characteristic as it is a relatively dynamic quality of a permit program that needs to be broken down into a few different characteristics in order to fully discuss how it fits into the structure of a visitor-limiting permit program. The quota is given meaning by the location to which it's applied, the units through which it's defined, and whether there are designated sites.

Quota unit

The quota unit characteristic defines what it is that a quota is directly limiting, or how the quota is measured. There are three different units that a permit program may use; these include people, groups, and vehicles. A land unit may find that choosing one unit over another does not have much of an impact, positive or negative, but they also may find a clear need or rationale for one over another.

Decisions to make
☐ What quota unit(s) will be used?
☐ If group-based, will there be small-group and large-group permits available?
☐ Will quota units be combined at any locations?

Design options

Per-person quota: A person-based quota puts a direct limit on the number of people in an area, counting each individual as one quota unit.

Per-group quota: A group-based quota limits the number of groups present in an area. Sometimes the number is determined by looking at the number of acceptable campsites in an area. Another factor could be the average group size or the maximum allowable group size. If the quota is based on the average group size, this average needs to be monitored; as user patterns shift over time, the average group size may increase, resulting in the amount of quota offered no longer attaining desired conditions (see "Quota unit" under 5.3.4). While there often is a fixed maximum group size, programs may offer small-group and large-group permits to maintain a little more control over the number of people in an area.

Per-vehicle quota: A vehicle-based quota places a limit on the number of vehicles in an area. This is similar in many ways to the group-based quota and is generally used when parking lots set a clear capacity and/or vehicle impacts have become a major issue. Often, direct visitor impacts are a factor in implementing a per-vehicle permit program, but vehicles may have been the most straightforward quota unit to implement.

Mixing quota units: This can take two forms; one of which is using different units for different quota locations if they require varying management strategies. An example would be giving all but one destination zone a per-group quota and implementing a per-person quota in the remaining

destination zone. The other way that quota units may mix is by combining and applying them to a single location; when this happens, two different quotas are set. For instance, the allowable number of people might be 20 and the maximum number of groups might be 5 while the maximum group size is 6 people. In this case, when either the maximum number of people or groups is reached, no more visitors can reserve permits for that area. This may have the potential to resolve some of the downsides of different units, similarly to combining windows of request or types of distribution. Combining a person-based and a group-based quota, for example, could help maximize the number of people while still acknowledging the set number of acceptable campsites in an area (with one group camping at each site).

Interactions with other system characteristics

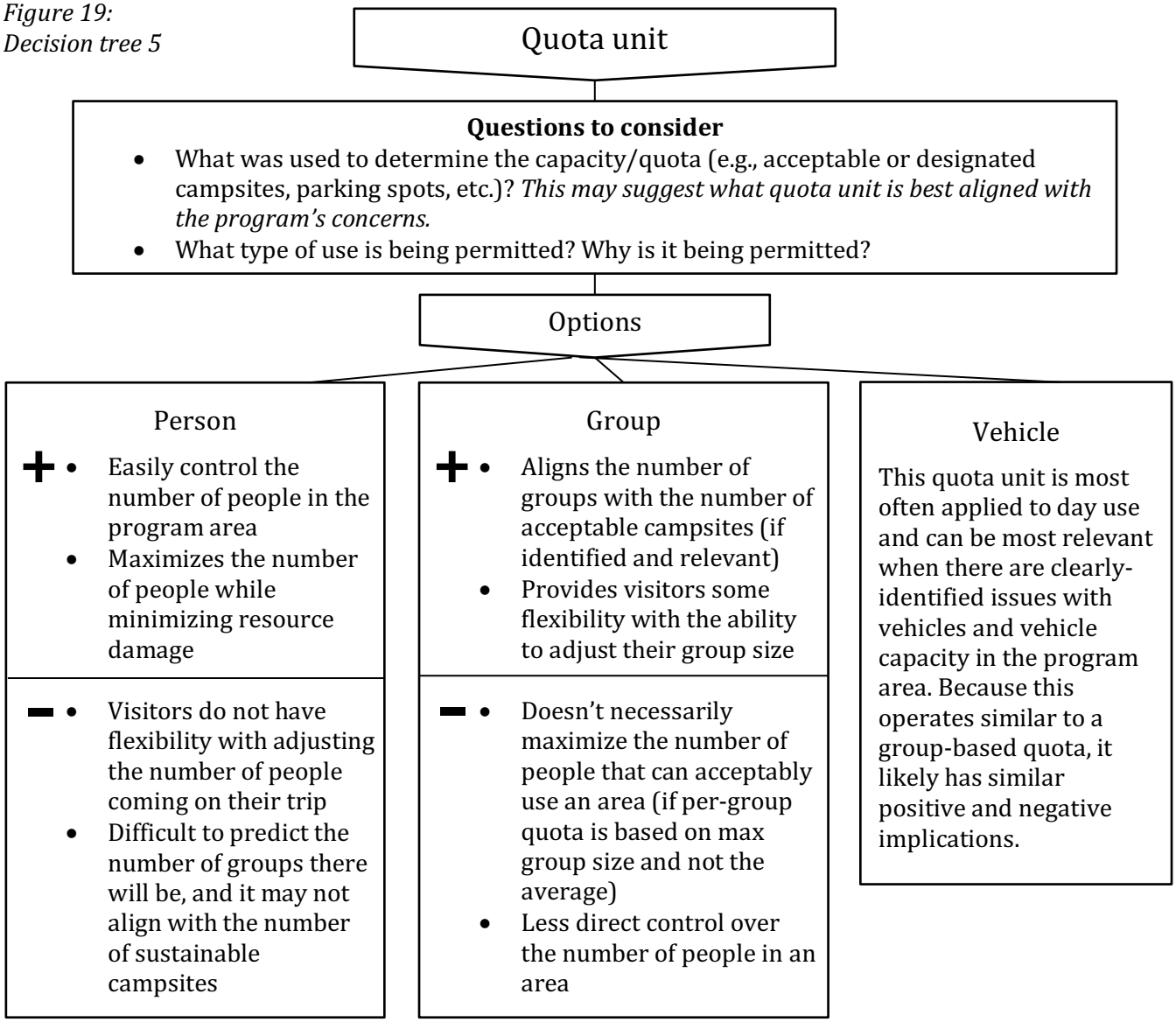
Type of use: The targeted type of use may determine what quota unit is best. Vehicle-based quotas are common for day use at recreation areas, driving on certain roads, or entry into parks. Group-based quotas are common for overnight use since individuals in a group tend to camp together — if the number of sustainable campsites has been identified and that number was a factor in determining the quota, a per-group quota can ensure the number of groups matches the number of sites.

Type of distribution: A lottery can favor larger groups — if each individual can submit at least one application, this can increase the odds of larger groups winning and could encourage larger groups to apply. If the quota is based on the number of groups, because groups can expand up to the maximum group size, the average number of individuals present in an area could potentially increase.

Quota location: The quota units used can be dependent on the quota location if locations within the permitted area have differing needs. The implications of different quota units demonstrate why one might be used over another depending on the conditions and other characteristics applied to the quota location (see Decision Tree 5).

Designated sites: With designated sites, often a per-group quota is used as a group tends to camp together at the same site; however, a per-person limit can work as well. Using a per-group quota may be more important if designated sites are used but not dictated on the permit — then, it is necessary to ensure the number of groups headed to a destination aligns with the number of available campsites. Combining designated campsites with a per-person quota could act as a multi-quota-unit system since the number of sites can act as a capacity for the number of groups. Sometimes, quota units are combined if there are 'camp areas' in which multiple groups can fit but the area's capacity for groups is also dependent on the number of people in each group. If only a per-group quota is used for designated sites, a program may either choose to keep the fixed maximum group size or give each campsite a customized maximum group size.

Figure 19:
Decision tree 5



Quota location

The quota location refers to the point or area in which an individual quota is applied. Often, a permit program has many different quotas for the permitted area, depending on what quota location is used. There are three possible quota locations a permit system may use. These include starting point, destination, and whole area.

Decisions to make
☐ What quota location(s) will be used?
☐ If overnight use, for what days of a visitor's trip will they need to reserve quota?

Another aspect of the quota location is for what days of a visitor's trip they need to reserve quota. This study considers it an aspect of the quota location characteristic, and it is discussed in more detail below.

Design options (Figure 20)

Destination quota: For this type of quota, the visitor limit is based on a visitor's destination, the location (zone, unit, or site) at which they will be camping each night of their trip — in this form, the permit becomes an itinerary. It would be possible for a program to require a visitor to reserve quota only for their first destination in which case the implications would be different and potentially align more with those of the starting-point quota. This quota is most relevant for overnight trips due to its ability to disperse camping impacts.

Starting-point quota: Starting-point quotas place a limit on the number of visitors using a 'starting point' within the program area. These starting points tend to be trailheads or parking lots. Visitors generally only need to reserve quota for the first day of their trip (if it is a multi-day trip); though, it is possible to have visitors reserve quota for each day of their trip, taking quota from their original starting point. With this type of quota location, determining the individual quotas may take a certain level of prediction in terms of user patterns, to ensure that the starting-point quotas will not create situations of resource degradation at potential destinations throughout the program area. This also means that user patterns need to be monitored and responded to in the case of any changes.

Whole-area quota: When a whole-area quota has been implemented, it means that there is a single quota for the entire program area — visitors can go wherever they want within the area if they have reserved a permit. These quotas are often used when the program area does not have a multitude of starting points or destinations and if visitation is relatively well-distributed, for

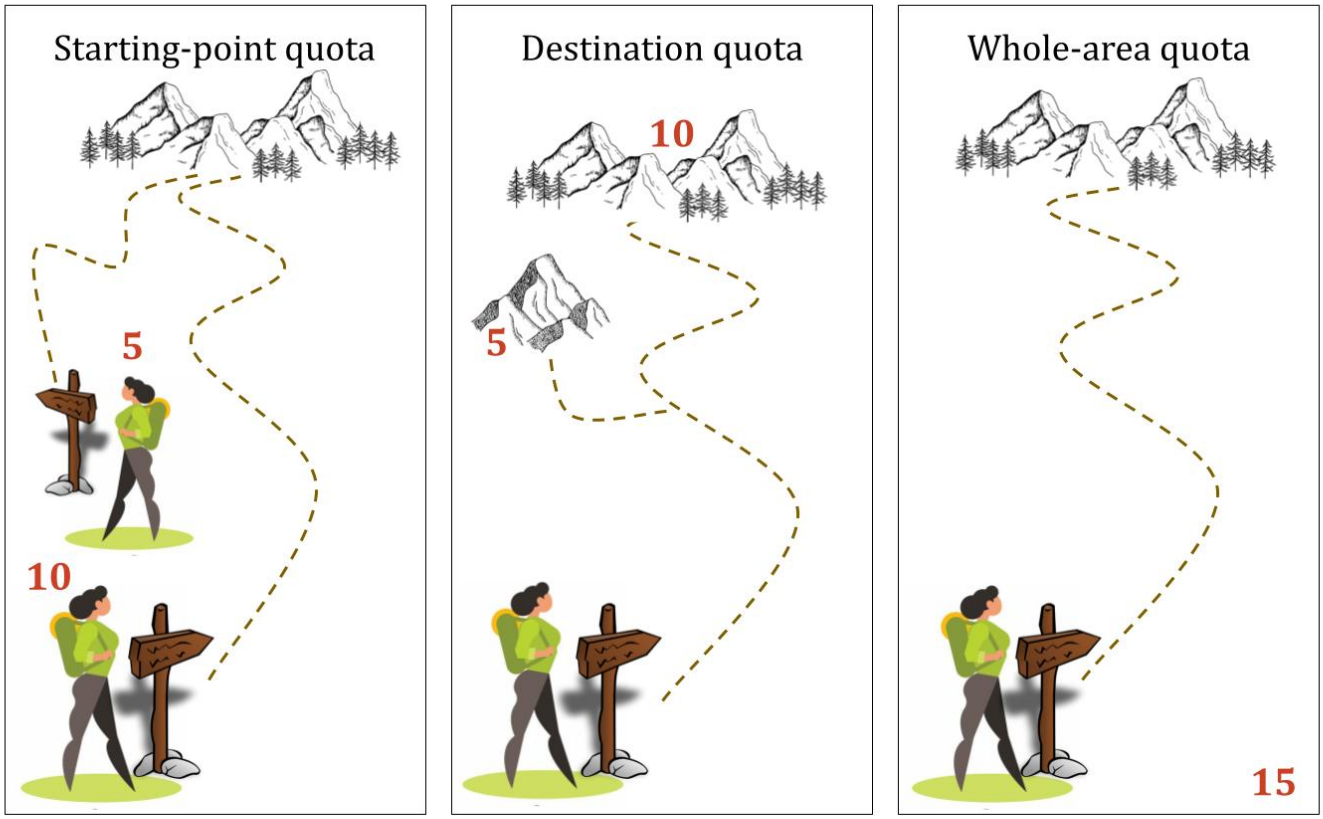


Figure 20: Quota location options

instance, if use of a single trail is being limited. Whole-area quotas tend to be most applicable to day-use or combined overnight- and day-use programs (see "Quota location" under 5.3.4).

More than one type of quota location may be used within a permitted area if parts of the area have differing needs. For instance, nine out of 10 zones may be managed via starting-point quotas while the remaining zone is managed through a destination quota.

Upon choosing a quota location, if the program is limiting overnight use, it also needs to be decided for what days of an individual's trip they need to reserve quota spots. Generally, visitors are required to either reserve quota for every day of their trip or just the starting day (see "Quota location" under 5.3.4). There is also the option of creating separate permits for short and long trips which could allow for greater predictability in trip length without all the complications of requiring visitors to reserve quota for every day of their trip.

Interactions with other characteristics

Type of use: Destination quotas may make more sense for overnight use than day use since day use doesn't cause the same level of destination-based impacts. Destination and starting-point quotas are commonly used for overnight use; day use is typically managed through whole-area and starting-point quotas.

Window of request: If using multiple windows of request, the individual qualities of quota locations may factor into what percent of the quota is released during each window of request. For example, a land unit may make some quota locations only available via day-of walk-up distribution because they require a different skill level and the land unit wants to ensure users know what they may encounter (e.g., challenging terrain, changes in elevation, extreme weather, etc.). It may also be the case that a quota location has a small associated quota; in this case, it may be sensible to divide the quota differently than at other locations with larger quotas.

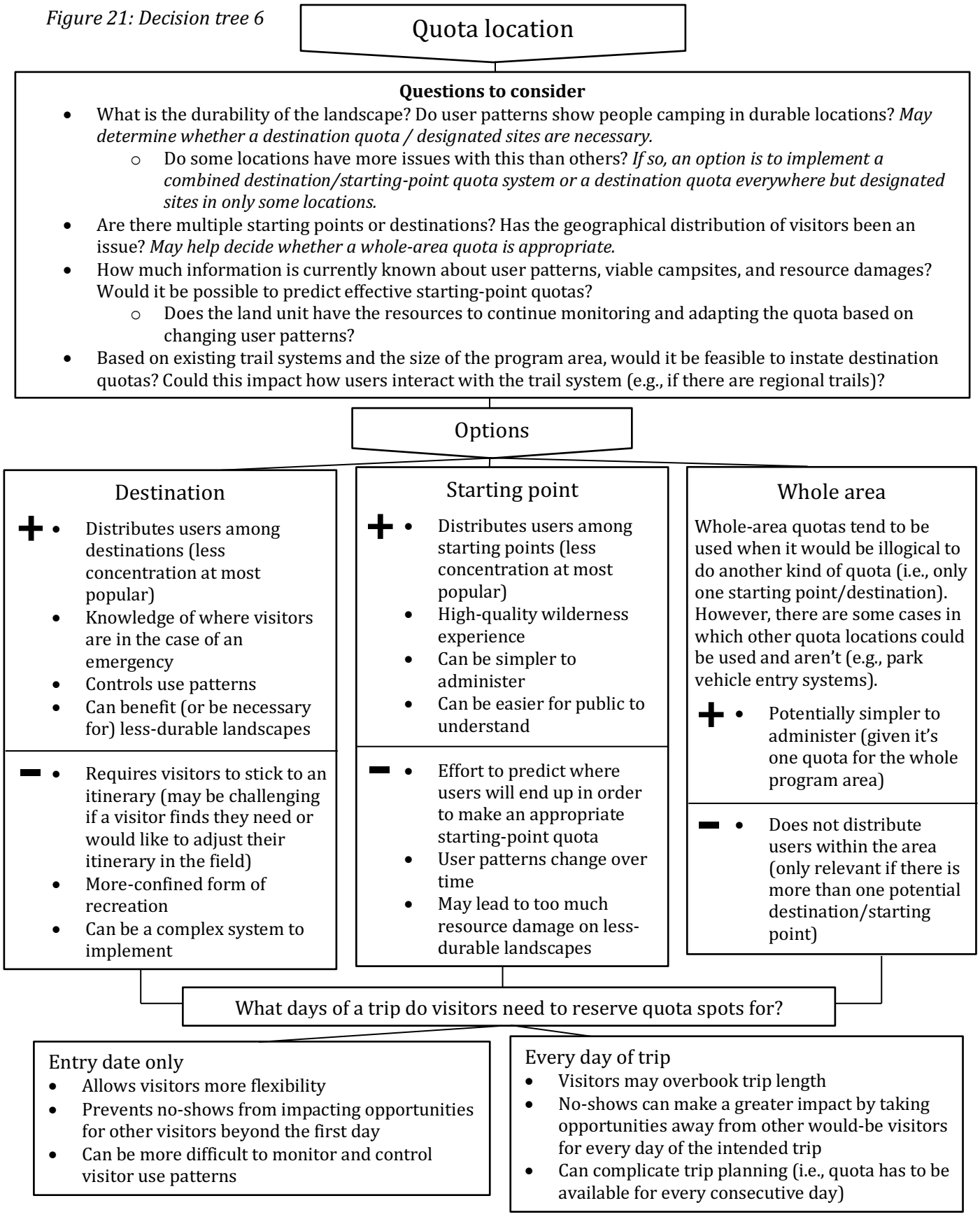
Type of distribution: A lottery may be necessary in the presence of high demand and destination quotas. Destination quotas are usually itinerary-based, so when permits are all released at once, high demand may make it challenging for users to form complete itineraries.

Mode of distribution: A land unit may make some quota locations only available in person if, for example, a destination necessitates that visitors have a certain level of skill, and managers want to ensure visitors are prepared and capable. Such quota locations may be made available over the phone, too, which still ensures visitors talk to a ranger and receive the essential education, something which cannot necessarily be ensured through online distribution. If online reservation is being used, visitors could be required to activate their permit in person which still allows rangers to educate visitors about their selected quota location(s).

Quota units: The quota units used can be dependent on the quota location if locations within the permitted area have differing needs. The implications of different quota units demonstrate why one might be used over another depending on the conditions and other characteristics applied to the quota location (see Decision Tree 5).

Designated sites: Destination quotas are highly interrelated with designated sites as the number of sites in a zone tends to define the amount of quota offered for that space. Nonetheless, designated sites can operate with other quota locations (Figure 22).

Figure 21: Decision tree 6



Designated sites

Decisions to make
☐ Will designated sites be used?
☐ In what areas?
☐ Will the sites be dictated on visitors' permits?

The designated sites characteristic refers to when a visitor is required to stay at a designated campsite that they either select upon reserving their permit or when they arrive at their destination. This characteristic is most commonly tied to destination quotas; however, it could be possible to use a different quota location, such as a starting-point quota. Because a permit program with designated campsites inherently dictates a destination, no matter the quota location, the implications of implementing a destination quota are applicable to designated sites as well (Figure 22).

There are four different design options regarding this characteristic, and they refer to the level at which designated sites have been incorporated into the permit program (see "Designated sites" under 5.3.4). Because designated campsites are restrictive forms of management, their application may just be limited to certain zones that particularly need it. The option chosen for this characteristic can have a lot to do with the management philosophy of a land unit, so the implications depicted in the decision tree have varying levels of importance to every unit.

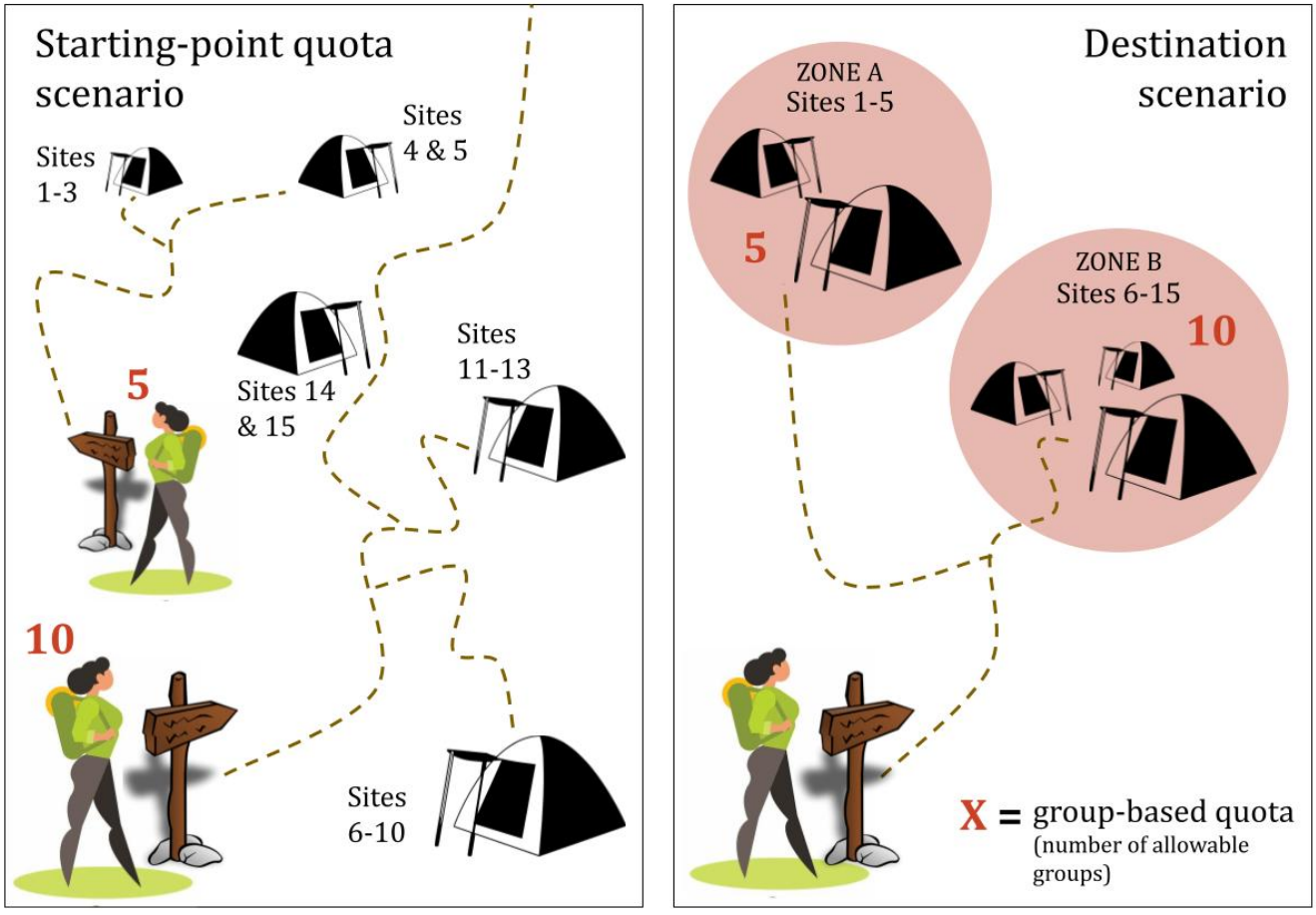


Figure 22: Different quota locations used with designated sites

Design options

Designated campsites everywhere: This refers to when visitors are required to camp at a designated site no matter their location in the program area. The implications of designated campsites would be felt across the entire area.

Designated campsites in most places: When designated campsites are instated in most places, this means that almost all zones of the program area require visitors to camp at a designated site — these sites are a defining feature of the permit program. The remaining dispersed-camping zones could be larger zones (in which it might be unreasonable to have designated sites), they might be trailless, or they might simply be set aside as a way to still allow some visitors to have the 'classic wilderness experience.'

Designated campsites in some places: When designated campsites are instated in only some places, this means that, rather than designated sites being a defining feature of the permit program, they have more so been placed in areas of particular need (e.g., ecologically sensitive areas) — when possible, dispersed camping has been retained.

Dispersed camping only: When dispersed camping is used throughout the entire program area, there are no designated campsites. This avoids the negative implications of designated campsites and especially makes sense if the benefits of designated sites are unnecessary.

It is also worth mentioning the use of designated camp areas, which are effectively designated sites, but other groups and individuals may be camping nearby. This was not a major focus of the study, and these are not as common as traditional designated sites, but it is likely that their implications are similar.

Interactions with other characteristics

Type of use: In the current manner in which these are applied, designated sites only apply to overnight use.

Window of request: When designated sites are utilized, the quota being divided corresponds to actual campsites. Certain sites could be made available only during specific windows of request. This could, presumably, be made more complex by also varying for what dates sites are available via each window. For instance, a site could be made available only for advance reservation during the month of July, but during the month of August, the site could be available only via day-of walk-ups.

Type of distribution: A lottery may be necessary in the presence of high demand and designated sites, particularly if users are having trouble making complete itineraries when permits are all released at once.

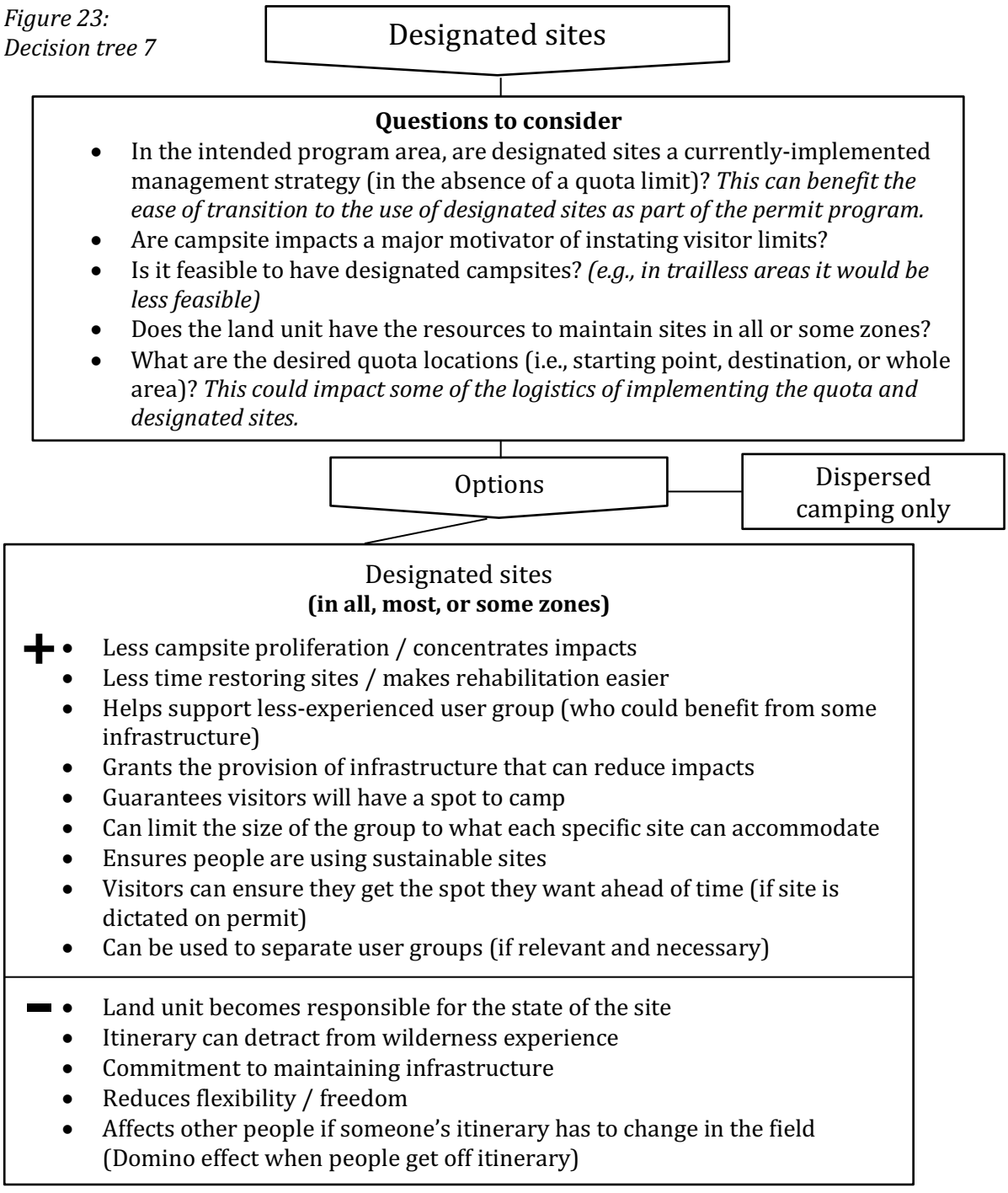
Mode of distribution: Just as certain quota locations may be made available only through in-person distribution, this can extend to designated sites.

Quota unit: With designated sites, often a per-group quota is used as a group tends to camp together at the same site; however, a per-person limit can work as well. Using a per-group quota may be

more important if designated sites are used but not dictated on the permit — then, it is necessary to ensure the number of groups headed to a destination aligns with the number of available campsites. Combining designated campsites with a per-person quota could act as a multi-quota-unit system since the number of sites can act as a capacity for the number of groups. Sometimes, quota units are combined if there are 'camp areas' in which multiple groups can fit but the area's capacity for groups is also dependent on the number of people in each group. If only a per-group quota is used for designated sites, a program may either choose to keep the fixed maximum group size or give each campsite a customized maximum group size.

Quota location: Destination quotas are highly interrelated with designated sites as the number of sites in a zone tends to define the amount of quota offered for that space. Nonetheless, designated sites can operate with other quota locations (Figure 22).

Figure 23: Decision tree 7



6.3.5 Cost

Visitor-limiting permit programs are resource-intensive; however, certain designs entail more management burden than others. Charging for a permit is a way to ensure that a successful and high-quality system is being implemented. This section is structured very differently than the others as the cost of a permit is a characteristic that many units have very little control over. Due to

differing agency cultures and management rules, national forests tend to have a more difficult time charging an administrative fee for a permit; this is not including the automatic recreation.gov reservation fee, from which the land unit does not get any money.

> I really think in order to successfully manage a permitted area and make it successful, you have to have that funding to back it up.
>
> – *Okanogan-Wenatchee National Forest*

The absence of resources that comes from not charging a fee tends to be most apparent when it prevents a unit from offering in-person distribution. Both in-person distribution and charging fees are not difficult characteristics to find among the national parks. Among national forests, in-person distribution is rare.

This section is not a tool for decision-making, but it provides some resources, particularly directed at national forests. Because there can be a great amount of value in talking with other land units who have already gone through the process, a list of all national forests that currently (as of 2022) charge administrative fees, along with the national forests that offer some form of in-person distribution, is provided below. These can also be found in Appendix A.

National forests that charge for a permit

National Forest	Permitted area & type of use	Cost of permit
Arapaho and Roosevelt National Forests	Brainard Lake Recreation Area (Space in one of the area's parking lots for day use or overnight)	$14/day for personal vehicle + $2 reservation fee
	Mount Evans Recreation Area (Timed vehicle entry)	$10 for personal vehicle + $2 reservation fee
	Indian Peaks Wilderness (Overnight trips)	$5 + $6 reservation fee
Eldorado National Forest	Desolation Wilderness (Overnight trips)	$5 per person if staying one night; $10 per person if staying longer + $6 reservation fee
Humboldt-Toiyabe National Forest	Hoover Wilderness (Overnight trips)	$3 per person + $6 reservation fee
Inyo National Forest	Ansel Adams, John Muir, Golden Trout, and Hoover Wildernesses (Overnight trips)	$5 per person + $6 reservation fee
	Mt. Whitney (Overnight trips on Mt. Whitney Trail or day trips in Mt. Whitney Zone)	$15 per person + $6 reservation fee
Okanogan-Wenatchee National Forest	Alpine Lakes Wilderness, Enchantment Area (Overnight trips)	$5 per person per night + $6 reservation fee

Ottawa National Forest	Sylvania Wilderness (Overnight trips in peak season)	$15 per night + $8 reservation fee
Sierra National Forest	John Muir, Ansel Adams, Dinkey Lake, and Kaiser Wildernesses (Overnight trips)	$5 per person + $6 reservation fee
Superior National Forest	Boundary Water Canoe Area Wilderness (Overnight trips)	$16 per person + $6 reservation fee

National forests with in-person distribution

Note: all other national forest permit programs have only online distribution.

National Forest	Permitted area & type of use	Distribution
Eldorado National Forest	Mokelumne Wilderness (Overnight trips in Carson Pass Management Area)	All permits are distributed as day-of walk-ups.
Ottawa National Forest	Sylvania Wilderness (Overnight trips in off-season)	In the off-season, permits are only available via day-of walk-ups.
Sierra National Forest	John Muir, Ansel Adams, Dinkey Lake, and Kaiser Wildernesses (Overnight trips)	All permits are reserved online and picked up in person.
Superior National Forest	Boundary Water Canoe Area Wilderness (Overnight trips)	All quota is released for reservation pre-season, and permits are picked up in person. Any unclaimed quota is distributed as day-of walk-ups.

6.4 Implementation advice

6.4.1 Establishing a new visitor-limiting permit program

While this guide is meant to aid managers in both establishing and modifying a permit program, the process of establishing a visitor-limiting permit program is a unique experience. This section is not comprehensive but includes an assortment of general advice and lessons learned by other land managers that are meant to provide some insight and nuance to this experience.

- The first year is a learning experience; expect to make some changes.
- Consider what management plans and legislation say about responsibilities for how an area should be managed, and establish priorities for implementing the permit program.
- Think about the long-term applicability of the permit program and build flexibility into the management plan to cope with changes or issues that might come up. User patterns and

site conditions may change over time; if a program is to successfully exist in perpetuity, it must be adaptable.

- Take advice from other land units. What have comparatively similar sites implemented? If applicable, how have nearby land units designed their permit program?

- Introducing new forms or combinations of system characteristics (not seen at other land units) may cause some initial confusion.

- Consider how the intended program area is already managed. Some of the currently implemented techniques may be possible to incorporate into the permit program (e.g., designated sites).

- Consider how the permit program might impact nearby, non-permitted natural areas. Where would users who didn't get a permit go instead?

- It may help to start with a simpler permit program and work up in complexity over time. This could be by slowly expanding the permit program to eventually cover the entire intended program area or by adding to the system characteristics (e.g., adding another window of request).

> If you're looking at setting a permit system up, try to anticipate where that use is going to go. Where does that displacement go? Because it doesn't go away.
>
> – *Arapaho and Roosevelt National Forests*

6.4.2 Common issue: no-shows

No-shows refer to when a visitor reserves a permit, doesn't cancel it, and then doesn't go on their trip. This issue is exceptionally pervasive and highly intertwined with the design of a permit program. There are two key questions to ask before diving into potential solutions. These questions look at what causes someone not to use their reserved quota and why they don't cancel their reservation.

Why do people reserve permits and end up not using them?

The most prominent cause of no-shows is the use of far-in-advance windows of request. Because far-in-advance windows of request require people to know their schedules months in advance, it is possible visitors' schedules change or they forget about their reservation (see Decision Tree 2). This issue can be exacerbated for day use which tends to have less follow-through than overnight use. People also may hoard quota — booking multiple trips with the intention of going when the weather is best. When the cost of a permit is low, visitors have little to no monetary disincentive to reserve more trips than they intend to take (see 5.3.5).

Why do people not cancel their reservations?

The main theory is that visitors don't cancel their reservations when there is not enough financial incentive to do so. Even if a permit costs a decent amount, if there is no associated refund, then there would be no financial incentive. Refunds, however, are becoming more common with the use of recreation.gov (see Decision Tree 4).

Potential solutions

- Charge a fee *and* offer a refund.
- Limit the number of permits a person can hold.
- Void all of someone's reservations if, for their first one, they are a no-show and don't cancel.
- Offer more quota for reservation than there is actual capacity (see 5.4.2).
- Require visitors to activate their permit online by printing or self-issuing.
- Require visitors to activate their permit in person (see Decision Tree 4).
- Adjust the windows of request (see Decision Tree 2).

6.4.3 Equity

Equitable access to public lands is an important issue to consider when implementing a system that is inherently about limiting the number of visitors, particularly when a cost is associated with the permits. This section uses a problem and solution format to discuss what causes inequity and what can be done to address it.[24]

Problem: The cost of a permit can be a barrier, but not charging for a permit can cause its own issues.

Solutions:

- Make permits available for free at local libraries where they often already offer free passes and permits for a variety of activities (see 5.4.3).
- Charging a per-person fee can more evenly distribute the cost burden among individuals.

> "Libraries are more than books; libraries are community centers.
>
> – *Gifford Pinchot National Forest*

Problem: Not everyone has equal access to technology, making online reservation and the requirement to print a permit a potential barrier.

Solutions:

- Coordinate with local libraries where staff can help the public navigate the reservation system and print their permit (see 5.4.3).

Problem: Windows of request can be a barrier to those who don't have flexible schedules or can't plan months ahead of time.

Solutions:

- Close-to-date rolling windows or day-of walk-ups can allow visitors who can't use advance reservation to still access a permit (see Decision Tree 2).
- Lotteries can prevent visitors from having to log on at a certain time to be competitive in getting a permit (see Decision Tree 3). This is not an issue with lower demand.

[24] These solutions, particularly regarding the fee, are band-aids to the equity issues of larger funding challenges, but they are at least actionable.

Other solutions:

- Offer informational materials in Spanish and engage with diverse partner groups.
- Keep some areas outside of the permit program or offer reduced-fee permits for certain areas.

6.4.4 Enforcement

Enforcement is a broad topic, but certain aspects of it can be heavily intertwined with the design of a permit program (see 5.4.4). This section provides a handful of considerations based on managers' experiences with existing programs.

- Think about how permits will be checked by rangers in the field. Can vehicles be checked for a permit as they drive in? What is available in terms of infrastructure? What form will the permit take (e.g., digital or paper)?

- Maintain some flexibility in the first year or so after a new program or characteristic is implemented. There tends to be a couple-year adjustment period.

- Be aware that visitors tend to be more encouraged to evade the system when demand is high.

- Prioritize contacts with visitors in the field — for enforcement, but also because it gives visitors a sense of satisfaction for abiding by the permit system.

- Envision ways people might cheat the system.

Chapter VII: Conclusion

Visitor-limiting permit programs are not by any means a popular management intervention, but across the United States they are becoming increasingly necessary and more frequently used as visitation levels and associated impacts continue to rise. These kinds of programs are an intensive and restrictive management tool. For this reason, it is important for land managers to fully understand how their early program design decisions may ultimately impact their ability to achieve desired conditions while mitigating the negative impacts on the management and visitor experience.

When beginning this research project, there were no identifiable, truly-holistic case studies reviewing the design of visitor-limiting permit programs. The case studies that were found tended to focus on aspects of the quota. However, the quota is only one facet of designing a permit program. Ultimately, this led to the research question "How are visitor-limiting permit programs being designed and what are the resulting implications of implementation?"

This study has taken an in-depth look at 15 different case studies, or permit programs. In doing so, I established a framework for holistically analyzing the design of such programs — this framework consists of the nine key characteristics, identified by this study, that compose a visitor-limiting permit program. While the case studies are a snapshot in time, the system characteristics will continue to be relevant. These characteristics are as follows:

- Type of use: the activities managed by the permit program (section 5.3.1)
- Time of year: when permits are required (section 5.3.2)
- Window of request: when permits are released for reservation and the window that follows (section 5.3.3)
- Type of distribution: how permits are allocated (section 5.3.3)
- Mode of distribution: the platform through which permits are accessed (section 5.3.3)
- Quota unit: what the quota is limiting; how it is measured (section 5.3.4)
- Quota location: where the quota applies (section 5.3.4)
- Designated site: whether or not visitors must camp at a specific location (section 5.3.4)
- Cost: cost of a permit (section 5.3.5)

In evaluating these characteristics, I also discussed their current design options and the implications of implementing different options. The extent and relevance of these implications was found to be highly dependent on a set of qualities and conditions unique to every land unit; these are the "considerations" identified in section 5.2 and listed below:

- Site conditions: physical qualities of a unit, in its form or operation (section 5.2.1)
- Program rationale: the rationale for establishing a program (section 5.2.2)
- Demand: the level, distribution, and temporality of demand within a permitted area (section 5.2.3)

When a land unit is experiencing major issues with their permit program, it almost always results from the program's design not accounting for or adapting to changes in one of these three considerations. The findings of this study, regarding the system characteristics, offer the necessary information to design a permit program that is shaped to a land unit's unique qualities and conditions.

This study's resulting management guide offers a means for managers to navigate these findings to make more informed decisions when establishing or changing their visitor-limiting permit program. The goal of this study was to "provide current and future land managers with valuable perspectives and information for implementing the best visitor-limiting permit program to meet their land units' desired conditions." Through the findings and subsequent management guide, this goal has in many ways been met.

This study looked at program design through an exceptionally broad, exploratory lens due to the limited existing research. Much more can and should be studied within the realm of visitor-limiting permit programs. The resulting product of this exploratory study is a solid foundation for more targeted studies to occur. Here, I have identified the important parts of a visitor-limiting permit program and on a basic level, how they interact and their consequential implications. A future researcher may now look at the distribution process while also having some idea of its place within a broader system.

I am left with many ideas for further research; the following list includes just some of the questions that could be useful to explore.

- Have any visitor-limiting permit programs been implemented and later deemed unnecessary? In this case, were the programs shut down or were their characteristics adjusted? What caused the change in need?
- How do different managers define 'success'? What indicators do they use (could be more than just ecological)? This could lead to the creation of a guide for post-implementation program outcome analysis.
- Is there a correlation between geographical area or ecosystem and the program design used?
- How is recreation.gov shaping permit programs? How is it limiting them or expanding the scope of possibility?
- How do politics (at any level) impact a program's design? This could be broken into a variety of smaller research questions looking at the allocation of resources, public response (local or national), in-unit ideologies/management philosophies, etc.

Beyond specific questions, I think there is ample opportunity to do deeper dives into any of the topics covered in this study, including the relationships between these topics. For instance, in the study, only some site conditions (and their relationships to program characteristics) have been identified; expanding upon this could be impactful.

The value in continuing research in this branch of visitor use management, to quote one of the interviewed managers, comes down to this sentiment: "the spirit of the permit system isn't to keep people out; it's to provide as much access as possible, while at the same time protecting wilderness character and protecting the physical features of the wilderness that make it what it is." As we come to better understand visitor-limiting permit programs, hopefully, we can make it a little easier to meet this crucial balance.

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Appendices

Appendix A: Dataset of all identified visitor-limiting permit programs

Appendix A can be found in the attachment "Appendix A – Dataset of visitor-limiting permit programs"

Appendix B: Decision-making frameworks

IVUMC Visitor Use Management Framework	Visitor Experience and Resource Protection (VERP) Process	Limits of Acceptable Change (LAC) System
1. Clarify the project purpose and need 2. Review the area's purpose and applicable legislation, agency policies, and other management direction 3. Assess and summarize existing information and current conditions 4. Develop a project action plan 5. Define desired conditions for the project area 6. Define appropriate visitor activities, facilities, and services 7. Select indicators and establish thresholds 8. Compare and document the differences between existing and desired conditions, and, for visitor use-related impacts, clarify the specific links to visitor use characteristics 9. Identify visitor use management strategies and actions to achieve desired conditions 10. Where necessary, identify visitor capacities and additional strategies to manage use levels within capacities 11. Develop a monitoring strategy 12. Implement management actions 13. Conduct and document ongoing monitoring, and evaluate the effectiveness of management actions in achieving desired conditions 14. Adjust management actions if needed to achieve desired conditions, and document rationale	1. Assemble an interdisciplinary project team 2. Develop a public involvement strategy 3. Develop statements of park purpose, significance, and primary interpretive themes; identify planning constraints 4. Analyze park resources and the existing visitor use 5. Describe a potential range of visitor experiences and resource conditions 6. Allocate the potential zones to specific locations in the park 7. Select indicators and specify standards for each zone; develop a monitoring plan 8. Monitor resource and social indicators; take management action	1. Identify area issues and concerns 2. Define and describe opportunity classes 3. Select indicators of resource and social conditions 4. Inventory existing resource and social conditions 5. Specify standards for resource and social indicators for each opportunity class 6. Identify alternative opportunity class allocations reflecting area issues and concerns and existing resource and social conditions 7. Identify management actions for each alternative 8. Evaluation and selection of a preferred alternative 9. Implement actions and monitor conditions

Appendix C: Contact with participants

Recruitment email:

Dear NAME:

I am a student at the University of Oregon and am currently in the process of completing my thesis for the Planning, Public Policy, and Management program. For my research project, I am looking to understand how visitor-limiting permit programs are being implemented on public lands and the ways in which they're characterized.

For the first part of my project, I reviewed relevant literature and compiled a list of visitor-limiting permit programs in all national forests and parks. Several exclusions were made when compiling this data; river and motorized-vehicle use permits were both excluded, as well as any permits for activities inaccessible to the average person (e.g. rock climbing). For the second part of the project, I am interviewing land managers who have either helped design, implement, or maintain permit programs identified during my initial research. I'm reaching out to you as I think you would be a valuable person to interview regarding SITE NAME's SITE AREA permit program.

I am hoping that the end result of this study will be a useful resource to other land managers in similar situations. I will be able to share the results of the study with you.

Please let me know if you would be interested in participating in my research, and if you have any questions. If you are interested, I will be following up with more logistical information.

Thank you,
Morgan Darby

Follow-up email:

Hi NAME:

Thank you so much for your interest in participating in this research project.

The goal of this project is to understand how visitor-limiting permit programs are being implemented on public lands and the ways in which they're characterized.

The information gathered in the interview will relate entirely to the permit program for SPECIFIC AREA. For your convenience, I have included an overview of the interview questions at the end of this email.

While your identity will not be disclosed in the study, quotes and information from the interview will be associated with your respective public land unit. It is possible that your identity may be inferred based on this information. That said, interviews will focus on non-sensitive information about the permit program. It is anticipated that there will be little to no risk of repercussions if your identity is ascertained.

With all this information in mind, if you are still interested in participating in the study, I would like to organize a 45-60 minute interview with you to discuss the quota-based permit program for

SPECIFIC AREA. This interview can take place over Zoom or phone. Let me know which mode of interview you would prefer.

Your participation in the study is voluntary, and you are free to withdraw at any time, for whatever reason. I would like to record the interview in order to retain an accurate account of what you say. If you prefer the interview not be recorded, please let me know.

I would like to propose a few dates that I am available to conduct the interview. Please let me know if you are available to talk during one of these times.
LIST OF DATES

Thank you,
Morgan Darby

Interview questions:

1. Why was this program initiated?
2. Have you changed the quota-based permit program's design since it was first implemented? If so, what changed and why?
   If not…
   a. Are you satisfied with the current design and implementation of the permit program or are there aspects of it that you would like to change?
3. How did you decide on the current system design?
4. What process did you go through to determine a carrying capacity?
5. What benefits and downsides have you observed from the system characteristics used?
6. What challenges have you experienced based on the system characteristics used?
7. Have the desired outcomes been achieved by this permit program?
8. If you were to give advice to others considering a permit program, what advice would you give?

Appendix D: Interview questions

1. What is your current position and how long have you been working at this site?
2. When was the permit program started?
3. I'd like to confirm a few details of the permit program. From what I've gathered online… (*describe program for SITE AREA*) Is all of this information correct?
4. Why was this program initiated?
5. Has the quota-based permit program's design changed over time? When and why were these changes made? (*any major changes or most recent ones*)
   If not…
   a. Are you satisfied with the current design and implementation of the permit program or are there aspects of it that you would like to change? Why or why not?
6. (*If changes made*) Were any of these changes due to the pandemic? If so, are you likely to revert to the previous system once the threat of the pandemic dissipates?
7. How did you decide on the current system design? What was the rationale behind it?
8. What process did you go through to determine a carrying capacity for SITE AREA?
9. What benefits have you observed from the system characteristics used?
10. What downsides have you observed from the system characteristics used?
11. What challenges (*management, visitor-experience, etc. related*) have you experienced based on the system characteristics used?
12. Have the desired outcomes been achieved by this permit program (*anecdotal or data-based answer works*)? Have you conducted any ongoing monitoring? If so, is this information publicly available?
13. If you were to give advice to others considering a permit program, what advice would you give?
14. Is there anything else you think is important that I haven't asked about?