



Appalachian National Scenic Trail The Virginia Triple Crown Segment Visitor Use Management Plan



2024

Cover photograph: Tinker Cliffs (Photograph credit: Suzanne Neal, Appalachian Trail Conservancy)

THE VIRGINIA TRIPLE CROWN SEGMENT APPALACHIAN NATIONAL SCENIC TRAIL

VISITOR USE MANAGEMENT PLAN MARCH 2024

The strategies as described herein meet the purpose and need for the Virginia Triple Crown Segment of the Appalachian National Scenic Trail and best address the planning issues and opportunities, ensuring long-term protection and preservation of the trail's resources while also enhancing the opportunities for visitors to enjoy them.

The Visitor Use Management Plan has been prepared as a collaborative effort between cooperative management partners (National Park Service, Appalachian Trail Conservancy, Roanoke Appalachian Trail Club, and US Forest Service) and regional partners (Virginia Department of Transportation, Roanoke County, Botetourt County, Roanoke City, and Roanoke Valley-Alleghany Regional Commission).

The plan is recommended for approval.

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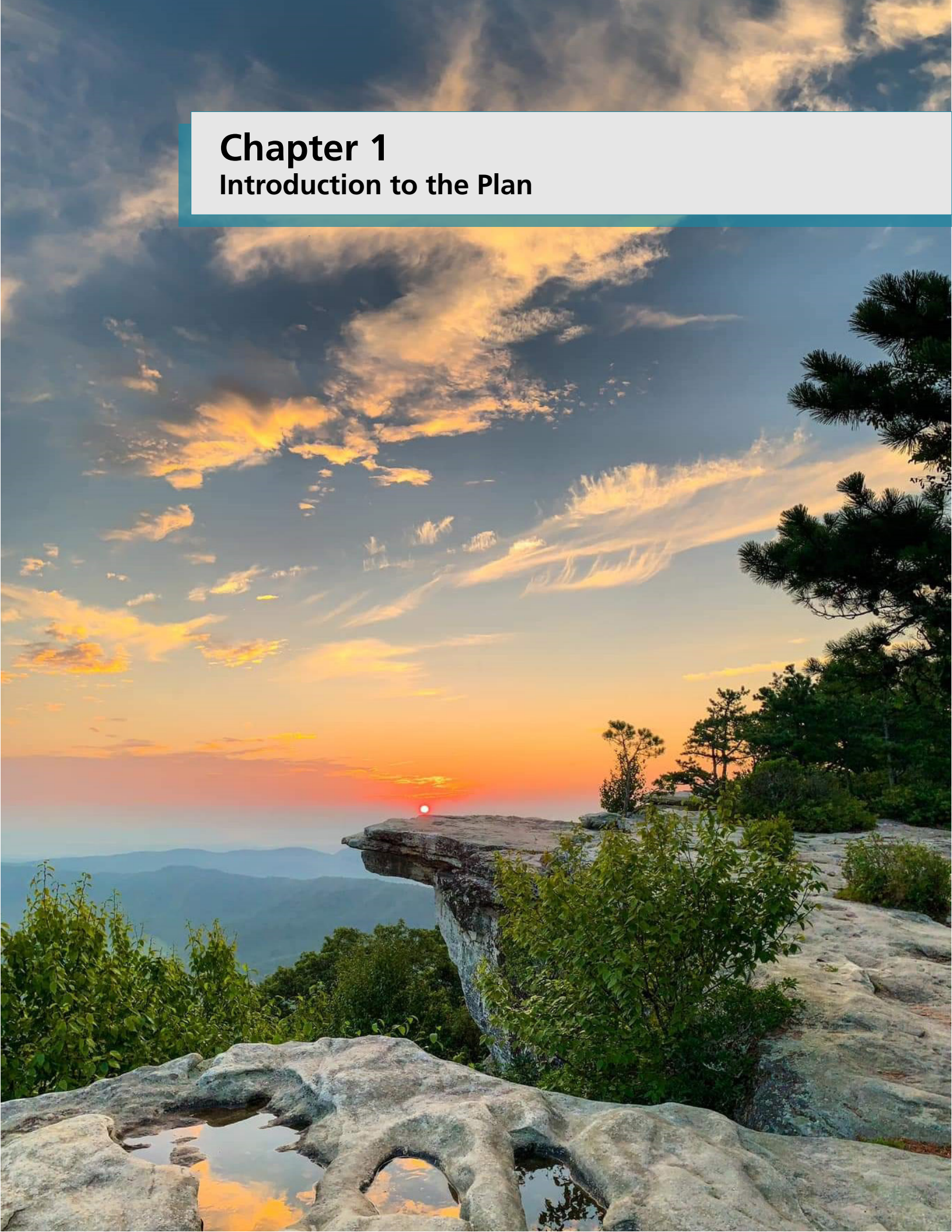
Acronyms and Abbreviations

ABA	Architectural Barriers Act
ATC	Appalachian Trail Conservancy
CFR	Code of Federal Regulations
Comprehensive Plan	Comprehensive Plan for the Protection, Management, Development and Use of the Appalachian National Scenic Trail
I-77	Interstate 77
I-81	Interstate 81
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
RATC	Roanoke Appalachian Trail Club
US-11	US Route 11
US-220	US Route 220
USC	US Code
USFS	US Forest Service
VA-264	Virginia State Route 264
VA-311	Virginia State Route 311
VA-620	Virginia State Route 620
VA-624	Virginia State Route 624
VA-652	Virginia State Route 652
VA-779	Virginia State Route 779 (Catawba Creek Road)
VA-864	Virginia State Route 864 (Old Catawba Road)
VDOT	Virginia Department of Transportation

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Chapter 1

Introduction to the Plan



Divider photograph: McAfee Knob (Photograph credit: Tim Lewis, Roanoke Appalachian Trail Club)

CHAPTER 1. INTRODUCTION TO THE PLAN

INTRODUCTION

Visitor use management is the proactive and adaptive process of planning for and managing characteristics of visitor use to sustain desired resource conditions and visitor experiences. Visitor use management helps managers maximize benefits for visitors while protecting resources in a particular area. This Visitor Use Management Plan identifies a collaborative vision for the Virginia Triple Crown segment of the Appalachian National Scenic Trail (figure 1).

The Virginia Triple Crown segment of the Appalachian National Scenic Trail is a world-class destination preserved and supported by a vibrant public/private partnership. The National Park Service came together with cooperative management partners (Appalachian Trail Conservancy, Roanoke Appalachian Trail Club, and US Forest Service) and regional partners (Virginia Department of Transportation [VDOT], Roanoke County, Botetourt County, Roanoke City, and Roanoke Valley-Alleghany Regional Commission) to identify issues of mutual interest, opportunities, and challenges. The work in the Virginia Triple Crown segment is a wonderful example of collective efforts to look at visitor experience and conservation as a whole — not fragmented by boundaries or jurisdictions — and to leverage the natural, cultural, scenic, and recreational value of the Appalachian National Scenic Trail towards common goals.

This comprehensive planning process allows the partners to evaluate the range of options to address issues and maximize opportunities while considering how the strategies in one location may be connected to strategies in other locations in the Virginia Triple Crown segment.

The plan is multi-jurisdictional, including National Park Service (NPS) lands, US Forest Service (USFS) lands, and Appalachian Trail Conservancy (ATC) easement lands (figure 2). The Appalachian National Scenic Trail is administered by the Secretary of the Interior in consultation with the Secretary of Agriculture and is managed as a partnership among the US Forest Service, the National Park Service Appalachian Trail Park Office, the Appalachian Trail Conservancy, and Appalachian Trail Conservancy-affiliated local Appalachian Trail clubs. Management is in accordance with the National Trails System Act and the *Comprehensive Plan for the Protection, Management, Development and Use of the Appalachian National Scenic Trail* (Comprehensive Plan; NPS 1981) using the Cooperative Management System.

This plan is not a decision document; it provides comprehensive guidance for managing the Virginia Triple Crown segment of the Appalachian National Scenic Trail regardless of land ownership, guiding the partnership in future management actions. The Visitor Use Management Plan complements other planning efforts (see the “Relationships to Other Actions and Planning Efforts” section later in this chapter) and does not supersede other applicable rules, laws, policies, or regulations unique to partners and land management agencies.

THE VIRGINIA TRIPLE CROWN SEGMENT DESCRIPTION

The Virginia Triple Crown segment is located near Roanoke, Virginia. Moving from north to south, the segment includes the attractions of Tinker Cliffs, McAfee Knob — one of the most impressive and highly visited scenic overlooks along the Appalachian National Scenic Trail — and Dragon’s Tooth (figure 1). Collectively, these three sites are known as the Virginia Triple Crown. Virginia State Route 652 (VA-652) marks the northern boundary of the Virginia Triple Crown segment between National Park Service and US Forest Service lands. Virginia State Route 264 (VA-264) marks the southern boundary of the Virginia Triple Crown segment between National Park Service and US Forest Service lands.

Figure 1. Project Area Map

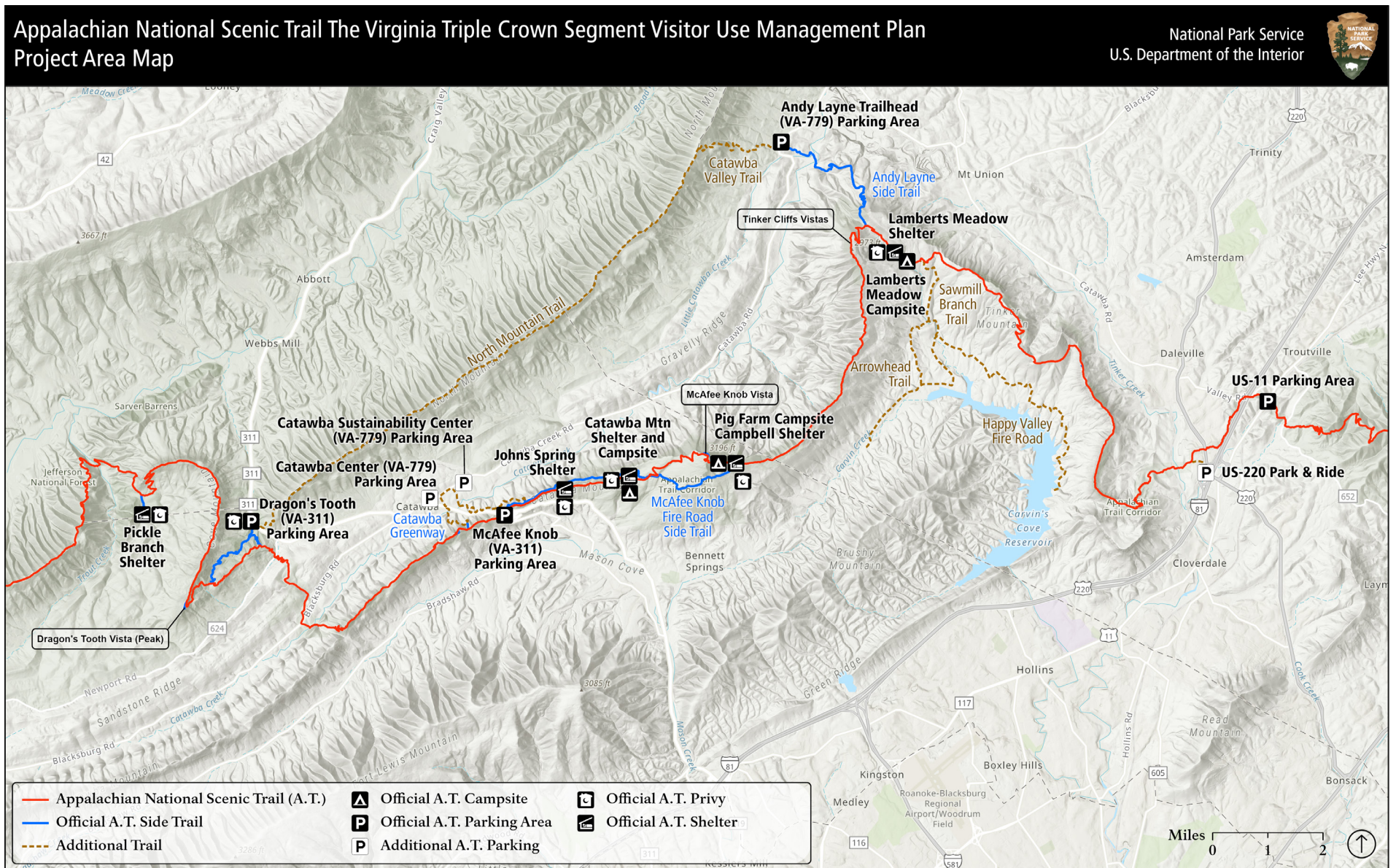
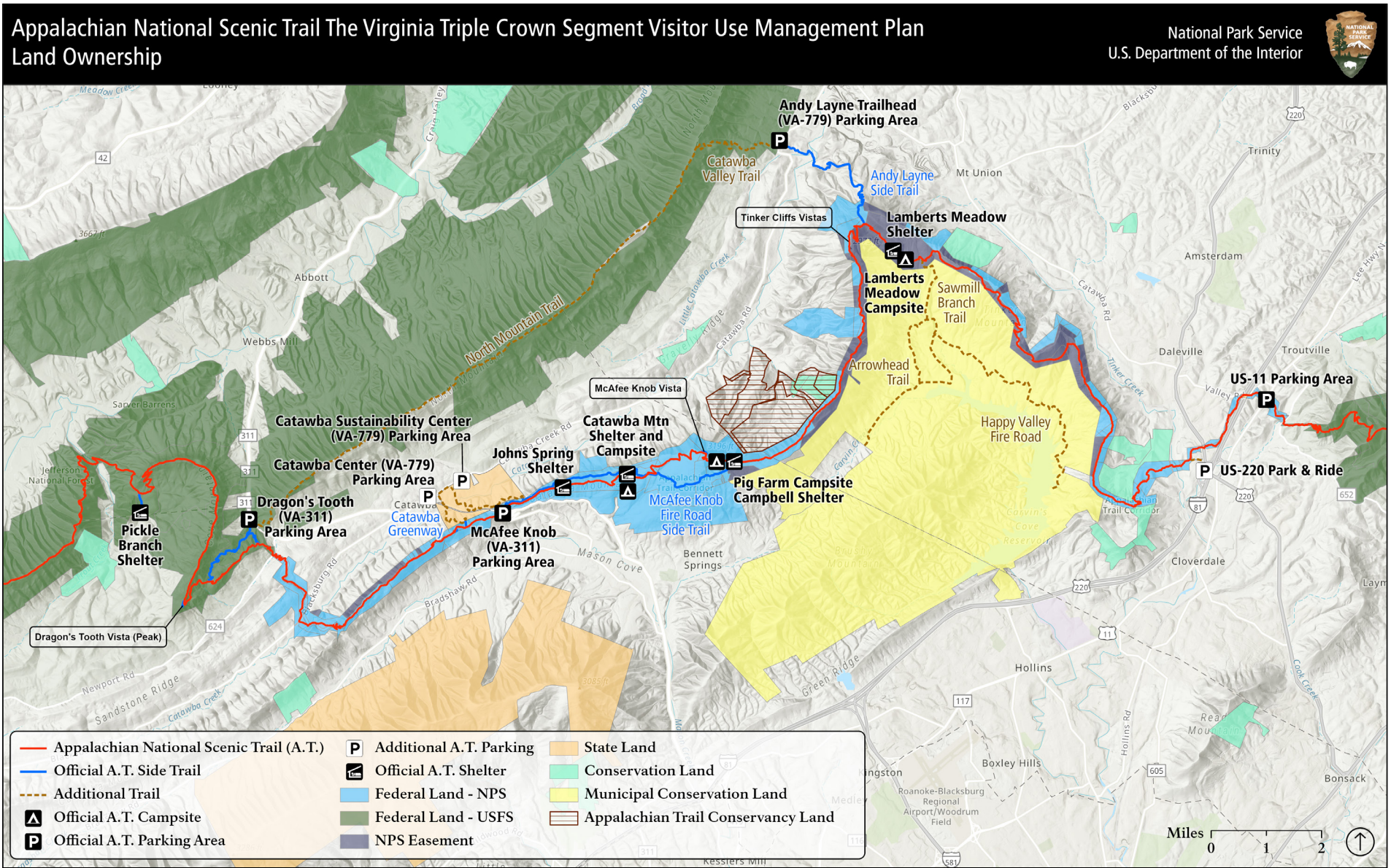


Figure 2. Land Ownership Map



Although many visitors hike these locations separately, there are opportunities to hike all three to complete the Virginia Triple Crown segment of the Appalachian National Scenic Trail. The options to do so include hiking in one direction (a trip of about 20 miles) or hiking a loop traveling between Tinker Cliffs and Dragon's Tooth on the Appalachian National Scenic Trail and returning on a US Forest Service trail, the North Mountain Trail (a trip of about 34 miles).

Tinker Cliffs is the northernmost site in the Virginia Triple Crown and has multiple land ownerships. It includes the Tinker Cliffs viewpoint and two designated camping locations, including one shelter. The Andy Layne Trail connects to the Appalachian National Scenic Trail in this area. The Andy Layne parking lot is a gravel lot on private property, with an official capacity of 15 vehicles. The nearby Carvins Cove Nature Reserve, managed by the Western Virginia Water Authority and City of Roanoke, is a popular mountain biking area. Sawmill Branch Trail connects the Carvins Cove trail system to the Appalachian National Scenic Trail north of Lambert's Meadow shelter. Since bicycle use is prohibited on the Appalachian National Scenic Trail, managers work collaboratively to address social trail creation and appropriate places for bicycling.

McAfee Knob is between Dragon's Tooth and Tinker Cliffs and is the most popular of the three sites in the Virginia Triple Crown. Attractions include the sandstone overhang bluff viewpoint at McAfee Knob and the massive boulders known as Devils Kitchen. This trail section includes access to three shelters and two designated campsites. McAfee Knob may be reached via four trailheads. The Virginia State Route 311 (VA-311) trailhead parking lot has an official capacity of 35 parking spaces and provides direct access to the Appalachian National Scenic Trail. The Roanoke County Catawba Center allows for 12 vehicles and the Virginia Tech Catawba Sustainability Center provides 25 parking spaces, both providing access to the Catawba Greenway trailhead. The area also includes a fire road that is often used by hikers. Hikers can also reach the trail section from the Andy Layne Trailhead to hike McAfee Knob and Tinker Cliffs as a single hike.

Dragon's Tooth is a spectacular rock formation on top of Cove Mountain in Jefferson National Forest and is the southernmost site of the Virginia Triple Crown. The area includes the Dragon's Tooth viewpoint, several areas popular for dispersed camping, and two Appalachian National Scenic Trail connecting trails, the Dragon's Tooth Trail and the Boy Scout Trail. The area is accessed from a parking lot with capacity for 50 vehicles, bear-proof garbage cans, and a vault toilet.

ABOUT THE APPALACHIAN NATIONAL SCENIC TRAIL

The Appalachian National Scenic Trail is notable for its length, unique management partnership, and complex web of land ownership and jurisdiction. These unique qualities pose a broad range of challenges and opportunities.

The Appalachian National Scenic Trail corridor traverses more than 2,100 miles of the Appalachian Mountains and valleys, winding through an ancient mountain range between Katahdin, Maine and Springer Mountain, Georgia. As the longest continuously marked, maintained, and publicly protected foot trail in the United States, the Appalachian National Scenic Trail receives approximately 3 million visitors annually.

The Appalachian National Scenic Trail is a complex National Park unit, passing through 14 states, each with diverse jurisdictions, communities, and ecological characteristics. Successful management of a resource as vast and complex as the Appalachian National Scenic Trail requires an equally broad assembly of partners. The National Park Service administers the Appalachian National Scenic Trail through partnerships, which include 30 trail-maintaining organizations and the Appalachian Trail Conservancy. The ongoing success of the Appalachian National Scenic Trail's Cooperative Management System serves as a model for national trails and other National Park Service units.

In 1981, the National Park Service and US Forest Service completed the Comprehensive Plan (NPS 1981), which established the framework of a Cooperative Management System, a unique partnership arrangement between public and private groups involved in management of the Appalachian National Scenic Trail. The Comprehensive Plan is supplemented by local management plans, which provide more specific policy and program direction for each section of the Appalachian National Scenic Trail cooperatively managed by the 30 trail-maintaining organizations.

The National Park Service is responsible for administering the entire Appalachian National Scenic Trail in coordination with the US Forest Service. The National Park Service may, however, delegate to states, private organizations, or individuals the responsibility to operate, develop, or maintain portions of the Appalachian National Scenic Trail. In its deliberations, Congress also recognized that the active leadership role of volunteers in management, which has been one of the Appalachian National Scenic Trail's great assets, should continue. The National Park Service recognizes the strength of the public/private effort to meet these management challenges. The Cooperative Management System for the Appalachian National Scenic Trail extends the partnership concept while seeking to protect the tradition of flexibility.

WHY THIS PLAN IS NEEDED

The purpose of the Visitor Use Management Plan for the Virginia Triple Crown segment of the Appalachian National Scenic Trail is to develop strategies to protect resources and provide opportunities for visitors to safely use, experience, and enjoy these key destinations.

The following statements define and articulate the need to act:

- **There is a need to alleviate barriers to the Appalachian National Scenic Trail experience.** The Virginia Triple Crown segment of the Appalachian National Scenic Trail has use levels that can degrade visitor experiences and social conditions along the trail. Because of the proximity of the Virginia Triple Crown segment to millions of hikers on the East Coast, especially in the Roanoke region and at universities (e.g., Virginia Tech, Liberty University), this trail segment is subject to high levels of use with increasing visitation. Many visitors from the Raleigh-Durham and Charlotte, North Carolina regions use Interstate 77 (I-77) and Interstate 81 (I-81) to access the Virginia Triple Crown Segment. Intense publicity of McAfee Knob on social media platforms, including Instagram and Facebook groups, national media including magazines and travel blogs, travel companies, and local and state government agencies, exacerbate high levels of use. User conflicts and visitor safety issues often increase with greater visitor numbers and increasing group use. As the Virginia Triple Crown segment visitation has increased in recent years, related effects to the trail experience, resources, and safety have also increased. Trail managers have recognized the need to proactively and comprehensively plan to maintain or achieve desired conditions.
- **There is a need to alleviate impacts on resources.** High levels of visitor use in concentrated areas can cause considerable impacts on resources (such as soils, vegetation, water, wildlife, and cultural resources). Intensive use levels can impact the trail tread and result in user-created trails, contributing to trail widening and greater erosion rates. User-created campsites can contribute to a loss of vegetation and soil, cause tree root exposure, and expose bare soils to colonization by non-native or invasive plant species. Other user-related impacts affecting resource qualities include user-created fires and trash accumulation. Trash that is not managed well contributes to human-wildlife conflicts, most notably bears. Other wildlife species are also affected including corvid birds, raccoons, and skunks, all of which can impact other wildlife species, such as forest birds. As natural resources are degraded by high levels of visitor use, the visitor experience degrades concurrently.

- **There is a need to address safety concerns.** The current amount, configuration, and condition of facilities are not sufficiently supporting the high levels of visitor use in the Virginia Triple Crown segment. At trailheads, basic visitor services such as vault toilets and waste management are needed, as trash and human waste on the landscape pose health concerns for people and natural resources. Frequently full parking lots, overflow parking along highways, and pedestrian crossing of high-speed roads create hazardous conditions throughout the Virginia Triple Crown segment. Limited management of the high levels of use also contributes to safety concerns, for example when parking exceeds lot capacity. Areas of concern include but are not limited to Virginia State Route 779 (VA-779)/I-81 underpass area, the US Route 220 (US-220) crossing, and VA-311. A pedestrian bridge project to improve crossing conditions is underway at the McAfee Knob Trailhead at VA-311, but there are safety concerns in the meantime, including user-created parking that disrupts sight lines when entering and exiting this lot. Management strategies are needed to address these concerns.

REGIONAL RECREATION AND SOCIOECONOMIC CONTEXT

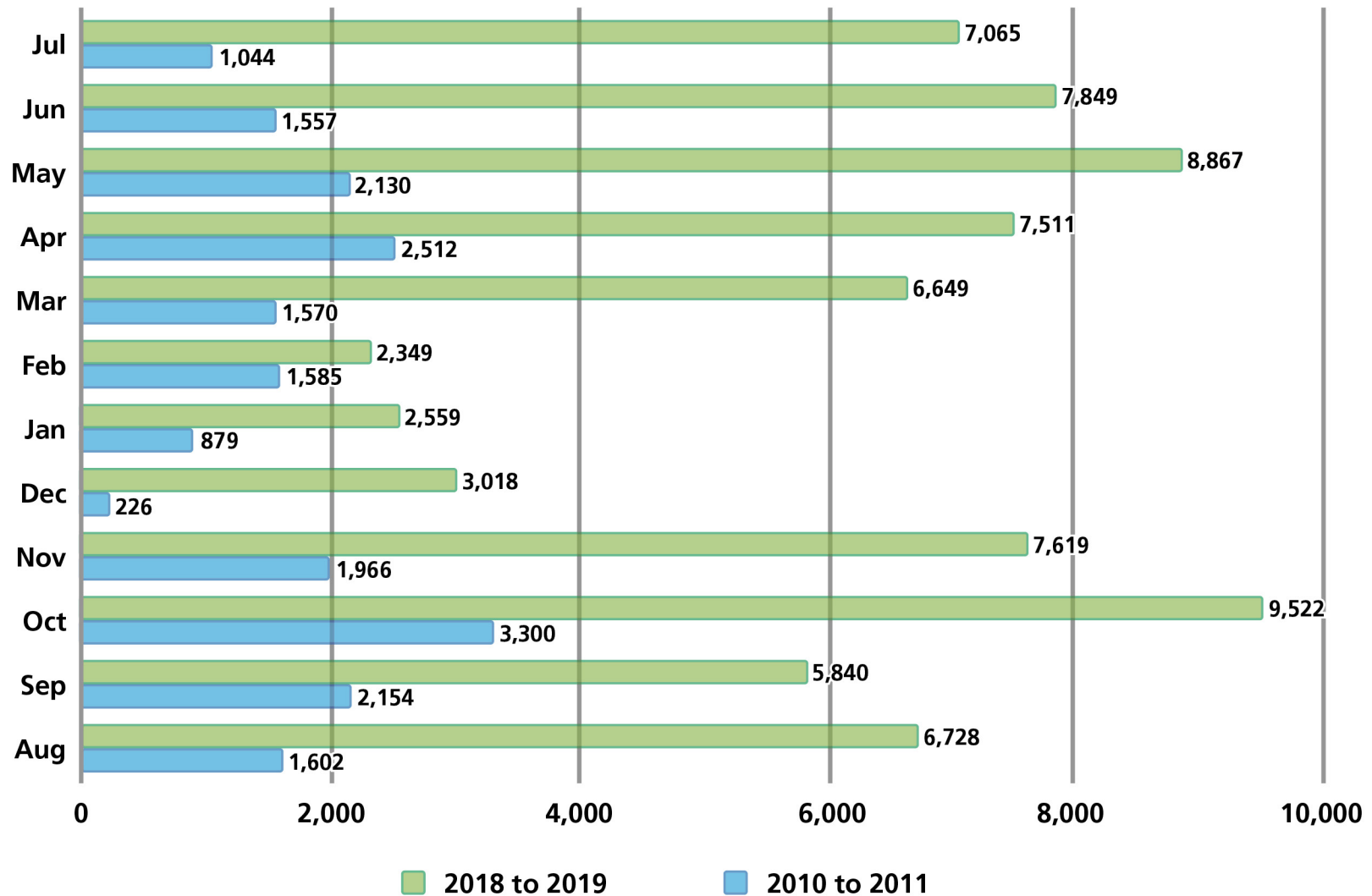
Between 2011 and 2015, visitor counts in the Virginia Triple Crown segment increased eight-fold, significantly faster than other sections of the Appalachian National Scenic Trail in Virginia. The 760,000 residents of the three areas within a one-hour drive of the Virginia Triple Crown — Roanoke, Blacksburg, and Lynchburg — form the year-round base for visitation, but their numbers are increasing much too slowly to account for the dramatically increased usage.

Volunteers with the Roanoke Appalachian Trail Club's (RATC) McAfee Knob Task Force, founded in 2015, have a vast knowledge of visitor composition. The Roanoke Appalachian Trail Club and McAfee Knob Task Force have assessed social media use and follower engagement across platforms, including blogs and magazines; compiled anecdotal reports capturing information from conversations with visitors, both local and international; and have tracked significant increases in student enrollment rates at local colleges and universities. Based on this collection of information, the Roanoke Appalachian Trail Club and McAfee Knob Task Force credit the following for the rapid increase in usage:

- Profusion of large Appalachian National Scenic Trail-related groups on social media platforms, such as Facebook
- Popularity of blogs, magazine articles, and the movie "A Walk in the Woods" featuring Tinker Cliffs, McAfee Knob, and Dragon's Tooth
- Promotion of the Virginia Triple Crown by state and regional tourism bureaus
- Growth of college student populations and promotion of the Virginia Triple Crown to students, especially at Virginia Tech and Liberty University — These sources often account for over half of all visitors on busy spring and fall weekends.
- Increased visitation from metro areas within four hours of the Virginia Triple Crown, including Washington, DC; Richmond and Hampton Roads, Virginia; and Charlotte, and Raleigh-Durham, North Carolina — Total population in these areas is 14 million, and these sources often account for about one-third of visitation on weekends throughout the year.

The Virginia Triple Crown attracts visitors from local and regional communities and universities and is a national destination for many. McAfee Knob is an iconic viewpoint for the Appalachian National Scenic Trail and has been popularized via movies, videos, and other media. During peak seasons (spring and fall) the McAfee Knob section of the Appalachian National Scenic Trail receives about 600 visitors per day. Figure 3 depicts the dramatic increase in monthly visitors between 2010 and 2019. In 2022, more than 50,000 people visited McAfee Knob, and between 20,000 and 30,000 people visited Dragon's Tooth.

Figure 3. McAfee Knob Trends in Use, Infrared Trail Counter Data



Data provided by the Roanoke Valley – Alleghany Regional Commission.

Day-hikers for the Virginia Triple Crown segment constitute about 80 percent of visitors, and backpackers make up the remaining 20 percent (RATC 2019). The backpackers are mainly overnight users (one or two nights), except in May when there is a swell of thru-hikers in the region. Large groups, such as college and youth groups, frequent McAfee Knob and nearby campsites, both designated and user created.

RELATIONSHIPS TO OTHER ACTIONS AND PLANNING EFFORTS

The Virginia Triple Crown Segment Visitor Use Management Plan is part of the Appalachian National Scenic Trail's planning portfolio. Under Director's Order #2: *Park Planning*, the assemblage of plans in a park's portfolio collectively serve to continuously address statutory comprehensive planning requirements over time. The planning portfolio creates a logical, trackable guide for National Park Service management actions as the agency continues to address emerging management issues. This plan complements previous comprehensive planning by addressing two general management plan statutory requirements identified in the National Parks and Recreation Act of 1978 (54 US Code [USC] 100502) for the Virginia Triple Crown segment of the trail: visitor carrying capacities and measures for preservation of resources. Other actions and plans directly related to this Visitor Use Management Planning effort are briefly described below.

McAfee Knob Task Force

In 2015, the Roanoke Appalachian Trail Club, with support from the Appalachian Trail Conservancy, US Forest Service, and the National Park Service, created the McAfee Knob Task Force to address management challenges at McAfee Knob. From 2011 to 2015, annual visitation increased, on average, a total of 55 percent per year, correlating with noticeable increases in avoidable emergencies and negative impacts on resources and wildlife. To begin addressing these issues, Roanoke Appalachian Trail Club volunteers were trained to support and amplify the existing education, mitigation, and monitoring work of the Appalachian Trail Conservancy staff. Volunteer Ridgerunners patrol the parking lot and/or trail at least one weekend day per month during the peak season. The team also was tasked with performing trail maintenance, monitoring conditions, submitting reports, and serving as a knowledgeable management presence.

Triple Crown Partnership Visitor Use Management Planning Efforts

The Triple Crown Partnership, comprising the Roanoke Appalachian Trail Club, the Appalachian Trail Conservancy, the National Park Service, and the US Forest Service, held three planning sessions in 2016, two planning sessions in 2017, and one planning session in 2018 to confirm the scope of visitor use management planning and discuss management strategies. Using the Interagency Visitor Use Management Council framework, the group identified six segments within scope, totaling about 50 miles of trail. These segments include the Andy Layne, North Mountain Trail, and Dragon's Tooth trails.

To support this effort, the group reviewed and assessed background information and conditions to strategize possible management directions. Core members and collaborative management partners were identified to develop a project action plan for the overall project, and segment three (VA-311 to Campbell Shelter) was designated as the first study area.

Since 2017, several mitigations have been implemented. Parking was restricted on the shoulders of VA-311, McAfee Knob Trailhead shuttle service was implemented, the Virginia Department of Transportation acquired funding for a pedestrian bridge, a wayfinding plan was initiated, and a trail assessment and visual resource inventory between Dragon's Tooth and Hay Rock (just north of Tinker Cliffs) has been initiated (NPS 2023).

Virginia Department of Transportation Pedestrian Bridge over VA-311

In June 2017, the Virginia Department of Transportation received project funding for a pedestrian bridge that will carry the Appalachian National Scenic Trail over VA-311 at the McAfee Knob trailhead. The *Appalachian Trail Bridge Over 311 in Roanoke County Project* (VDOT 2022) will provide a safer pathway for pedestrians to cross VA-311, eliminating the need for trail visitors to cross the heavily traveled highway on foot. Project development and design began in 2018, and bridge construction is anticipated to begin in May 2024. Construction is anticipated to be completed over a one-year period. Additional project actions include:

- An accessible sidewalk will be constructed from the parking lot to the new bridge.
- During construction of the pedestrian bridge, the parking lot will be closed for public use and will be used as a temporary construction staging area and for emergency services staging when needed.
- To preserve public access during bridge construction and reduce parking pressures in the meantime, a trailhead shuttle service was piloted in 2022. Additional information on the trailhead shuttle follows.

McAfee Knob Roanoke County Trailhead Shuttle

Trail users were surveyed for interest in the use of a park-and-ride shuttle if offered. The first phase of the survey was shared as an online survey with the public on October 28, 2019, and the survey remained open through December 2019. A total of 484 responses were received from hikers in multiple states, and approximately 75 percent of responses indicated the respondent would use a shuttle service if available. Approximately 35 percent of responses indicated that the lack of parking has kept the respondent from visiting McAfee Knob. An average user fee of \$6 per person was acceptable to the respondents.

When presented with the 2021 Transit Feasibility Study (NPS 2021), Roanoke County staff contended that shuttle service could be used immediately because of vastly increased visitation rates and parking issues observed in 2020. In conjunction with the Visitor Use Management Plan, the Transit Feasibility Study outlined potential scenarios for shuttle service to the Virginia Triple Crown segment sites, including the McAfee Knob trailhead during construction of the pedestrian bridge.

With the support of the National Park Service Appalachian National Scenic Trail staff, the Appalachian Trail Conservancy, the Roanoke Appalachian Trail Club, and other federal, state, regional, and local stakeholders, Roanoke County requested and was awarded fiscal year 2023–2024 demonstration project funding from the Virginia Department of Rail and Public Transportation for a McAfee Knob Trailhead shuttle from the I-81 Exit 140 park-and-ride to reduce trailhead parking demand. Roanoke County offsets any additional operating cost of the shuttle service that exceeds the grant funding awarded from the Virginia Department of Rail and Public Transportation.

Roanoke County launched the pilot shuttle service on September 2, 2022, which operated until November 27, 2022 in its initial phase under a special use permit with the National Park Service. For its first season of operation, there were 716 reservations, serving 488 individuals in just 37 days of service. The shuttle service resumed on March 3, 2023 and will operate on Fridays, Saturdays, Sundays, and holiday Mondays until November 26, 2023. Roanoke County has requested additional funding to operate an expanded shuttle service in 2024 and through the first half of 2025.

Appalachian National Scenic Trail Funded Research: Camping and Trail Conditions and Best Management Practices

The National Park Service recently funded a study on sustainability, camping, and trail condition management along the Appalachian National Scenic Trail (Marion et al. 2020). Between 2015 and 2019, the study assessed tread conditions at sample sites along the Appalachian National Scenic Trail. The sample sites represent 9 percent of the total trail length and included 63 segments (3.1 miles each), informal trails, and 3,150 transects (50 sample transects per segment). The study concluded that the largest areal extent of impact (69 percent) is attributed to the trail footpath, followed by overnight campsites (19 percent), informal trails (6 percent), and day-use sites (5 percent). The trail alignment was found to be in good condition overall, although less so in New England states.

Although the study did not sample within the Virginia Triple Crown segment, it provided information on potential indicators and guidance for setting thresholds. Trail width is an issue in some locations, and the Roanoke Appalachian Trail Club is improving some of the narrower sections. Camping impacts and sustainable camping management were significant concerns since the higher numbers of users in the last decade correlated with site expansion and proliferation (Marion et al. 2020). The Virginia Triple Crown segment lacks camping accommodations for large groups and building capacity at locations outside of shelters is desired.

Appalachian National Scenic Trail Foundation Document (2015)

Each unit of the national park system is required to have a formal statement of its core mission that will provide basic guidance for all planning and management decisions — a foundation for planning and management.

The *Appalachian National Scenic Trail Foundation Document* (NPS 2015a) provides the underlying principles that guide the management direction in this plan. It identifies what is most important to the Appalachian National Scenic Trail (including the Appalachian National Scenic Trail's purpose and significance), notes special mandates and administrative commitments that affect management of the trail, and identifies fundamental resources and values in the trail. This plan was designed to be consistent with the trail's purpose and significance and ensures the protection of those fundamental resources and values related to visitor use that were used to guide the plan. These fundamental resources and values are:

- the trail itself
- the empowered volunteer
- enduring collaborative spirit
- experience
- education
- scenery along the treadway
- views beyond the corridor
- natural resource quality and ecological connectivity
- a journey through American heritage

The *Appalachian National Scenic Trail Foundation Document* (NPS 2015a) summarizes the following relevant needs related to the Virginia Triple Crown segment:

- A high-priority data need is a Virginia regional overnight site inventory and condition assessment to document changes to overnight sites over time (i.e., rate of expansion into surrounding environs).
- All trail-wide planning priorities were ranked as high for the Virginia region, including a visitor use management plan, a development concept plan for specific high-use areas (such as McAfee Knob), a scenic and landscape-level protection-and-response strategy, a sustainable trail and camping plan identifying management zones, and a wayfinding plan.

Appalachian National Scenic Trail Resource Management Plan (2008)

The Appalachian National Scenic Trail Resource Management Plan (NPS 2008) provides the following relevant guidance for the Virginia Triple Crown segment:

About 96 percent of the Appalachian National Scenic Trail is in the backcountry zone. The primary use of these lands is for providing a backcountry recreation experience to the greatest extent possible, even if certain lands are in a relatively urban setting. Hiking and camping are the primary uses of these lands. Trail shelters and overnight-use sites are included in and managed as part of the backcountry recreational area.

Comprehensive Plan for the Protection, Management, Development and Use of the Appalachian National Scenic Trail (1981)

The Comprehensive Plan (NPS 1981) provides a framework for development and management of the Appalachian National Scenic Trail and its immediate environs. It established several tenets for the management philosophy of the Appalachian National Scenic Trail, particularly that management of the Appalachian National Scenic Trail will be achieved via a cooperative management system based on local partnerships between trail clubs and other agencies. Because of this decentralized management model, detailed guidance for managers is provided in other planning documents for distinct trail segments.

Revised Land and Resource Management Plan for the Jefferson National Forest (2004)

The *Revised Land and Resource Management Plan, Jefferson National Forest* (USFS 2004) directs the management of the Jefferson National Forest. The Forest Plan provides direction to assure coordination of multiple uses (outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness) and sustained yield of products and services (16 USC 1604 (e)). The Forest Plan also calls for no commercialization of the Appalachian National Scenic Trail. It fulfills legislative requirements and addresses local, regional, and national issues and concerns. Chapters 3 and 4 of the Forest Plan establish management areas, which reflect biological, physical, watershed, and social differences in managing each area of land, and management prescriptions, which reflect different desired conditions and provide the specific information used to develop projects to implement the Forest Plan (36 Code of Federal Regulations [CFR] 219.11 (c)).

The prescription area for the Appalachian National Scenic Trail within the context of the Forest Plan consists of those lands mapped as the area visible from the Appalachian National Scenic Trail footpath, and — as designated on a case-by-case basis — associated trail shelters, overnight use sites, viewpoints, water sources, and spur trails.

Roanoke Appalachian Trail Club Local Management Plan (2015)

The Roanoke Appalachian Trail Club *Local Management Plan for the Appalachian Trail* (RATC 2015) provides the following relevant guidance:

- In general, the Roanoke Appalachian Trail Club favors development and maintenance of select designated connecting trails. Alternate hiking routes and variable access points add variety to the hiking experience and lessen the impact on the main trail (Appalachian National Scenic Trail).
- The Roanoke Appalachian Trail Club is responsible for general maintenance and cleanup of shelters and camping sites in its area. These areas shall be monitored for overuse, abuse, and environmental impact by the appropriate overseer and the shelter supervisor.
- On the Catawba-Daleville corridor, correlating with the section that is on Appalachian National Scenic Trail lands, (starting in the Virginia Triple Crown segment and extending northeast), camping and fires are allowed at designated campsites only. Overnight stays longer than two consecutive nights at any one facility are prohibited.
- The Roanoke Appalachian Trail Club does not plan to propose any more shelters on its section of the Appalachian National Scenic Trail; however, it will respond to increased needs, as necessary.
- It is Roanoke Appalachian Trail Club policy to monitor its shelter environs and respond to excessive camping impact by developing dispersed facilities for campers in the form of campsites with cooking grills and picnic tables at least several hundred yards away from the affected shelter site. Use of these facilities is promoted by signage. Criteria for development of camping sites are demonstrable need, accessibility to the Appalachian National Scenic Trail, minimal environmental impact, location at least one mile from public vehicular access, a reliable water source, and where appropriate, approval from the land management agency (National Park Service or US Forest Service).
- The Roanoke Appalachian Trail Club continues the policy of maintaining the McAfee Knob Fire Road in a primitive condition, passable with high-clearance vehicles, as long as it is feasible within the constraints of club resources. The fire road serves as a valuable route to the high-use McAfee Knob area to deal with emergency situations.
- Hiking groups staying overnight on the Appalachian National Scenic Trail should limit their party to 10 persons, and day groups are limited to 25 persons. User conflicts can occur when large groups fill Appalachian National Scenic Trail shelters, leaving no room for individual hikers.
- The Appalachian Trail Conservancy will provide a Ridgerunner on Catawba Mountain and Dragon's Tooth from April to November, pending funding. The main objective of the Ridgerunner program is to prevent misuse of the Appalachian National Scenic Trail and its environs. This is achieved by educating the hiking public in Leave No Trace hiking and camping practices and by monitoring the Appalachian National Scenic Trail and fire road between VA-311 and McAfee Knob and the trail to Dragon's Tooth for progressive signs of misuse or overuse so that appropriate corrective measures may be taken.
- Ridgerunners should inspect the shelters and campsites regularly to watch for overuse and environmental deterioration and be prepared to advise campers on low-impact camping techniques. Ridgerunners should keep a rough tally of the use of the VA-311 parking lot to determine ongoing needs.

- The Roanoke Appalachian Trail Club supports the view that the presence of motorized and mechanized vehicles, including off-road vehicles, all-terrain vehicles, four-wheel-drive vehicles, bicycles, and snowmobiles on the Appalachian National Scenic Trail, is incompatible with the purposes of the trail. It is club policy to monitor the National Park Service corridor for unauthorized vehicular activity via regular club monitors and Appalachian National Scenic Trail neighbors. Enforcement of these regulations is recognized as a problem for the Roanoke Appalachian Trail Club, and policy is to proceed with efforts of information, education, and signage.
- For areas prone to littering, such as parking lots and shelters, Roanoke Appalachian Trail Club policy is to monitor these areas frequently and to keep them as clean as possible. It is also policy to avoid supplying receptacle bins and trash cans anywhere in this section because regular trash removal services are not available.
- The Roanoke Appalachian Trail Club action plan noted the importance of determining the feasibility of getting permanent restroom facilities at the McAfee Knob Trailhead parking lot.
- The Roanoke Appalachian Trail Club action plan noted the importance of determining the long-term disposition of the McAfee Knob Fire Road.

Superintendent's Compendium (Updated Annually)

The Superintendent's Compendium is the summary of park-specific rules implemented under 36 CFR, *Parks, Forests, and Public Property*. It serves as public notice, identifies areas closed for public use, provides a list of activities requiring either a special use permit or reservation, and elaborates on public use and resource protection regulations pertaining specifically to the administration of the Appalachian National Scenic Trail. For example, the current compendium closes all National Park Service lands within one mile of McAfee Knob to special events and closes all National Park Service lands within a quarter mile of McAfee Knob to climbing. The compendium is annually reviewed and updated before being signed by the National Park Service Superintendent.

THE PLANNING PROCESS

This plan uses the Interagency Visitor Use Management Council's (Interagency Visitor Use Management Council 2022) visitor use management framework to develop a long-term strategy for managing visitor use within the project area (figure 4). This framework is divided into four major elements: (1) build the foundation; (2) define visitor use management direction, (3) identify management strategies; and (4) implement, monitor, evaluate, and adjust. Each element includes steps that were taken in completion of this plan (figure 5).

The overall planning process followed elements 1 through 3 featured in figure 5. Starting in late 2019, an interdisciplinary team of representatives from the National Park Service, US Forest Service, Appalachian Trail Conservancy, Roanoke Appalachian Trail Club, Roanoke County, and Roanoke Valley Alleghany Regional Commission came together to develop the plan elements. Representatives from Botetourt County, City of Roanoke, Roanoke Parks and Recreation, and the Virginia Department of Transportation also provided input and engaged in discussion during development of the plan. This work built on previous collaboration among the partners.

This plan was also informed by feedback from organizations, agencies, and members of the public. The planning team sought feedback in March 2022 and August 2023. Element 4: Implement, Monitor, Evaluate, and Adjust will occur after approval of this plan and will be a collaborative effort among the partners.

Figure 4: Visitor Use Management Framework Overview

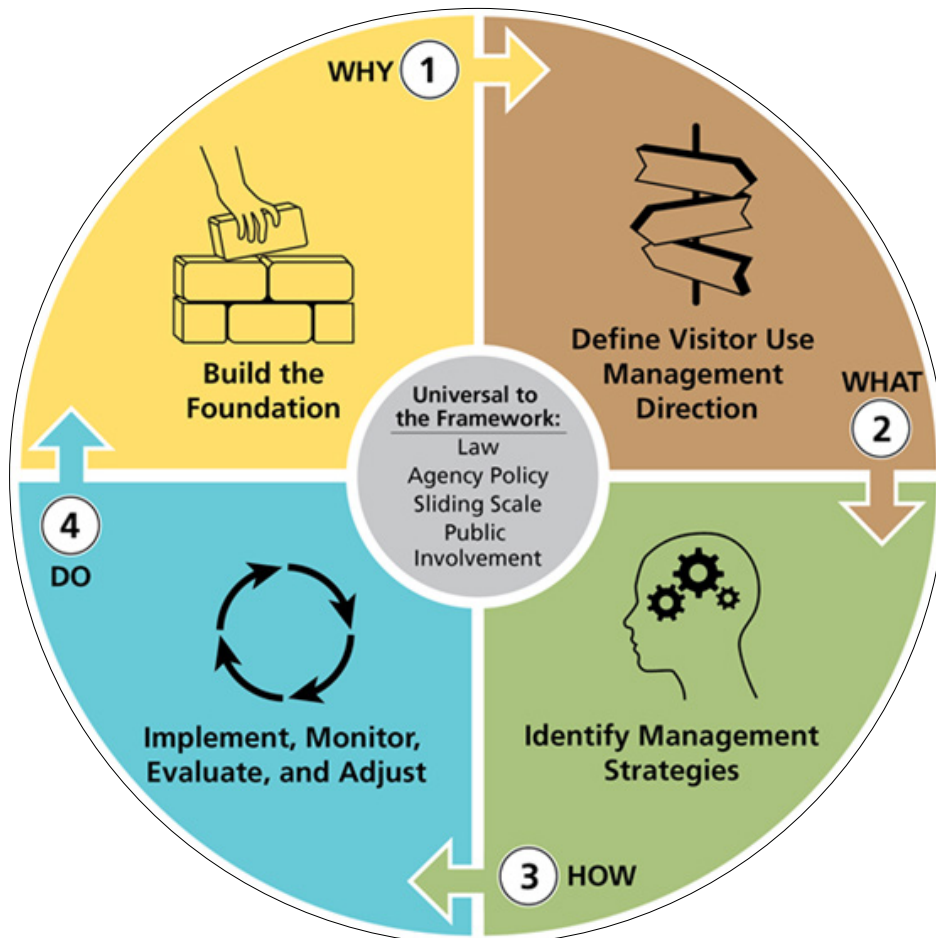
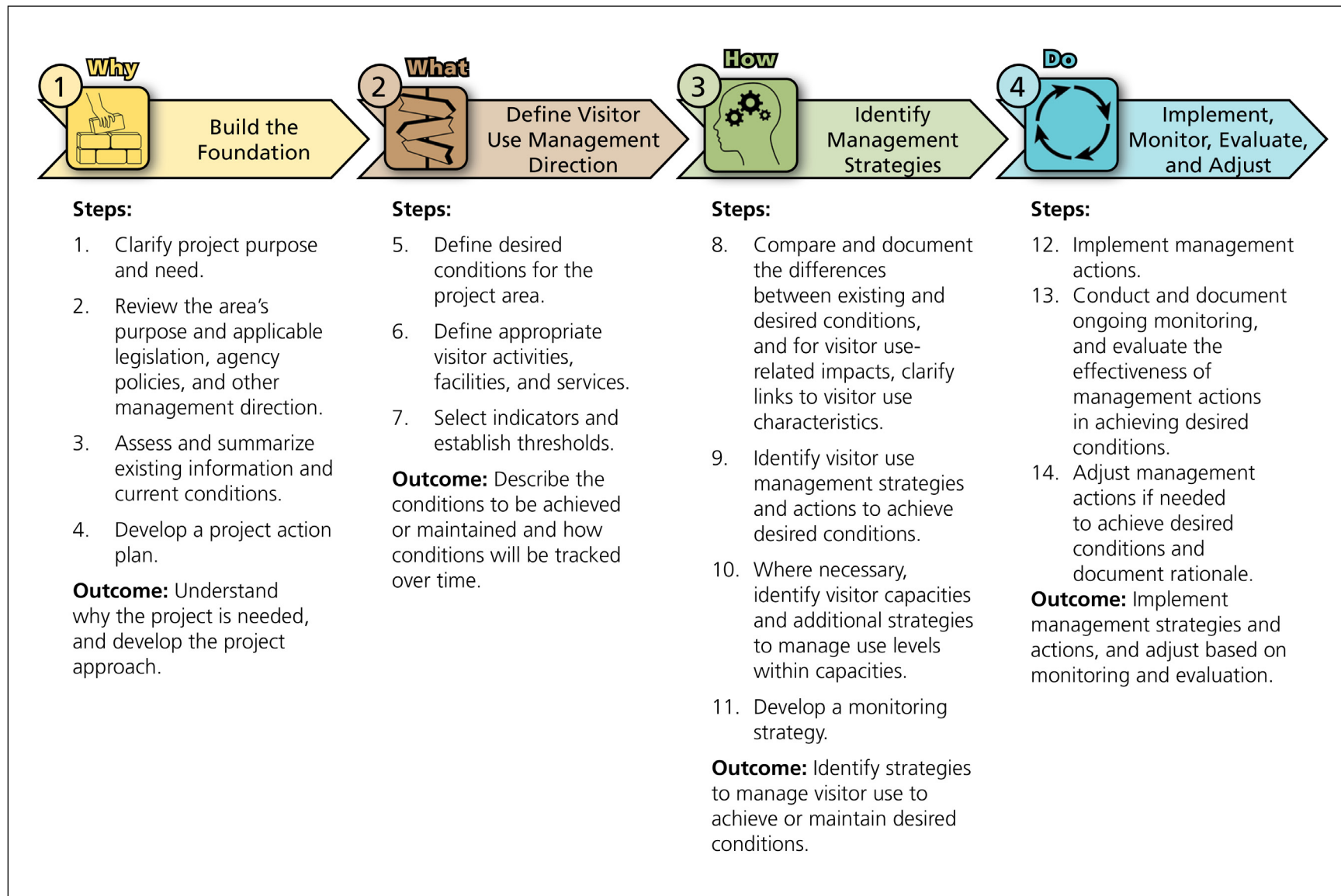


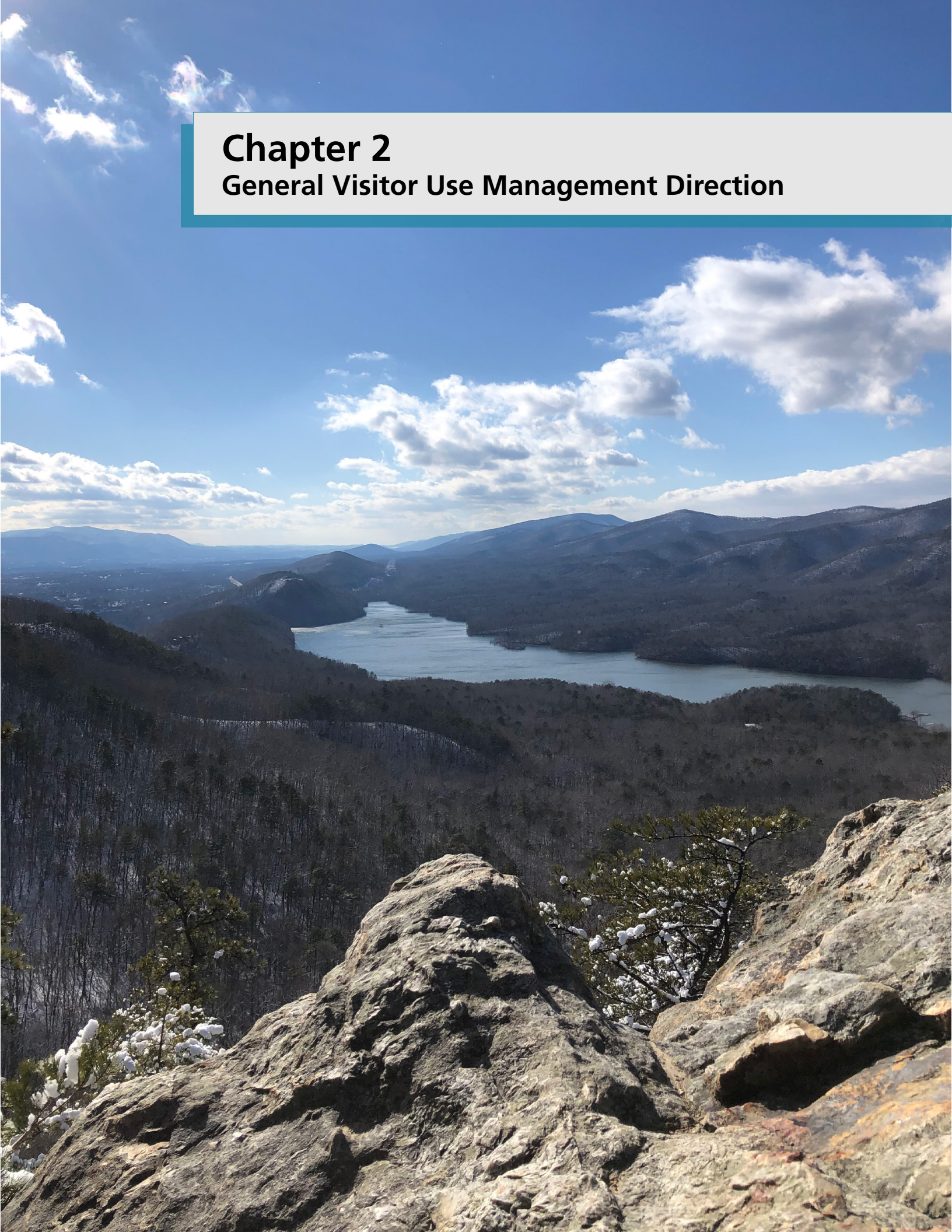
Figure 5. Elements and Steps of the Visitor Use Management Framework



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Chapter 2

General Visitor Use Management Direction



Divider photograph: Carvins Cove (Photograph credit: B. Wilson, National Park Service)

CHAPTER 2. GENERAL VISITOR USE MANAGEMENT DIRECTION

INTRODUCTION

This chapter outlines the general visitor use management direction for the Virginia Triple Crown segment of the Appalachian National Scenic Trail. The Comprehensive Plan (NPS 1981) provides high-level guidance on how the Appalachian National Scenic Trail will be managed. This chapter expands on the comprehensive management plan and answers the question “What are we managing for?” regarding visitor use. This includes descriptions of desired conditions.

DESIRED CONDITIONS

Desired conditions outline the vision for resource conditions, visitor experiences, and facilities and services that managers strive to achieve and maintain in a particular area. They help trail managers answer the question “What are we trying to achieve?” Desired conditions tie back to the trail’s fundamental resources and values, the visitor experience opportunities associated with them, and the types and levels of management, development, and access that would be appropriate in a particular location. The following desired conditions apply within the Virginia Triple Crown Segment project area, including access trails, connector trails, and the Appalachian National Scenic Trail section (within the Virginia Triple Crown segment) itself.

Key phrases, ideas, and terms related to desired conditions for the Virginia Triple Crown segment were initially developed by an interdisciplinary team during the November 2019 preliminary project planning workshop. The draft desired conditions were further refined by the Virginia Triple Crown segment management partners during the two planning workshops in 2021 and were bolstered with relevant guidance from the 2004 *Revised Land and Resource Management Plan, Jefferson National Forest* (USFS 2004) and the *Appalachian National Scenic Trail Foundation Document* (NPS 2015a).

SEGMENT-WIDE DESIRED CONDITIONS

Natural Resources

- Erosion is controlled through sustainably located, designed, and managed infrastructure, as well as through limiting or avoiding uses that are significantly contributing to erosion.
- Negative effects on wildlife ecology and behavior are reduced via visitor education and appropriate food and refuse treatment.
- Visitor impacts on natural resources will be minimized. Visitors have opportunities to learn more about responsible practices before and during their visit.
- Visitors can see native wildlife and flowers, rustic cultural features, seasonal variations, and dynamic weather patterns.
- Within the Virginia Triple Crown segment’s trail corridor, anthropogenic signs, including evidence of contemporary human development and impacts, are minimized and unobtrusive so that the area retains its natural character.
- The Appalachian National Scenic Trail within the Virginia Triple Crown segment is free from user-created trails and is easy to follow. Bare soil is minimized to the extent possible.
- The vegetation retains its native essential components, processes, and functions to support soil stability, control noxious and/or invasive plants, and reduce impacts on the aesthetic and natural qualities of the Appalachian National Scenic Trail within the Virginia Triple Crown segment.

- Recreational activities do not significantly detract from the natural character, health, and ecosystem functions of the forest and the Virginia Triple Crown segment trail corridor.
- Water resources are protected from negative recreational or agricultural impacts.

Cultural Resources

- Visitors have opportunities to learn about the cultural resources and rich history of the Appalachian National Scenic Trail within the Virginia Triple Crown segment and the region, including agricultural and Native American uses.
- Visitors have opportunities to learn about the history of Catawba Valley and Carvins Cove.
- The Appalachian National Scenic Trail has been found eligible for listing in the National Register of Historic Places as a Historic District given its place in American conservation and recreation history and will be managed to preserve its character-defining features, including the trail (e.g., treadway, stairs, boardwalks, stiles, puncheons), viewpoints, overnight use sites, bridges over 20 feet in length built specifically to carry the Appalachian National Scenic Trail treadway, and side trails, loops, and spurs within the Virginia Triple Crown segment.
- The prevailing natural scenery and agricultural landscapes are preserved as important cultural landscapes and visual resources.
- Cultural resource sites are identified, documented, and protected.

Visitor Experience

- Scenic viewpoints provide visitors with opportunities to take in stunning scenery, including natural and forested views sporadically intermixed with meadows, old fields, pastoral valleys, and cultural landscapes.
- Sweeping views of vast landscapes extend beyond the trail corridor and visitors are exposed to a wide range of landforms along the Appalachian Mountains.
- Visitors can connect with natural and cultural resources, as well as other visitors, relax and reflect, and have opportunities for remote, uncrowded, and quiet recreational experiences year-round.
- The hiking experience may be as short as an afternoon's walk or up to an extended hike to all three sites in the Virginia Triple Crown segment.
- The Appalachian National Scenic Trail within the Virginia Triple Crown segment allows people to challenge themselves, physically and mentally, via self-reliant backcountry recreation and long-distance hiking.
- Visitors have adequate information before and during their visit to allow safe navigation. Trip-planning information and Appalachian National Scenic Trail use policies are readily available and easy to find.
- Visitors enjoy safe hiking conditions, opportunities for solitude, and camping. A range of experiences is available to a variety of users and skill levels.
- There are opportunities for groups to hike and camp.
- Group camping occurs at designated group sites.
- To the extent feasible, universally accessible opportunities exist for all visitors.

- Across the land-management boundaries, visitors have a seamless experience with coordinated signage and messaging.
- Visitors can connect to other regional recreation opportunities while balancing the preservation of the Appalachian National Scenic Trail's character as a foot-travel experience only and without compromising management standards.
- There are appropriate access trail connections to the Appalachian National Scenic Trail within the Virginia Triple Crown segment.
- Visitors engage in low-impact camping to reduce long-term impacts on natural and cultural resources.

Facilities and Services

- The Appalachian National Scenic Trail in the Virginia Triple Crown segment is maintained primarily as a foot path.
- Within the Virginia Triple Crown segment, camping options, including shelters, developed campsites, and dispersed camping, are well-distributed, sustainably designed, and out of sight from the Appalachian National Scenic Trail.
- Campsites are separated to the extent feasible to create opportunities for solitude.
- Within the Virginia Triple Crown segment, new overnight facilities are located out of sight of the Appalachian National Scenic Trail.
- There are an appropriate number of facilities, such as campsites, to sustainably support group use capacity.
- Group camping opportunities exist at thoughtfully designed group campsites that are out of earshot of other established campsites. The number of people per camping group remains limited to numbers established in the National Park Service Superintendent's Compendium, which is consistent with National Park Service policy for the Appalachian National Scenic Trail corridor.
- No developed water sources would be established.
- Road crossings and parking lots are designed to facilitate visitor safety and minimize impacts on natural and cultural resources.
- Wayfinding features, such as signs and markers, help ensure that visitors can self-navigate.
- Sufficient signage exists to articulate regulatory, safety, and resource information.
- Human waste and other trash do not pose a threat to natural resources and high-quality experiences.
- Visitor waste at trailheads and throughout the Virginia Triple Crown segment does not pose undue burden on volunteers and land managers.
- Facilities are clustered at key locations, so the rest of the trail has opportunities for solitude.
- To the extent feasible, new facilities are accessible to and usable by all people, including those with disabilities. Facilities meet Architectural Barriers Act (ABA) accessibility standards. In particular, Chapter 10: Outdoor Developed Areas of the ABA Standards would apply to trail facilities.

- Where feasible, land managers and management partners would evaluate, identify, and take advantage of natural landscape terrain characteristics to support campsite sustainability (contain campsite size and proliferation) in terms of location, design, construction, and maintenance.
- All facilities are sustainably designed, constructed, and maintained. Associated structures are in harmony with the surrounding environment.
- Funding and staff are available to maintain operational facilities.
- Parking lot entrances, ingress, egress, and lot circulation are well-defined, maintained, and controlled to ensure safe traffic flow.
- Parking lots are well-maintained, with clear designated parking and wayfinding signs to help ensure that visitors know where they are going and what to expect, including awareness of other options when the parking lot is full.
- The roadway and parking lots are designed and improved for good circulation, to alleviate congestion, and promote visitor safety.
- The design of parking lots does not further concentrate visitor use.
- Visitors using parking lots find them safe and inviting.
- ABA-accessible facilities exist at the trailhead.

LOCATION-SPECIFIC DESIRED CONDITIONS

Tinker Cliffs

Natural Resources

- See desired conditions for the Virginia Triple Crown segment-wide natural resources.

Cultural Resources

- See desired conditions for the Virginia Triple Crown segment-wide cultural resources.

Visitor Experience

- There are appropriate access trail connections to the Tinker Cliffs area of the Appalachian National Scenic Trail that are managed to improve and protect Appalachian National Scenic Trail values.
- Unobstructed views are preserved and maintained.

Facilities and Services

- Safe water crossings exist.

McAfee Knob

Natural Resources

- See desired conditions for the Virginia Triple Crown segment-wide natural resources.

Cultural Resources

- See desired conditions for the Virginia Triple Crown segment-wide cultural resources.

Visitor Experience

- Although encounters with other visitors may be frequent, the trail and viewpoints are safe and provide for a pleasant experience.
- Visitors have opportunities to quietly enjoy the viewshed.
- Visitors can find their way to and from McAfee Knob with minimal confusion.
- Visitors can choose from loop hike options incorporating the McAfee Knob Fire Road and other access trails, facilitating varied experiences and minimizing congestion.
- Unobstructed views are preserved and maintained.

Facilities and Services

- The Campbell, Johns Spring, and Catawba Mountain shelters offer well-designed campsites along a sustainable Appalachian National Scenic Trail access trail.
- A safe access route is maintained across VA-311.
- McAfee Knob Fire Road is maintained and recognized as an official route for visitors and as an administratively used route for the National Park Service, Roanoke Appalachian Trail Club, Appalachian Trail Conservancy, emergency response personnel, and American Electric Power to support emergency response and maintenance needs.

Dragon's Tooth

Natural Resources

- See desired conditions for the Virginia Triple Crown segment-wide natural resources.

Cultural Resources

- See desired conditions for the Virginia Triple Crown segment-wide cultural resources.

Visitor Experience

- There are opportunities for challenging and strenuous hikes at Dragon's Tooth and a sense of accomplishment that comes with hiking this trail section.
- Visitors are informed and aware of the difficulty and safety precautions associated with the hike, do not take unnecessary risks, and can access wayfinding information at trailheads.
- Signs of camping are minimized from the Appalachian National Scenic Trail, Dragon's Tooth Trail, and Boy Scout Trail.
- Designated and unobstructed viewsheds are preserved and maintained.

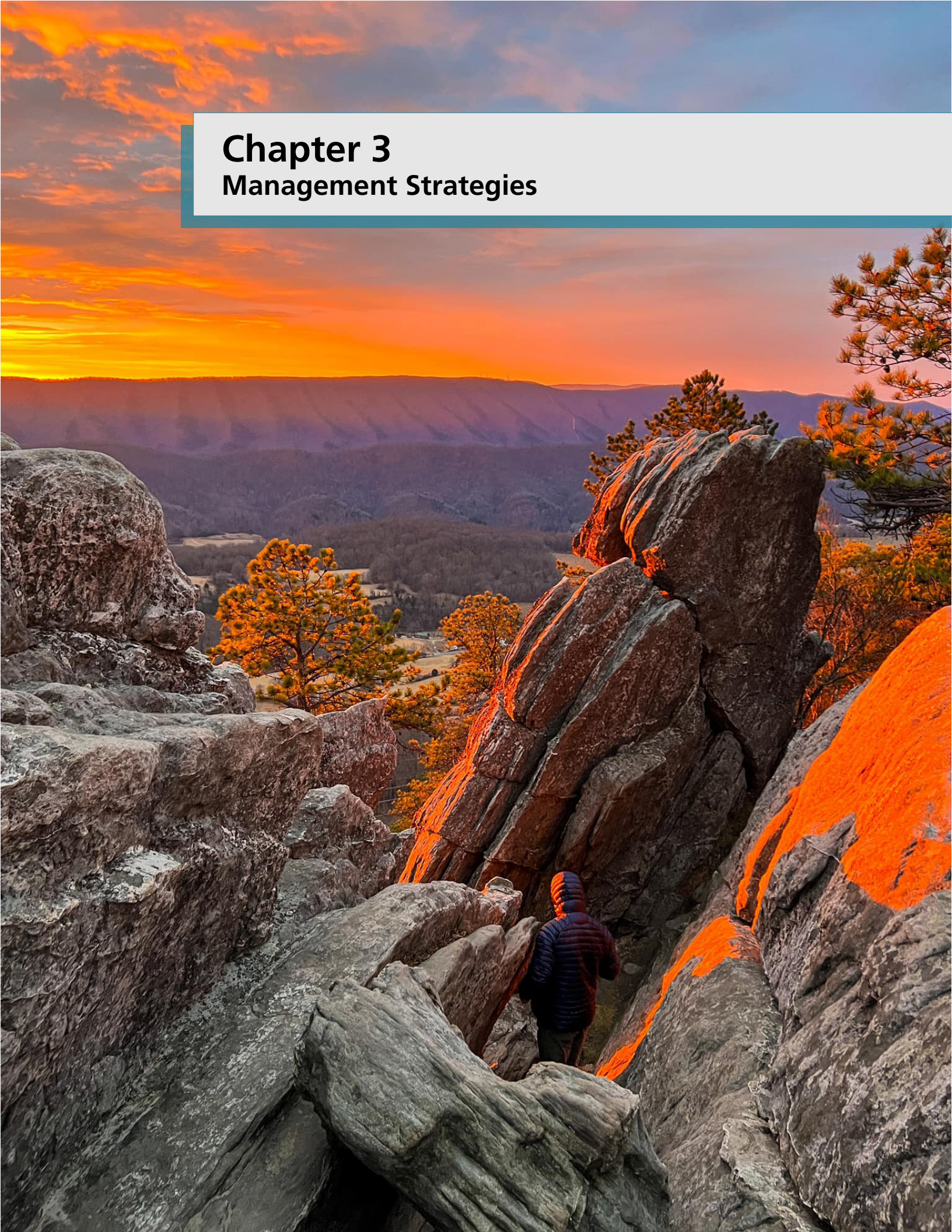
Facilities and Services

- Facility footprints meet visitor needs while achieving and maintaining desired resource experiences.
- There is simple, safe, and — for people with disabilities — barrier-free access to the trailheads, trail-road crossings, and parking lots to the extent practicable.
- Sustainable camping areas are identified, and visitor use impacts are concentrated in appropriate locations.

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Chapter 3

Management Strategies



Divider photograph: Sunrise at Dragon's Tooth (Photograph credit: Tim Lewis)

CHAPTER 3. MANAGEMENT STRATEGIES

INTRODUCTION

This chapter identifies management strategies that were developed during a series of interdisciplinary team work sessions, and incorporates available data, studies, and reporting to address the issues identified earlier in this document. These management strategies will be used to achieve and maintain the desired conditions described in chapter 2 related to visitor use and to resolve issues described in chapter 1. This chapter begins with strategies that will be applied widely throughout the Virginia Triple Crown segment followed by location-specific strategies. Strategies for specific sites are organized further into camping, trail, and trailhead strategies. Confirmed strategies are those that the interdisciplinary team would like to pursue, and potential strategies are those that may require additional information before pursuing.

Strategies directed by the Visitor Use Management Plan or in site-specific subsequent implementation plans will be accomplished in the years following the plan and will be updated as needed. However, there is no guarantee that the strategies proposed in this plan will be funded. The land managers and management partners will continue to seek creative and diverse funding opportunities. Budget restrictions and competing priorities may prevent implementation of some strategies. If it is determined that the investment would not be sustainable for the agency or partner to operate and maintain with realistic funding and staffing projections, the investment will not be made. Additionally, as the Virginia Triple Crown segment includes multiple landowners, implementation of strategies will follow the laws, policies, and priorities of the relevant land manager.

Some strategies will likely require additional data and compliance, including National Environmental Policy Act (NEPA) documentation and analysis, as well as other consultation and coordination, such as National Historic Preservation Act (NHPA) Section 106 and tribal consultations and Endangered Species Act compliance. The purpose of the NEPA process is to help managers make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment (NPS 2015b). The NEPA process includes analysis of the affected environment, mitigation and adaptive management to minimize impacts, and consultation with the public and other stakeholders, among other elements. Completion of the NEPA process will allow the land manager to move forward with implementation of the proposed strategies. Compliance will be completed, where appropriate, by the relevant agency at the time when sufficient design detail is available to analyze the impacts of the strategy.

Additional adaptive management strategies, mitigation measures, and monitoring approaches are identified in chapter 4. These adaptive management strategies and mitigation measures would be situationally implemented in relation to the monitoring of indicators and thresholds (also identified in chapter 4).

SEGMENT-WIDE STRATEGIES

Facilities and Transportation

Further compliance may be required to implement strategies.

Confirmed Strategies

- Manage transportation facilities and services, such as active parking lot management.
- Identify and document authorized parking capacity of parking lots and authorized roadside parking areas to establish baselines for monitoring.

- Restrict overflow and road-shoulder parking at trailheads.
- Develop, sign, and enforce size limits for vehicle parking at trailheads.
- Evaluate feasibility, financial viability, and need for a day-use shuttle to address roadside parking and diversify transportation options.
- Evaluate facilities and determine facility development needs to meet desired conditions.
 - Evaluate and improve facilities throughout the Virginia Triple Crown segment, including bathrooms, trash cans, signs, drainage, and fencing.
- Establish and maintain ABA-compliant facilities (e.g., access routes, parking spaces, restrooms, kiosks).
 - Adhere to universal design and accessibility standards.
- Evaluate, improve, and maintain safe road crossings.
- Evaluate and improve signage and wayfinding to standardize, as described in wayfinding plans.
- From the ongoing Visual Resource Inventory¹, develop a scenic viewshed inventory and monitoring strategy, and a protection plan/strategy.

Potential Strategies

- Examine pedestrian safety issues in problem areas.
- Add Leave No Trace information at each trailhead kiosk with trail-specific recommendations.
- Explore feasibility of charging fees for parking lots.

Trails

Further compliance may be required to implement strategies.

Confirmed Strategies

- Continually evaluate, improve, and maintain trail tread and associated structures, especially in high-volume areas.
 - Relocate sections that are too steep or that are aligned to a fall line to more gently sloped side-hill alignments with grade reversals to shed water and/or harden sections with rock or wooden erosion-controlling structures. Add gravel mixed with soil where necessary and appropriate.
 - Install and maintain an appropriate density of in-tread drainage features (e.g., outsloping, drainage dips, linear ditch drains).
 - Harden tread with rock or wooden erosion-controlling structures (e.g., steps, waterbars, retaining walls). Add gravel mixed with soil where necessary and appropriate.
 - Where appropriate, design and construct tread widths to accommodate the intended amount of traffic, understanding that areas with heavy two-way traffic would require wider trails.

¹ The National Park Service Visual Resource Inventory is a systematic process for inventorying scenic resources within and beyond National Park Service boundaries. The inventory helps identify the scenic quality and importance of the visual landscape to the National Park Service and its visitors and provides a baseline against which to compare potential impacts of new development or changes to areas surrounding around park units.

- Evaluate user-created trail causes when making decisions about acceptability of new user-created trails. Some may be acceptable with more sustainable alignments. Others can be closed and restored, and visitors notified via signage of alternative access options. For example, it may be unfeasible to attempt closing and restoring every user-created trail to prevent visitors from accessing a new bouldering area. Visitors might be better influenced if sustainable trail access to that area is provided.
- Use persuasive education via trailhead signs and trailside prompter signs to assist in closing unauthorized/user-created routes at intersections to discourage off-trail hiking.
- Encourage land protection to protect viewsheds.

Potential Strategies

- Add bicycle racks at appropriate trailheads (applies to trailheads under US Forest Service management).
- Identify and implement trail management protection mitigations where appropriate, including string fencing to mark sensitive areas for revegetation and other types of resource rehabilitation.

Campsites and Shelters

Further compliance may be required to implement strategies.

Confirmed Strategies

- Create a campsite inventory for the entirety of the Virginia Triple Crown segment, to include all formal and user-created sites (whether they are authorized “dispersed” camping sites or unauthorized camping sites) to establish baseline conditions via a (new) survey of campsites. (The National Park Service has an asset inventory for all formal campsites but not for unauthorized sites).
- Use criteria to identify and establish an appropriate set of campsites and apply site selection criteria to problem areas to identify and concentrate future use on sites that are rated as resistant to impacts and that can promote solitude.
 - Review the feasibility of restricting camping in sensitive areas on US Forest Service lands.
- Implement sustainable camping best management practices (Marion et al. 2020). Have all campsites and shelters align with and adhere to National Park Service, US Forest Service, and Appalachian Trail Conservancy design standards and management policies.
 - Establish dimensions for formal campsites that are appropriate for use type (i.e., group, individual) and apply consistent campsite sustainability indicators (Arredondo et al. 2021).
 - Establish reference-point data for formal campsites. This would include determination of the type of reference point (e.g., photo points, obscure monument marker).
 - Ensure that all campsites and shelters align with National Park Service and US Forest Service policies on food storage.
- Confirm and/or define reference conditions for designated campsites.
- Improve spacing of camping options.

- Provide designated group campsites where appropriate (locations to be determined).
- Explore options for water-free/dry campsites.
- Encourage visitors to use established campsites and require (enforce) visitors to use designated campsites on National Park Service lands.
- Explore options to manage dispersed camping, including use of special orders² on US Forest System lands (USFS 2023) and corresponding educational campaigns and signage to encourage best practices.
- Wherever possible, locate overnight camping sites on access trails and out of sight of the Appalachian National Scenic Trail.
- Evaluate the number and spacing of overnight shelters.

Potential Strategies

- Identify more reliable and naturally existing water sources.

Information and Education

Confirmed Strategies

- Develop and implement a public information strategy concerning desired conditions, management strategies to achieve those conditions, and how visitors can best experience the Appalachian National Scenic Trail. This information could be distributed via direct visitor contact, publications, wayside exhibits, mobile apps, maps, social media, websites, and partners. The goal would be to have visitors self-disperse to approved sites or arrive during lower-use periods to avoid concentrating use during peak periods.
 - Ensure that informational materials cover a wide variety of topics, such as locations for permitted activities, trail rules and regulations, and Leave No Trace practices and are available for visitors in a variety of languages.
 - Make greater public education efforts to encourage voluntary redistribution of use to off-peak times.
 - Develop hiker forecasts using historic visitation data, such as an Appalachian National Scenic Trail-wide heat map to promote off-peak times.
 - Advertise a range of day-use options, such as alternate trails, or recommended direction of travel to manage congestion at convergence areas.
 - Continue and/or expand visitor information regarding alternate trail access points.
- Improve trip planning information.
 - Use up-to-date technology to provide information to visitors before and during their visits.
 - Use social media and websites to forecast the best times to hike on the trail, including encouraging use of the Appalachian Trail Conservancy's website.

² Reasons to implement special orders may be to protect public safety, prevent resource damage, preserve a particular area's setting (such as non-motorized), protect wildlife populations, among other reasons. Special orders may prohibit a specific activity or impose permit requirements. Some examples of permits that may be required are hiking, camping, or burning permits.

- Increase communication and messaging regarding lot utilization, as well as information on alternative parking locations and shuttle availability and/or schedules. This could include messaging on social media and websites using real-time video to provide information regarding parking and access opportunities, time-stamped photos to help forecast parking conditions to help inform visitors' decisions regarding trip timing, or information about historically busy times with photos.
- Promote less-challenging hikes, such as Sawtooth Ridge, Humbert Hill, Tinker Ridge view of Carvins Cove, and Rawies Rest.
- Include best practice information specific to food storage on trip planning materials across information platforms.
- Provide education on Leave No Trace practices to hikers, including messaging on bear-resistant canisters and bear boxes (where provided), education and best practices for preserving natural sound, litter management, preparedness, and awareness.
 - Target Leave No Trace and ecological messaging at young and/or inexperienced visitors and novice/youth-oriented programs to influence long-term outdoor ethics and skills.
 - Reinforce Leave No Trace messaging for 'trail angels' who may leave unattended food or drink on the trail for hikers (wildlife attractant, abandonment of personal property on public lands).
- Where and when appropriate, increase maps and signage about various destinations on and off the trail.
- Promote use of sustainable campsites via endorsed informational means (navigational smartphone apps and Global Positioning System devices, printed brochures that include maps).
- Improve outreach, education, and interpretation to include historical information and educational programs such as the history of the Catawba Valley.
- Improve communication with universities, particularly Virginia Tech, Roanoke College, and Hollins University.

Potential Strategies

- Evaluate shuttle ride options to identify ways to provide basic information and education on hiking the Virginia Triple Crown segment and advocate for Leave No Trace practices. Communication methods and content would be developed in partnership with the shuttle vendor, and information would be included on the McAfee webpage for shuttle reservations.

Regional Strategies and Partnerships

Confirmed Strategies

- Create a coordinated communication plan among partners and other community stakeholders.
 - Collaborate with stakeholders, including landowners, to advance communications and projects that improve visitor experience.

Potential Strategies

- Coordinate with local hospitality companies.
- Coordinate with local economic development/tourism offices to promote lodging opportunities in Salem, Roanoke County, and Daleville.
- Partner with Salem, Roanoke County, and Daleville to promote resupplying options.

Enforcement

Further compliance may be required to implement strategies.

Confirmed Strategies

- Prohibit organized ‘hiker feeds’³ in the Virginia Triple Crown segment, consistent with National Park Service policy.
- Regulatory signs will inform visitors of parking policies.
- Ensure adherence to National Park Service rules, regulations, and policies, including the Superintendent’s Compendium (NPS 2022a), Title 36 CFR (CFR 2023), and other laws and policies (NPS 2022b).
- Ensure all actions will be in compliance with the Jefferson National Forest Land and Resource Management Plan.
- Initiate and sustain enforcement of formalized and designated parking and access restrictions, and use site management (signage, curbing, paving, revegetation, fencing) to resolve overparking and visitor-created parking.
- Resolve circulation and access issues with crosswalks, bridges, and other pedestrian crossings, such as constructing a pedestrian crossing (VA-311) between Dragon’s Tooth and North Mountain.

Potential Strategies

- Provide opportunities to station a campsite/shelter host(s) at key locations for monitoring overnight use.

Managed Access

Further compliance may be required to implement strategies.

Confirmed Strategies

- Promote and improve the Appalachian National Scenic Trail voluntary overnight registration system.

³ ‘Hiker feeds’ are described as events that are organized to provide food for multiple trail users within a given time frame. These activities are correlated with undesirable behavior and conditions on the trail, such as proliferation of garbage, the creation of clumps of hikers that cause crowding at campsites, may contribute to the transmission of food-borne illnesses, such as Norovirus, and creates additional work for trail volunteers, among other issues. Hiker feeds that occur on National Park Service lands are considered functions requiring permitting by the National Park Service. More details on the topic of hiker feeds are available on Appalachian Trail Conservancy’s website (ATC 2023); search for the term “trail magic” or “hiker feeds.”

Potential Strategies

- Require group registration using an overnight registration system.
- Require permits for overnight camping using an overnight registration system.
- Require permits for day users.

LOCATION-SPECIFIC STRATEGIES

Daleville

Further compliance may be required to implement strategies.

Confirmed Strategies

- Provide visitors with a safe and functional trailhead at US-220.

Potential Strategies

- Provide safe crossing across US-220.

Tinker Cliffs Camping

Further compliance may be required to implement strategies.

Confirmed Strategies

- Redirect unauthorized ridge campers to other locations, such as Lamberts Meadow.
- Identify a location to establish a group campsite between McAfee Knob and Tinker Cliffs.
- Design wayfinding signage for campsites and designated viewsheds using Appalachian National Scenic Trail design specifications.

Potential Strategies

- Designate primitive fire-free tent sites in the Lamberts Meadow-to-Daleville stretch, where appropriate. There is no available water within this stretch of trail.

Andy Layne (Tinker Cliffs) Trailhead Area

Further compliance may be required to implement strategies.

Confirmed Strategies

- Improve signage and wayfinding per recommendations and best practices from the pilot wayfinding and signage project.
- Work with local partners to improve and formalize the parking area to address safety concerns and relieve pressure on other parking areas within the Virginia Triple Crown segment. Improvements could include paving, marking spaces, and providing accessible parking areas.
- Ensure that the lot and associated facilities meet ABA accessibility standards.

Potential Strategies

- Evaluate and assess the need for shuttle service to include Tinker Cliffs.
- Continue to evaluate tread improvements to reduce impacts from water runoff and facilitate hiking activity. Evaluate options to widen the corridor to improve trail alignment via voluntary easements or acquisitions.

Tinker Cliffs Area

Further compliance may be required to implement strategies.

Confirmed Strategies

- Continue to evaluate tread improvements to reduce impacts from water runoff and facilitate hiking activity. Evaluate options to widen the corridor to improve trail alignment via voluntary easements or acquisitions.
- Design and update bridges for safe visitor crossing and use.
 - Address maintenance and improvement needs at the large Catawba Creek Bridge.

Potential Strategies

- Provide safe road crossing across VA-779 to access North Mountain Trail.
- Provide safe crossing across US-220.
- Explore possibilities for additional side trails and other recreational opportunities on protected lands near the McAfee and Tinker Cliffs section.

North Mountain Trail

Further compliance may be required to implement strategies.

Confirmed Strategies

- Improve wayfinding, signage, and trip-planning information available for the North Mountain Trail and Catawba Valley Trail.
- Continue to protect the tread and viewsheds of the North Mountain Trail corridor through acquisition or easements from willing sellers.

McAfee Knob Camping

Further compliance may be required to implement strategies.

Confirmed Strategies

- Close and restore user-created campsites at McAfee Knob.
- Establish two group-camping sites near McAfee Knob. Group campsites should be far enough from shelters and other campsites (out of sight and sound) and large enough to serve more than one group. Group sites could be located between McAfee and Tinker and along the McAfee Knob Fire Road.
- Use a voluntary registration system for group sites.
- Redesign the Catawba Mountain shelter and overnight site to sustainably accommodate current use levels. A proposed plan includes installation of a series of side-hill tent sites near the shelter, a minor reroute of the Appalachian National Scenic Trail away from the shelter, and developing a single route to access the shelter and tent sites from the Appalachian National Scenic Trail.
- Redesign Campbell Shelter and Pig Farm Campsite using clusters of tent pads for small groups, such as section-hikers and thru-hikers.
 - Revegetate this area along with other highly used sites.

McAfee Knob Area – Trail and Vista

Further compliance may be required to implement strategies.

Confirmed Strategies

- Encourage the use of routes that use approved connecting trails, as well as the Appalachian National Scenic Trail, where they exist.
- Determine the number and location of user-created trails between the parking lot and McAfee Knob and identify new trail alignments after bridge work is complete. Complete environmental compliance on new trails and implement new trail alignments. Decommission and revegetate unused trails.
- After the pedestrian bridge and connector trails are constructed, communicate new circulation patterns with the public.
- Improve educational efforts related to the history of this trail section, such as the work to return the trail to McAfee Knob between 1978 and 1987, highlighting core values, including partnership, the leadership role of citizen volunteers in building and managing the trail, and McAfee Knob as the optimal location for the trail.
- Improve signage and wayfinding per recommendations and best practices from the pilot wayfinding and signage project.
- Establish an information kiosk where the Appalachian National Scenic Trail crosses the McAfee Knob Fire Road.
- Conduct a condition assessment of the Appalachian National Scenic Trail and its access trails. Develop and submit a project proposal to implement the repair of any identified deficiencies.

Potential Strategies

- Evaluate marking and maintaining the McAfee Knob Fire Road as a blue-blazed trail to the Pig Farm Campsite, Campbell Shelter, and water source, providing a figure-eight loop hike option to McAfee Knob. An old road that is currently used by Roanoke County Fire & Rescue, approximately halfway between the Appalachian National Scenic Trail/McAfee Knob Fire Road junction and Campbell Shelter, could also be evaluated as a potential side trail that would provide an easier route to McAfee Knob for less able hikers.
- Explore possibilities for additional side trails and other recreational opportunities on protected lands near the McAfee and Tinker Cliffs section.

McAfee Trailhead Area

Further compliance may be required to implement strategies.

Confirmed Strategies

- Develop the McAfee Knob parking area to accommodate a visitation level to meet desired conditions, establish a National Park Service experience, and improve ingress and egress. The parking lot will accommodate the new pedestrian bridge. Development should include hardening the parking lot surface, designating parking spaces, installing a drainage system, and defining the parking lot perimeter. The National Park Service is seeking funding for this project.
 - Consider including design guidelines for designated space for pop-up interpretive opportunities, including space for tables and tents.

- Consider the 8-acre property, currently owned by the Conservation Fund, for development and using it for administrative and accessible parking, shuttle turnaround, and for trash and comfort stations.
- Continue to inform the public of Catawba Greenway as an alternative hike and parking for McAfee Knob.
- Provide trip planning information and clear signage at the trailhead, including trail information that meets accessibility guidelines on the level of difficulty, steepness, tread barriers, and distances, and provide recommendations on equipment for hiking to McAfee Knob from the McAfee Knob Parking Lot.
- Develop the McAfee Knob Parking Area to ensure all facilities meet ABA requirements (e.g., potential parking spaces, pedestrian routing, restrooms, signage).

Potential Strategies

- At the existing and planned parking at McAfee Knob Trailhead parking lot on VA-311:
 - Enforce no overnight parking at the existing and future parking lots and designate them as day-use parking only.
 - Maintain shuttle pull-off area and explore options for a permanent shuttle stop.
 - Establish restroom facilities, ADA-accessible parking, and bear-proof trashcans.
- Explore overnight parking and potential shuttle stops in the Catawba Valley area.

Dragon's Tooth

Further compliance may be required to implement strategies.

Confirmed Strategies

- Short term (next 5 years)
 - Educate and encourage visitors on Leave No Trace practices.
 - Establish a US Forest Service order to ensure protection of natural resources, such as maintaining distances from water resources, as needed.
 - Restore dispersed camping impacts in unsustainable locations to natural conditions.
 - Inform the public of dispersed camping areas.
 - Encourage Dragon's Tooth hikers to make a loop hike or route with the Boy Scout Trail, Dragon's Tooth Trail, and Appalachian National Scenic Trail.

Potential Strategies

- Acquire a parcel or explore a public/private partnership to accommodate drive-in camping and overnight parking.
- Evaluate the potential for designating primitive fire-free tent sites in the Dragon's Tooth to Johns Spring Shelter area, where appropriate.

Dragon's Tooth Trailhead Area

Further compliance may be required to implement strategies.

Confirmed Strategies

- Short term (next 5 years)
 - Explore options for a safe crossing plan with the Virginia Department of Transportation at the VA-311 crossing at Dragons Tooth trailhead to North Mountain trailhead.
 - Evaluate the feasibility of hardening the lower part of the driveway into the lot.
- Long term (beyond 5 years)
 - Ensure that the lot and associated facilities meet ABA accessibility standards.

Potential Strategies

- Coordinate with the Virginia Department of Transportation to reduce the speed limit on Catawba Valley Drive (VA-311) near the Dragon's Tooth parking area.
- Consider parking lot reconfiguration, expansion, and hardening in collaboration with the Virginia Department of Transportation, the National Park Service, and the US Forest Service.
- Prepare a development concept plan for the Dragon's Tooth area to address camping, parking areas, and ABA accessibility standards for any new facilities.
- Evaluate hiker-friendly locations for potential shuttle service to serve the Dragon's Tooth trailhead.

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Chapter 4

Monitoring and Adaptive Management



Divider photograph: McAfee Knob and Tinker Cliffs trail sign (Photograph credit: Ethan Smith)

CHAPTER 4. MONITORING AND ADAPTIVE MANAGEMENT

INTRODUCTION

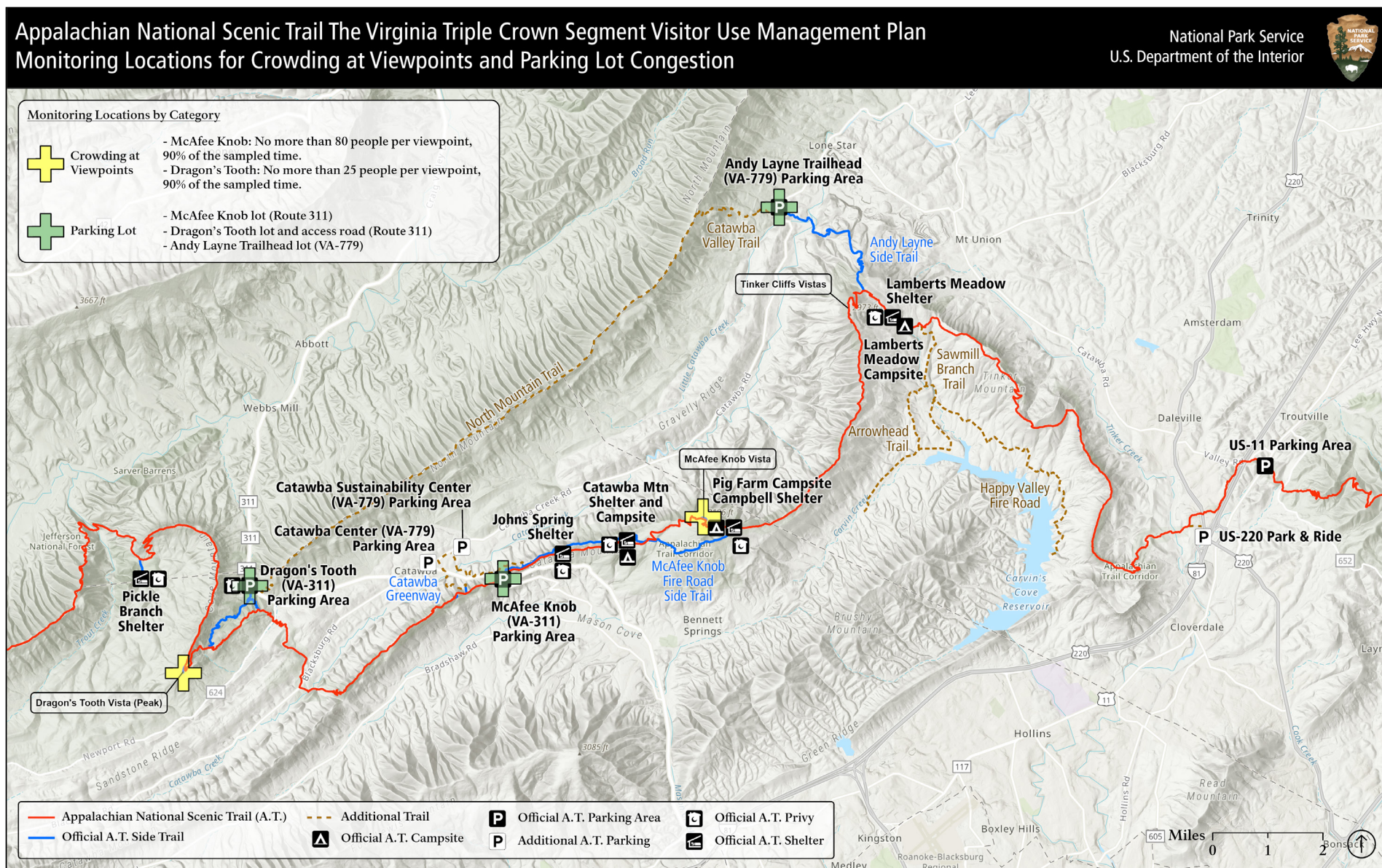
Indicators, thresholds, and visitor capacity are key components of the Interagency Visitor Use Management Council framework. Indicators measure conditions related to visitor use, which then may be monitored over time. The monitoring results are used to inform and select strategies by trail managers to not exceed maximum visitor use for sites (“visitor capacity identification”). Potential management strategies are described for each indicator below and would be applied in conjunction with the management strategies presented in this plan. This iterative practice of monitoring, implementing adaptive strategies, and continuing to monitor to gauge effectiveness allows trail managers to achieve and maintain desired conditions for resources and visitor experiences in a dynamic setting. This section presents indicators that will be monitored in the Virginia Triple Crown segment of the Appalachian National Scenic Trail. Figure 6 presents the monitoring locations used to collect data on crowding at viewpoints, crowding at trails, and parking lot congestion. Associated thresholds and adaptive strategies that would inform visitor capacity identification are described in chapter 5.

Indicators. Indicators translate the broad description of desired conditions into measurable attributes (e.g., people at one time at key locations, number of user-created trails) that can be tracked over time to evaluate progress in maintaining or achieving desired conditions. These are critical components of the visitor use management framework. The planning team considered many potential issues and related indicators that would identify impacts of concern, but those described below are the most noteworthy, given the importance and vulnerability of the resource or visitor experience affected by visitor use. The planning team also reviewed the literature and experiences of other areas with similar issues to identify meaningful indicators.

Thresholds. Thresholds that represent the minimum acceptable condition for each indicator were established, considering qualitative descriptions of desired conditions, data on conditions, relevant research studies, and staff management experience. Although defined as “minimally acceptable,” thresholds still represent acceptable conditions. Also, establishing thresholds does not imply that no action would be taken prior to reaching the threshold. One goal of visitor use management is to progress toward desired conditions. Thresholds identify the point at which visitor use effects on desired conditions are anticipated to become enough of a concern that a management action is needed to achieve and maintain desired conditions. The planning team also reviewed the literature and experiences of other areas with similar issues to identify meaningful thresholds.

Indicators and thresholds that will be implemented as a result of this planning effort are described below, including rationale for these indicators, thresholds, and associated potential management strategies. Indicators will be implemented over time, as resources allow, and in consideration of the overall goal to manage visitor use to meet desired conditions.

Figure 6. Monitoring Locations for Crowding at Viewpoints and Parking Lot Congestion



Monitoring Approach, Adaptive Management Strategies, and Mitigation Measures

Adaptive management is the proactive and adaptive process for managing visitor use characteristics in natural and managerial settings using a variety of strategies and tools to achieve and maintain desired resource conditions and visitor experiences. Adaptive management relies on knowledge obtained from monitoring and learning from management outcomes. Monitoring is used to measure, assess, and report progress toward desired conditions. Effective use of adaptive management requires an initial investment of time and effort, willingness to make objective observations, and flexibility and support over the life of a project or plan.

Use and reporting of monitoring data also help managers identify and prioritize areas that have continuous and disproportionate impacts on management staffing and capacity to maintain desired conditions. This data and reporting will also support requests for agencies and Appalachian National Scenic Trail management partners to direct assistance, capacity, and funding to correct these impacts.

A consistent monitoring methodology is imperative to ensure monitoring protocols are reliable and replicable and result in quality data over time. Detailed documentation of monitoring protocols will guide monitoring efforts and ensure consistency into the future.

Mitigation measures are a collection of identified actions that may be undertaken to reduce visitor use impacts and conflicts to an acceptable level. The mitigation measures that are used depend on the most appropriate scope and action, as well as timing, and are situationally implemented. Mitigation measures usually relate to education, improvements, monitoring, regulation, and enforcement.

Developing adaptive management strategies and mitigation measures help managers understand the relationship between current and desired conditions and to make defensible decisions about visitor use management strategies and actions implemented dependent on indicators and thresholds, including those regarding visitor capacity.

Campsite types are described in table 1 with attention to the following definitions:

“**Authorized**” refers to campsites that are National Park Service-designated sites campsites.

“**Unauthorized**” refers to user-created sites (not officially designated) that occur on National Park Service lands. Because US Forest Service lands are subject to dispersed camping policies, the term “unauthorized” does not apply to USFS-managed lands.

Table 1. Campsite Descriptions and Land Management Direction

Campsite Type	Campsite Definition	US Forest Service Policy	National Park Service Policy
Designated site camping (designated campsite)	A land-management strategy that contains camping impacts on a defined area . Leave No Trace practices are encouraged.	There are currently no designated campsites in the US Forest Service-managed areas. Designated campsites could occur in the future, but it would have to be an identified priority of the US Forest Service for site use management.	Authorized and established on National Park Service lands.
Dispersed site camping (dispersed campsite)	A land-management strategy that disperses camping on public lands away from developed recreational facilities . Leave No Trace practices are encouraged.	Occurs on US Forest Service lands where there are no closures or restrictions. Not allowed in developed recreation areas like campgrounds, picnic areas, or trailheads A US Forest Service order may be issued to ensure protection of resources, such as maintaining distances from water resources, as needed.	Does not occur on National Park Service lands.
User-created recreation site (user-created campsite)	Arbitrary sites created by users that are contrary to law, policy, and regulations of the land management agency where they are placed.	An incompatible use in instances where specific US Forest Service laws and policies, special orders ¹ , and specific land use plans are in place.	Unauthorized on National Park Service lands.

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MONITORING APPROACH

Camping Impacts

Indicators

Indicator 1: Aggregate area of authorized camping impact per section at National Park Service designated sites and US Forest Service dispersed camping areas. The impacts are similar for both federal agencies.

Indicator 2: Aggregate area of unauthorized campsite creation or camping impacts per section (see “Thresholds”).

Thresholds

- Area of departure from designated recreation (camping) site: No more than 20 percent of areal unit increase in impacts from reference conditions. Reference conditions are based on camping type (user-created, designated, dispersed) and associated environmental factors. This indicator will require collection of baseline information in advance of implementation.

- User-created Site:
 - No (zero) unauthorized campsite on National Park Service-administered lands or user-created campsites within US Forest Service lands along any length of trail or in or near sensitive resource areas (e.g., water, fragile vegetation).
- Dispersed Campsite:
 - Acceptable locations: On US Forest Service lands only, within guidelines and policies established for dispersed camping.
 - Unacceptable locations: Camping within 200 feet of a water resource, including ephemeral springs and seeps; camping within 500 feet of a rare, sensitive, threatened, or endangered species and/or natural community.

Rationale

The Appalachian National Scenic Trail was designated to protect its natural and cultural resources and provide opportunities for long-distance foot travel in a primitive setting, conserved for public use, enjoyment, and appreciation. Visitation has substantially increased during the last decade, and overnight or multi-day experiences are gaining popularity, particularly in the Virginia Triple Crown segment. A core goal of this indicator is to confine intensive trampling impacts from camping to the smallest footprint possible. This indicator provides an important measure in relation to visitor enjoyment at high-use destinations, a measure for natural resource impacts related to acute effects of vegetation loss and bare ground exposure, and local and chronic effects of vegetation degradation and habitat alteration.

Impacts from camping and campsite proliferation that is not managed can impair the visitor experience and cause long-term ecological effects, such as changes to soil abiotic and biotic character, plant species composition, tree condition and age class, and forest canopy cover. Studies show that the greatest impact occurs with initial use in a new site and that proliferation of new campsites is a major contributing factor to the increase in total camping impact.

This indicator helps track conditions to ensure that visitors have opportunities for experiencing solitude (individual sites), or appropriate conditions in group use facilities. This indicator also defines the limits of acceptable change to the local natural environment.

Monitoring Locations

This indicator applies to:

- All Appalachian National Scenic Trail lands

Monitoring Approach

Monitoring:

- Conduct condition survey of formal campsites at 5-year intervals and more frequently as needed.

Metrics may include:

- Condition class
- Ground cover (litter, vegetation) on-site
- Tree damage

- Root exposure
- Bare soil

Adaptive Management Strategies

- Construct “side-hill” campsites⁴ with short access trails in places that are previously inventoried and found suitable. These can either be established or designated campsites.
- Evaluate the feasibility of effects of hardening selected sites; where determined appropriate, harden existing sites.

Trail Conditions

Indicators

Indicator 1: Trail width. Change in trail width from the description in the *Appalachian Trail Design, Construction, and Maintenance* manual (Birchard and Proudman 2000):

- *Free from erosion – leaf litter on the footway, less than three inches of cupping, no gullies, no broken roots, or loose rocks*
- *Narrow treadway for single-file travel – 12 to 18 inches wide in flat woodland, 24 inches wide on side slopes.*
- *Dry, well-drained-hardened with rock or mineral soils “turnpike” or bog bridges in wet soils – and lacking signs of widening.*
- *Designed for foot traffic – rarely following woods roads, closed to pack stock, bicycles, and vehicles.*
- *Lush with plant life – bordered by healthy, untrampled vegetation, gullies filled, bare soil mulched and seeded.*
- *Simple in design – free of structures (stiles, steps, cribbing, bridges, waterbars, switchbacks); rustic improvements only.*
- *Varied grade appropriate to terrain, low enough to minimize erosion.*

Indicator 2: Trail tread incision. Change that occurs with use over time to the trail tread condition or its engineered slope from the trail class specifications. This indicator relates to a trail tread condition that would exacerbate erosion and soil loss.

Indicator 3: Unauthorized user-created trails. Evidence of user-created trails branching from the formal trail.

Thresholds

Trail width: Trail width increases no more than 20 percent from the baseline defined by the intended trail class and zone.

Trail tread: Average maximum incision (soil loss) does not appear to exceed two inches on the outside of the trail along a 25-foot interval. (For monitoring activities, this threshold implies a visual assessment instead of a formalized comparative analysis.)

⁴ “Side-hill” campsites are campsites established on naturally occurring small flat spots, or through cut-and-fill methods and built into the side of a hill or slope. These campsites are established in areas surrounded by sloping topography or excessive rugosity, with short access trails.

Unauthorized user-created trails: Develop and implement rapid-assessment criteria to guide urgency and timeliness of corrective management strategies that would be contingent on the sensitivity of the impacted resource. This could include counting user-created trail departures from the main stem and include affiliated factors (i.e., direction from the main stem, reason for leaving the main stem, and length and condition class of the informal trail) and providing a framework for identifying when a user-created trail is suitable for accessing trail-use resources, such as springs, vistas, and campsites. An example would be zero acceptance of user-created trails departing from the main stem that are directed toward sensitive natural or cultural resources.

Rationale

The Appalachian National Scenic Trail offers healthy outdoor opportunities for self-reliant foot travel through wild, scenic, natural, and culturally and historically significant lands. The Virginia Triple Crown segment is a popular destination for single- and multi-day experiences. High use in this area generates conditions in which established trails may deteriorate with heavy use, diminishing their capacity to provide quality recreational experiences. From a user standpoint, trail treads that are eroded or muddy are difficult to navigate, present safety concerns, and are aesthetically displeasing. For natural resource concerns, trail conditions that do not have adequate trail out slope and prevent water from leaving the trail tread increase the risks of soil erosion, vegetation loss, and artificially high sedimentation, and exacerbate conditions related to more frequent pulses of severe storm activity. Additionally, proliferation of informal user-created trails, as departures from the formal trail or near heavily used recreation sites, directly impacts natural plant communities and wildlife habitats and can exacerbate resource degradation because of their lack of sustainable design, siting, construction, and maintenance. The Roanoke Appalachian Trail Club monitors and corrects user-created trails on an ongoing basis.

There are four general types of trail impacts of concern: tread muddiness, trail widening, soil loss (from erosion and displacement), and unauthorized user-created trail proliferation. Tread muddiness is rarely a problem on the Virginia Triple Crown segment trails. The other three core impacts are common and concerning, and expansion in tread width is quite noticeable on the primary McAfee Knob and Dragon's Tooth trail sections⁵. Soil loss occurs in a variety of areas and is related primarily to steep trail grades located in a fall line alignment that do not provide adequate tread drainage.

For the second indicator and threshold (trail tread), the focus is on soil loss as the resource impact of concern rather than trail maintenance qualities and/or attributes. If the threshold is reached or exceeded, managers may first consider attempting to install or add to existing in-tread drainage features, such as dip drains, outsloped tread, and/or linear ditch drains. A long-term solution is to relocate the non-sustainable section to a more sustainable side-hill alignment and trail grade with an appropriate density of full tread grade reversals that would reduce the frequency of recurring maintenance. When this is not possible the next solution is to harden treads with rock pitching in treads or rock steps or add durable tread substrates of gravel mixed with soil. In more severe situations managers may consider installing erosion-controlling structures, such as rock and/or wooden steps, checks, waterbars, and retaining walls, among other engineered solutions.

For the unauthorized user-created trail indicator and threshold, the aggregate lineal extent of user-created trails may be a more valuable indicator than counts of user-created trails. For example, several very short (e.g., up to 10-foot) user-created trails to scenic viewpoints along a clifftop trail (common) would be treated more consequentially than a single 300-foot steep fall-aligned user-created trail from a camping area directly to a stream. In this example, the clifftop user-created trails involve shallow soil over bedrock and removal of a few shrubs and may be of less consequence (and likely more difficult

⁵ Though trails in high-use areas must be wider to accommodate passing in both directions, it is important to identify what is practical at these areas to define a reasonable threshold.

to manage) compared to a much longer user-created trail that would erode quickly and move large soil quantities into a stream.

These indicators provide an important measure in relation to trail conditions and impact on visitor enjoyment, as well as a measure of natural resource impacts related to erosion and erosion-related impacts, vegetation degradation, and changes to soil profiles.

Monitoring Locations

For monitoring locations, there is a preference to classify these in broader terms that reference the trail type when reporting:

- Appalachian National Scenic Trail proper (white blazes; main stem)
- Blue-blaze trails (official side trails, alternate access routes)
- Hotspots (unauthorized user-created trails that proliferate in a given area)

Monitoring Approach

- Develop a baseline inventory of trail conditions.
- Perform monitoring via use of an accepted, standardized, and transferable data-collection protocol, such as a smartphone app or established trail counters, that could be applied by a Ridgerunner, Roanoke Appalachian Trail Club volunteer, or Appalachian Trail Conservancy staff.
- Periodically (e.g., every 5 years) map the entire unauthorized user-created trail network to monitor changes and compare to the baseline and threshold values. This would allow for spatial (geographic information system) analysis of user-created trail attributes (steepness, slope alignment) to determine the relationship of the user-created trails to sensitive resource locations and identified hotspots. Spatial analysis may also demonstrate the reason for user-created trail creation and provide support to determine whether they are suitable or acceptable as formalized trails.
- Perform periodic condition assessments (every 1 to 5 years) to identify effective, appropriate management responses (e.g., maintenance, education, design and redesign).
- Monitoring interval: every 5 years.

Adaptive Management Strategies

- Encourage visitation during off-peak visitation periods.
- Remove unauthorized user-created trails, especially at intersections. Removal of trails could be implemented through management actions, such as scarification combined with placement of “iceberged”⁶ rocks and felled or rotted trees, site-appropriate shrub plantings, and mulch/compost plus appropriate plant propagules. Establish signs that include a combination of messaging that provides a concise rationale for not using closed trails and that directs visitors to more sustainable access options. More numerous but small symbolic “prompter” signs at intersections of formal and user-created trails, along with log/rock barriers, can also be effective.
- Where practicable, improve the trails to be accessible. Elsewhere, improve the slopes, widths, and surface to be usable by a wider range of visitors.

⁶ “Iceberged” rocks work best when three-quarters of a large rock’s bulk is buried so that visitors cannot kick, pull, or work them free.

Parking Lot and Roadway Congestion

Indicator

Number of vehicles at one time in parking lots.

Threshold

The number of vehicles at one time does not exceed the design capacity of the parking lot 80 percent of the sampled time. This threshold will be applicable once the parking lot redesign is implemented.

Rationale

Free-flowing roads and parking areas allow access for emergency services, equipment, and personnel. This indicator measures visitors' ability to find parking at popular destinations. This indicator provides an important measure of parking lot conditions in relation to visitor access to popular destinations and potential resource impacts as a result of parked vehicles in unauthorized areas when lots are full. This indicator helps track conditions to ensure that visitors have safe and stress-free access to popular locations by reducing vehicle congestion and conflicts in parking lots. Parking lot congestion, particularly at the McAfee Knob parking lot, is related to traffic congestion and safety associated with vehicles parking illegally on the highway.

Monitoring Locations

- Andy Layne trailhead lot (VA-779)
- McAfee Knob lot (VA-311)
- Dragon's Tooth lot and access road (VA-311)

Monitoring Approach

Continued monitoring of parking lots by Appalachian Trail Conservancy seasonal staff Ridgerunner, Roanoke Appalachian Trail Club Volunteer Ridgerunners, and National Park Service ranger. Appalachian Trail Conservancy's staff Ridgerunner currently works full-time from mid-April through mid-November, while Volunteer Ridgerunners prioritize weekend patrols. Document the number of cars in parking lots at one time, along with the date and time. Document improper parking in lots, as well as egress issues. This could be measured using a scale of one to five for issue severity. Install cameras to monitor lot fullness. Monitoring would take place as often as possible, with an emphasis on weekend data collection.

Adaptive Management Strategies

- Explore and evaluate a reservation system for parking areas.
- Implement a shuttle system from park-and-ride lots and provide designated shuttle turnaround areas in parking lots.
- Explore and evaluate methods to close the McAfee Knob lot when full.

Crowding at Viewpoints

Indicator

People per viewpoint.

Monitoring Locations and Thresholds

- McAfee Knob: No more than 80 people per viewpoint 90 percent of the sampled time.
- Dragon's Tooth: No more than 25 people per viewpoint 90 percent of the sampled time.

Rationale

Crowded trail conditions diminish visitor experience quality. This indicator aids managers in understanding visitor-use density at key destinations along trails. This indicator allows managers to accurately and efficiently evaluate the number of people visible at one time in a landscape and to compare those numbers to desired conditions for the area. People per viewpoint is also used by managers and researchers to quantify visitor crowding impacts on natural resources (such as trail widening as visitors leave the trail to pass other parties). By monitoring and protecting visitor experiences at key destinations, the effectiveness of management strategies that influence specific destinations can be assessed and adjusted as needed. Research suggests that visitors can identify site-specific standards for crowding. These visitor-based standards can be used to guide development of social indicators and thresholds for crowding. At McAfee Knob, crowding diminishes visitor experience quality, including opportunities to take photos. At McAfee Knob and Dragon's Tooth, crowding can reduce safety near ledges and cliffs.

Monitoring Approach

Document the number of people visible at one time from specific vantage points associated with key destinations. Monitoring would occur at different times of the day and year, as possible. However, high-use weekends would be prioritized to ensure that the busiest days and high-use trail sections are captured. Monitoring would occur manually with an individual person (Appalachian Trail Conservancy or Roanoke Appalachian Trail Club Ridgerunners) capturing counts or photographs or using an automatic trail camera set to capture photographs at designated times.

Management Strategies

- Collect data for sites, trails, or destinations where additional information on visitor use patterns, levels, and behaviors could further inform thresholds. This information would be collected and used to refine thresholds before actions that limit or reduce visitor use are taken.
- Install trail counter at Andy Layne (Scorched Earth Gap) and Dragon's Tooth (Lost Spectacles Gap).

Vantage points for observations:

- McAfee Knob: from the edge of the blue blaze to the first 50 yards of rock
- Dragon's Tooth: upper and lower viewpoint areas

Adaptive Management Strategies

- From the ongoing Visual Resource Inventory, evaluate whether the following desired condition is being met (Virginia Triple Crown segment-wide): scenic viewsheds from the ridge tops provide visitors with opportunities to take in stunning scenery including natural forested views sporadically intermixed with meadows, old fields, pastoral valleys, and cultural landscapes.

Other Related Monitoring

Incidence of Illegal Roadside Parking and Car Towing

Congested parking lots frequently fill beyond capacity, leading to unauthorized parking on nearby roadways. Congested parking lots and roadways can hinder access for emergency services, equipment, and personnel, and lead to car towing. Unauthorized parking damages vegetation and contributes to an increase in bare soil. Additionally, unauthorized parking can create hazards, such as reduced road lane width, an increased number of pedestrians in the roadway, and pavement damage at the road's edge. Unauthorized parking is also related to decreased visitor experience quality because it creates difficult visitor mobility and circulation and shows a higher risk of surpassing other thresholds (e.g., people per viewpoint and encounter rates).

Roadways adjacent to parking lots are under the jurisdiction of other management entities, such as the Commonwealth of Virginia and Roanoke County. While the Virginia Triple Crown managing partners do not directly manage these roadways, monitoring information can help justify adjustments to parking lot capacity or better communication of lot conditions. By monitoring the number of vehicles in parking areas, as well as illegal parking and car towing, managers will be able to make informed management decisions related to transportation infrastructure and the timing and level of visitor use that occurs in an area. Managers will monitor this by reviewing county records for incidence of citations and towing on a monthly basis. This monitoring would take place at VA-311 adjacent to the McAfee Knob and Dragon's Tooth trailheads and Virginia State Route 864 (VA-864/Old Catawba Road). A goal would be to eliminate all incidents of illegal roadside parking and towing.

Visitor Waste

Visitor waste along the trail and in parking lots is a major issue on Virginia's Triple Crown segment; volunteer Ridgerunners collected and removed 2,237 gallons of trash (i.e., litter) from 2015 to 2019. Ridgerunners will continue to collect and report the volume of trash collected. Increases in amounts of trash and specific areas of concern will inform increased education and messaging efforts, enforcement, and placement of waste bins.

Safety and Incidents of Inappropriate Behavior

Trail managers continue to monitor and respond to reported incidents, such as rescues (injured and lost hikers), vehicular accidents, citations, and heat exhaustion. Unendorsed behaviors, such as human/wildlife interactions and inappropriate shelter uses, are primary safety concerns and negatively impact visitor experience. This monitoring information supports resource protection and visitor safety. It will also inform messaging, education, and enforcement. Trail managers will monitor incidents via incident management reporting systems and emergency medical services reports.

Water Reliability and Water Quality

In recent years, historically reliable, naturally occurring water sources have become less reliable, especially during the warmer months. Reliable naturally occurring water sources are important along Virginia's Triple Crown segment, particularly for multi-day hikers and thru-hikers. Currently, water availability is reported weekly through communications from volunteer Roanoke Appalachian Trail Club Ridgerunners and Appalachian Trail Conservancy staff. In the future, monitoring could also include reporting on encounters with hikers experiencing serious water shortage issues. Human waste and other water contaminants are of concern for water quality. However, user-caused impacts on water quality cannot be readily isolated from other contributing factors, such as sedimentation, agricultural runoff, wildlife use, and livestock grazing.

Crowding on Trails

Monitoring crowding on trails would be done by collecting data on the number of visitors an individual encounters as they travel on trails. Encounter rates are a primary means by which opportunities for solitude would be measured on trails. The data would allow managers to monitor the use levels on trails and help determine whether reducing encounters on trails is necessary to maintain desired visitor experiences. This monitoring would be useful for understanding the effects of parking enforcement or a reduction in parking. This monitoring is not currently occurring but could be implemented in the future to provide additional data points to other indicators of crowding described above, such as crowding at viewpoints.

Chapter 5

Visitor Capacity



Divider photograph: Survey marker (Photograph credit: Kathryn Herndon-Powell, Appalachian Trail Conservancy)

CHAPTER 5. VISITOR CAPACITY

INTRODUCTION

This chapter provides additional information about visitor capacity identification. For a description of the Interagency Visitor Use Management Council's framework and additional resources, visit their website (Interagency Visitor Use Management Council 2023).

The Interagency Visitor Use Management Council defines visitor capacity as the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established. By managing amounts and types of use, the Appalachian National Scenic Trail cooperative management partners can help ensure that resources are protected and that visitors have the opportunity for a range of high-quality experiences.

Visitor capacities will be used to inform and implement the management strategies selected as part of this Visitor Use Management Plan. Identifying visitor capacity is also directed by legal mandates that require the National Park Service to identify and implement commitments for visitor capacities for all areas of a park unit per the National Parks and Recreation Act of 1978. Visitor capacities were identified using best practices and examples from other plans and projects across the National Park Service. Based on these best practices, the planning team used the following guidelines to identify capacity:

1. determine analysis area(s)
2. review direction and knowledge
3. identify the limiting attribute(s)
4. identify visitor capacity

This section outlines considerations used to identify visitor capacity for key destinations.

Guideline 1. Determine the Analysis Area(s)

Analysis areas for visitor capacities are based on where the capacities will be implemented and should include all the various factors that influence the desired conditions for that area. For high-use locations with associated visitor impacts, a detailed analysis has been conducted to identify appropriate use levels (see figure 7). For each analysis area, an overview of the setting, relevant indicators, visitor use issues, use levels, and visitor capacity identifications are described. Use levels have been informed by relevant studies and data, and the strategies in this plan were considered as part of the visitor capacity identifications.

Following guidance from the Interagency Visitor Use Management Council, the level of analysis that occurs during visitor use management planning and visitor capacity identification is determined on a sliding scale depending on impact risk, issue uncertainty, stakeholder involvement, and level of controversy related to the plan scope. A higher analysis level is necessary for three analysis areas because of visitor use issues there. Those locations are Tinker Cliffs, McAfee Knob, and Dragon's Tooth. If associated thresholds are exceeded, adaptive management strategies will be implemented to ensure that capacities are not exceeded.

For locations other than Tinker Cliffs, McAfee Knob, and Dragon’s Tooth, a lower level of analysis has been conducted. Current use levels at these other locations have been identified to be below capacity levels. Future monitoring will inform trail managers if use levels are nearing visitor capacities. If so, adaptive management strategies, as outlined in this plan, will be taken. For these locations, a table is included that states current use levels, visitor capacity identifications, and rationale.

This chapter fulfills the requirements of the 1978 National Parks and Recreation Act (54 USC 100502) to identify visitor capacity for all areas that this planning effort addresses. The analysis also fulfills the requirement from the 1968 National Trails Systems Act (16 USC 1241–1251) for the Virginia Triple Crown segment of the Appalachian National Scenic Trail. These analysis areas comprise most visitor use areas in the plan scope. Strategies to implement visitor capacities have also been identified as part of this process.

Guideline 2. Review Direction and Knowledge

During this step, the planning team reviewed direction and knowledge, including:

- Applicable law and policy
- Prior applicable planning and guidance
- Analysis area conditions
- Indicators, triggers, thresholds, and objectives
- Applicable management strategies

The following plans provide overarching guidance for managing the amounts, timing, distribution, and types of use throughout the Virginia Triple Crown segment of the Appalachian National Scenic Trail. The plans include descriptions of desired visitor experiences, resource conditions, and appropriate support facilities. These plans include:

- *Comprehensive Plan for the Protection, Management, Development and Use of the Appalachian National Scenic Trail* (NPS 1981)
- *Revised Land and Resource Management Plan, Jefferson National Forest* (USFS 2004)
- *Appalachian National Scenic Trail Resource Management Plan* (NPS 2008)
- *Appalachian National Scenic Trail Foundation Document* (NPS 2015a)
- *Local Management Plan for the Appalachian Trail* (RATC 2015)

During development of this plan, the interdisciplinary planning team developed desired conditions, indicators, and thresholds for the Virginia Triple Crown segment, with particular attention to conditions and values that must be protected and are most related to visitor use levels.

The amount, timing, and distribution of visitor use on the trail influence resource conditions and visitor experiences.

The Virginia Triple Crown segment has use levels that may degrade the visitor experience and social conditions along the trail. The Virginia Triple Crown segment’s proximity to I-81 makes the trail accessible and therefore susceptible to increasing visitation. Heavy publicity of the Virginia Triple Crown segment in print, broadcast, and social media, as well as promotion by state, regional, and local agencies and businesses, exacerbate this trend. Users are primarily day-hikers, and many are from regional universities.

There may also be conflicts with uses beyond hiking, such as drone users, climbers, mountain bikers, and trail runners. More than 50,000 people visit McAfee Knob each year, and over 30,000 people visit Dragon's Tooth each year. Weekend days are generally crowded, especially in spring (March through May) and fall (September through November). Day-hikers constitute about 80 percent of visitors, and backpackers make up the remainder (RATC 2019). Backpackers are predominantly overnight (one or two nights), except in May when there is a swell of thru-hikers in the region. Large groups, such as college and youth groups, frequent McAfee Knob and nearby campsites (designated and user-created). The noise and volumes of people impact other hikers' experiences, especially backpackers. Visitor safety is also a growing concern due to ill-prepared hikers, resulting in injuries and rescues. Although rescues at McAfee Knob are relatively feasible due to access via fire road, rescues at Tinker Cliffs and Dragon's Tooth can be more challenging.

This analysis is informed by data, guidance, and the judgment of managers. Visitor capacities have been identified based on the best available information and will be reviewed and updated as future planning occurs.

Methodological Considerations

To determine the appropriate amount of use for each analysis area, a variety of data were reviewed to understand current conditions compared to desired conditions. An infrared trail counter installed by the Roanoke Valley-Alleghany Regional Commission and maintained by the Appalachian Trail Conservancy staff is located along the Appalachian National Scenic Trail near McAfee Knob. The counter uses an infrared sensor to record the number of people who pass it. Data are recorded in hourly increments. Since most visitors are on out-and-back hikes and are therefore counted twice, the raw counter numbers are adjusted to estimate visitation. Visitor use information is also collected by volunteer Roanoke Appalachian Trail Club Ridgerunners and Appalachian Trail Conservancy staff who patrol Tinker Cliffs, McAfee Knob, and Dragon's Tooth to provide visitor education, monitoring and reporting, and removing impacts, such as trash, graffiti, and fire rings. Ridgerunners document the number of visitors encountered during their patrols, the number of gallons of trash removed, and the number of fire rings removed. A National Park Service Ranger also communicates with Ridgerunners and addresses concerns. Observations of the number of vehicles parked at trailheads are used to estimate peak visitor use levels at key destinations. The persons per vehicle estimate is 2.8, consistent with the measure for two nearby National Park Service units: Blue Ridge Parkway and Great Smoky Mountains National Park.

Because of the COVID-19 pandemic and associated operational changes and visitation pattern changes, data from 2020 and 2021 were not used in the visitor capacity analysis. Where available, 2019 data were used.

Guideline 3. Identify the Limiting Attribute

Guideline 3 requires identification of attributes that most constrain the ability of the analysis area to accommodate visitor use. The limiting or constraining attributes may vary across the analysis areas and are described in the "Limiting Attributes and Relevant Indicators" sections below for each analysis area. This is an important step, given that the Virginia Triple Crown segment could have a variety of challenges regarding visitor-use issues, and there could be more than one limiting attribute for identifying the amounts and types of use that the analysis area can accommodate. Relevant indicators to monitor limiting attributes are noted for each analysis area.

Guideline 4. Identify Visitor Capacity and Implementation Strategies

To identify the appropriate use amounts and types at key areas, outputs from previous steps were reviewed to understand current conditions compared to desired conditions for the area. This analysis, in combination with an understanding of the visitation data collected annually by Appalachian National Scenic Trail cooperative management partners to track levels of visitor use parkwide and by area, helped Appalachian National Scenic Trail trail managers identify visitor capacities for each analysis area. Management strategies have been identified to implement visitor capacity.

Visitor capacity metrics used in the analysis include people in one day, people at one time, and people per night. The planning team identified the metric for each area that was most meaningful to manage to capacity in that area.

The visitor capacities were developed using monitoring data, research, lessons learned from comparable areas, and professional judgment based on desired conditions and the limiting attributes for each analysis area. The analysis uses the best available information to make the decision for current visitor use management. Visitor capacities are the decision of the agency and are subject to amendment. Should there be meaningful changes, such as those outlined below, the agency may re-evaluate and update the visitor capacity. The criteria that may warrant a re-evaluation of capacity or updating strategies to manage to capacity are:

- There is evidence that thresholds are being approached;
- There is evidence that park conditions are trending away from desired conditions;
- There is meaningful new knowledge or understanding of the relationship between visitor use and impacts on resources or visitor experiences; and
- There have been changes to the desired conditions.

TINKER CLIFFS

Review of Direction and Knowledge

The Tinker Cliffs analysis area includes the Tinker Cliffs viewpoint, the Andy Layne Trail, the Lamberts Meadow Shelter, and Lamberts Meadow Campsite. The hike from the Andy Layne trailhead to Tinker Cliffs is about 3.8 miles. Andy Layne Trail intersects with the Appalachian National Scenic Trail about 3 miles from the trailhead. The Andy Layne parking lot is a gravel lot on private property, with an official capacity of 15 vehicles. There are several bridge crossings, and trail sections are steep and strenuous.

The Andy Layne trailhead parking lot is a gravel lot on a conservation easement held by the Appalachian Trail Conservancy. The parking area is used by Tinker Cliffs hikers, runners, and backpackers and North Mountain Trail hikers, runners, backpackers, and mountain bikers. The parking lot, although not striped, safely accommodates about 15 vehicles, but on peak weekends there are often more than 25 vehicles parked in a disorganized fashion with overflow onto grassy areas alongside the lot. Disorganized parking creates risks of cars getting stuck in ditches, and it is difficult for large vehicles to maneuver. There are no restrooms or trash facilities at the lot and there is poor visibility of the parking lot entrance from VA-779. Carrying out rescues of lost or injured hikers is difficult at Tinker Cliffs because vehicle access is limited, and the hike is strenuous. The bridges along the trail are at risk of washing out and require frequent repairs.

Resource concerns include user-created trails off Andy Layne Trail, user-created campsites along Tinker Cliffs, and a proliferation of user-created campsites in the floodplain along the creek between Lamberts Meadow Shelter and Lamberts Meadow Campsite. Sensitive vegetation communities and species in this area include the Central Appalachian Xeric Shale Woodland (chestnut oak/mixed herbs type), Southern Appalachian Virginia Pine Woodland, Appalachian-Northwest Chinquapin Oak-Red-cedar Alkaline Forest and Woodland, Cooper's milkvetch, and the northern long-eared bat (listed federally endangered under the Endangered Species Act). Copperhead snakes are known to nest in this area, especially near waterways.

Visitation is high during March through May and September through November with day-hikers and long-distance hikers. Managers estimate 80 people at one time at the Tinker Cliffs analysis area at peak times.

Limiting Attributes and Relevant Indicators

The Tinker Cliffs area's ability to accommodate use is constrained by the visitor experience for remote, uncrowded, and quiet recreational experiences. As use levels increase, opportunities for this experience are diminished. In addition, impacts on resources from user-created camping worsen as use levels increase. Finally, the presence of several easements in this area (along Andy Layne Trail and Lamberts Meadow shelter and campsite) constrain this area's ability to accommodate use.

The most relevant indicators that managers would monitor related to this limiting attribute are the number of encounters per hour on the Andy Layne Trail, the number of vehicles at one time in the Andy Layne Trailhead lot and access road, trail condition, and campsite impacts in the area.

Visitor Capacity and Implementation Strategies

Current use levels in the Tinker Cliffs analysis area are consistent with achieving and maintaining desired resource conditions and visitor experiences. Desired conditions for remote, uncrowded, and quiet recreational experiences along with resource impacts and nearby easements inform the amounts and types of use that this area can accommodate. Managers assessed current conditions relative to desired conditions and identified the opportunity to maintain use levels across activity types. To achieve and maintain desired conditions, the agencies have identified the Tinker Cliffs analysis area capacity as up to 80 people at one time for day use and up to 50 people per night.

The following management strategies and adaptive management strategies may require further compliance. Management strategies to implement visitor capacity include:

- Redirect unauthorized ridge campers to other locations, such as Lamberts Meadow.
- Identify a location to establish a group campsite between McAfee Knob and Tinker Cliffs.
- Design wayfinding signage for campsites and scenic viewpoints using Appalachian National Scenic Trail design specifications.
- Evaluate the facilities and determine facility development needs to meet desired conditions.
- Evaluate improvements to the Lamberts Meadow camping area, such as shifting camping to more sustainable sites away from the creek at the base of the valley walls. Preferred sites could be marked by paint blazes, camping posts, or small signs.
- Designate a camp host at Lamberts Meadow.

- On National Park Service lands, ensure adherence to National Park Service rules, regulations, and policies, including the Superintendent’s Compendium (NPS 2022a), Title 36 CFR *Parks, Forests, and Public Property* (CFR 2023), and other information.
- Create a campsite inventory, including all formal, informal, and user-created campsites.
- Promote and improve the Appalachian National Scenic Trail voluntary overnight registration system.

Adaptive management strategies to be implemented only as thresholds are approached or exceeded could include:

- Use criteria to identify and establish an appropriate set of campsites and apply site-selection criteria to problem areas to identify and concentrate future use on sites that are rated as resistant and that can promote solitude.
- Curtail campsite expansion and proliferation via designation of small sites in sloping terrain, including constructing side-hill campsites in areas that are previously inventoried and have been found suitable.
- Evaluate the feasibility of effects of hardening selected sites.
- Evaluate the role and use quotas, permits, hiker shuttles, and/or parking reservations to manage to capacities.
- Evaluate the implementation of advanced reservations for trail access.

McAFEE KNOB

Review of Direction and Knowledge

The McAfee Knob analysis area includes the McAfee Knob viewpoint, the Appalachian National Scenic Trail, McAfee Knob Fire Road, and Catawba Greenway Trail, the Devil’s Kitchen bouldering area, the Johns Spring Shelter, the Catawba Campsite, the Catawba Mountain Shelter, the Campbell Shelter, and the Pig Farm Campsite. The hike to the McAfee Knob is moderate to strenuous and is 8 to 10 miles roundtrip, depending on the origin. From the McAfee Knob parking lot, hikers start out on the Appalachian National Scenic Trail, and after 0.3 mile, have the option of continuing or taking the McAfee Knob Fire Road, which is an easier route. McAfee Knob may also be accessed from the relatively new Catawba Greenway, which departs from the Roanoke County Catawba Center and the Virginia Tech Catawba Sustainability Center and connects to the fire road.

Sensitive vegetation communities and associated plant species in this area include the Central Appalachian Xeric Shale Woodland (chestnut oak/mixed herbs), Southern Appalachian Virginia Pine Woodland, and the mountain sandwort (a perennial flower).

A number of issues occur in the McAfee Knob analysis area. The McAfee Knob parking lot is frequently congested and disorganized, as there are no marked spaces. Although Roanoke County has begun towing cars, illegal roadside parking on VA-311 still occurs during peak times. As a gravel lot, it frequently develops large hazardous potholes. Overcrowded and inefficient parking leads to little or no space for emergency vehicles, and vehicles may get blocked in during peak times. Inadequate trail signage and wayfinding are concerns, especially for first-time visitors. During peak times, more than 90 cars are parked in the lot with more than 25 overflowing onto VA-864/Old Catawba Road. If undertaking a hike towards McAfee Knob from the parking lot, hikers will cross a highway with a 55 miles-per-hour speed limit and limited visibility in both directions. A pedestrian bridge project led by the Virginia Department of Transportation is underway, which will resolve some concerns.

The campsites in this analysis area are heavily used, and there are user-related impacts on resources. During peak time, there is a proliferation of user-created campsites (particularly near the summit and the existing shelters and campsites), unauthorized fire rings, vegetation damage, and erosion. High visitation has contributed to worn trail tread, trail widening, and user-created trails. Sunrise-watching at McAfee Knob is popular, and use levels tend to peak around 8 or 9 am on weekends with up to 100 people at the viewpoint area. Although not quite as popular as sunrise, McAfee Knob sees sunset-viewing peak levels between approximately 4 and 9 pm. Crowding at peak levels may lead to unsafe conditions, such as the risk of falling off a ledge.

In 2019, the trail counter recorded visitation peaks from April through May and October through November with weekly peaks of more than 1,500 visitors per week. On peak days, the counter recorded more than 600 visitors. Managers estimate 420 people at one time in the McAfee Knob analysis area during peak times. Managers estimate peak overnight use at 105 people per night. This number was derived from the following overnight use levels: 20 people at Johns Spring Shelter, 35 people at Catawba Mountain Shelter and Campsite, and 50 people at Campbell Shelter/Pig Farm Campsite.

Limiting Attributes and Relevant Indicators

The interdisciplinary team identified a limiting attribute for day use and a limiting attribute for overnight use at McAfee Knob. For day use, the primary attribute that constrains the McAfee Knob area's ability to accommodate use is a pleasant and safe visitor experience. As use levels increase at the overlook, the risk of a visitor falling or slipping off a ledge increases. During peak times, safety concerns in the parking lot are exacerbated.

For overnight use, camping-related resource impacts are the limiting attribute. These impacts include vegetation trampling, bare ground, and erosion impacts that worsen as overnight use increases. The visitor experience for solitude and natural soundscapes is another limiting attribute, along with reliable water sources and waste-management issues.

The most relevant indicator managers would monitor related to these limiting attributes is people per viewpoint at the overlook, the number of encounters with other individuals per hour at the Appalachian National Scenic Trail/McAfee Knob Fire Road intersection, the number of vehicles at one time in the VA-311 parking lot, trail conditions, and campsite impacts in the area.

Visitor Capacity and Implementation Strategies

Use levels in the McAfee Knob analysis area, as observed during peak use days in 2019, are consistent with achieving and maintaining desired resource conditions and visitor experiences for day and overnight use. Pleasant and safe visitor experiences for day use and camping-related resource impacts for overnight use inform the amounts and types of use this area can accommodate. Managers assessed current conditions relative to desired conditions and identified the opportunity to maintain use levels across activity types and uses. To achieve and maintain desired conditions, the agencies have identified the McAfee Knob analysis area capacity as up to 420 people at one time for day use and up to 105 people per night. Based on the current use patterns, this should result in about 600 people per day on this section of trail.

The following management strategies and adaptive management strategies may require further compliance. Management strategies to implement visitor capacity include:

- Establish two group-camping sites near McAfee Knob. Group campsites should be far enough (out of sight and sound) from shelters and other campsites, and large enough to house more than one group. Group sites could be located between Tinker Cliffs and McAfee Knob and along the McAfee Knob Fire Road.
- Redesign Campbell Shelter and Pig Farm campsites using clusters of tent pads for small groups, such as section-hikers and thru-hikers.
- Inform hikers about the McAfee Knob Fire Road loop option instead of the Appalachian National Scenic Trail and communicate that the fire road loop route is a worthwhile alternative to staying on the Appalachian National Scenic Trail.
- Determine the number and location of user-created trails between the parking lot and McAfee Knob and identify new trail alignments after bridge work is complete. Complete environmental compliance on new trails and implement new trail alignments. Decommission and revegetate unused trails.
- Inform the public of Catawba Greenway as an alternative hike and parking option for McAfee Knob.
- Provide an accessible route from the parking area to the Appalachian National Scenic Trail.
- Use a voluntary overnight registration system for group sites.
- Implement a camp host system during peak seasons.
- Collaborate with stakeholders and landowners to advance communications and projects that improve visitor experience.
- Evaluate the role and use of transportation systems to manage to capacities. The mix of shuttle delivery and private vehicle delivery should be managed to ensure desired conditions are met and visitor capacities are not exceeded.

Adaptive management strategies to be implemented only as thresholds are approached or exceeded could include:

- Use criteria to identify and establish an appropriate set of campsites and apply site-selection criteria regarding problem areas to identify and concentrate future use on sites rated as resistant to impacts and that can promote solitude.
- Curtail campsite expansion and proliferation via designation of small sites in sloping terrain, such as constructing side-hill campsites in areas that are previously inventoried and found suitable.
- Evaluate the feasibility of effects of hardening selected sites; where determined appropriate, harden existing sites.

DRAGON'S TOOTH

Review of Direction and Knowledge

The Dragon's Tooth analysis area includes the Dragon's Tooth viewpoint, Dragon's Tooth Trail, the Boy Scout Trail, and areas where camping is popular (Lost Spectacles Gap, and areas near the junction of the Boy Scout and Dragon's Tooth trails). Dragon's Tooth is a spectacular rock formation on Cove Mountain. From the Dragon's Tooth trailhead parking lot off VA-311, it is a 2.4-mile hike to Dragon's Tooth rock. The hike is a gradual uphill climb for the first 1.7 miles until it joins the Appalachian National Scenic Trail and begins to climb steeply with some rock scrambling near the top.

Desired conditions include opportunities for challenging and strenuous hikes at Dragon's Tooth and the sense of accomplishment that comes with hiking this trail section, minimal user-created trails and signs of bare soil, unobstructed views, and clearly designated parking and minimized roadside parking.

The Dragon's Tooth parking lot is frequently congested, partly because it is a gravel lot without marked spaces. Unauthorized roadway parking occurs at peak times. The steep, narrow gravel entry road develops deep potholes presenting a hazard to vehicles and pedestrians. There is somewhat poor visibility entering and exiting the parking lot from the high-speed VA-311 highway, which has no designated turn lanes. Rescuing lost or injured hikers is difficult in this area because of steep and challenging terrain and few access points. High visitation volumes and densities along certain trail sections have led to trail widening and erosion in some areas. There is also a proliferation of user-created trails along the path from the parking lot to the overlook. User-created campsites and visitors who do not observe Leave No Trace practices cause negative resource impacts, especially close to the parking lot. Managers estimate 200 people at one time in the Dragon's Tooth analysis area during peak times.

Limiting Attributes and Relevant Indicators

The trail section at Dragon's Tooth is mainly along a narrow and steep ridge with a limited amount of ground space for visitors to spread out. There is also a limited amount of space at the overlook because of steep topography. The ability for visitors to move safely along the trail and to have a quality hiking experience, with high levels of use that exceed capacity, is limited by the topography of this trail area. Capacity is limited by the topography of the area, which constrains the Dragon's Tooth area's ability to accommodate high levels of use. Limiting attributes based on desired conditions for the area include user-created campsite impacts, crowding leading to unsafe conditions climbing the Dragon's Tooth rock, and a rare plant species, piratebush, around the parking area. The most relevant indicators that managers would monitor related to limiting attributes are people per viewpoint at the Dragon's Tooth overlook, number of encounters per hour at the Appalachian National Scenic Trail/Dragon's Tooth Trail (blue-blaze) intersection (Lost Spectacles Gap), vehicles at one time in the Dragon's Tooth lot and access road, trail conditions, and campsite impacts in the area.

Visitor Capacity and Implementation Strategies

Use levels in this analysis area are consistent with achieving and maintaining desired resource conditions and visitor experiences. The steep and narrow topography in this area, resource impacts, safety concerns, and rare plant populations inform the amounts and types of use that this area can accommodate. Managers assessed current conditions relative to desired conditions and identified the opportunity to maintain use levels across activity types. To achieve and maintain desired conditions, the agencies have identified the Dragon's Tooth analysis area capacity as up to 200 people at one time.

The following management strategies and adaptive management strategies may require further compliance. Management strategies to implement visitor capacity include:

- Short term (next 5 years)
 - Discourage camping at Dragon's Tooth summit area.
 - Develop a safe crossing plan with the Virginia Department of Transportation to implement safety measures, including safe ingress and egress of the parking lot.
 - Restore dispersed camping impacts in unsustainable locations to natural conditions.
 - Inform the public of dispersed camping areas.
- Long term (beyond 5 years)
 - Implement sustainable camping best management practices: Work toward all campsites and shelters aligning with and adhering to US Forest Service management policies.
 - Ensure that all campsites and shelters align with National Park Service and US Forest Service policies on food storage.

Adaptive management strategies to be implemented only as thresholds are approached or exceeded could include:

- Evaluate potential closures of campsite locations and consider relocating dispersed camping opportunities.

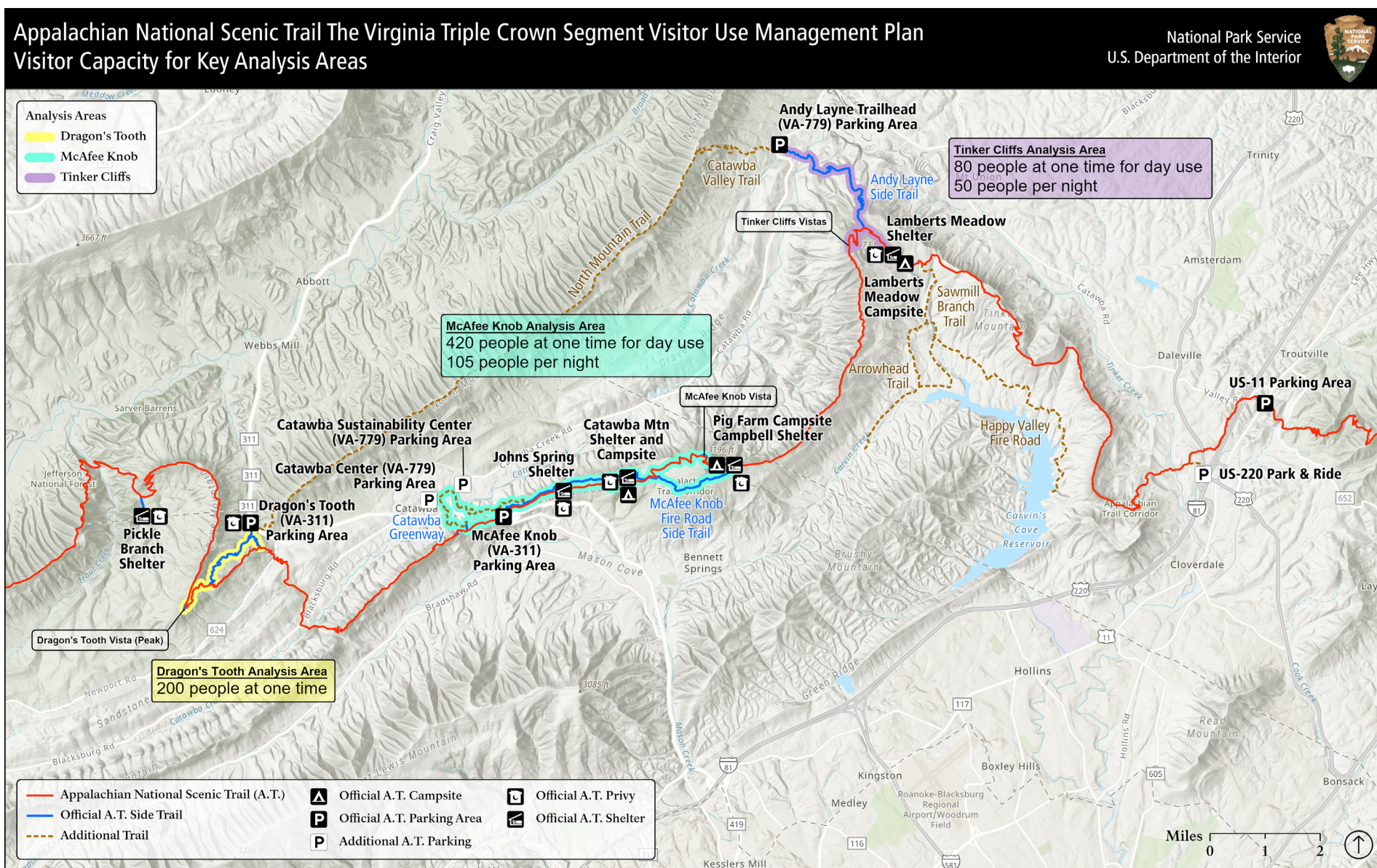
OTHER LOCATIONS

Table 2. Assessment of Appropriate Amounts and Types of Use for Other Virginia's Triple Crown Segment Locations

Analysis Area	Review of Direction and Knowledge	Limiting Attribute(s) (and Indicator)	Visitor Capacity (and Strategies)
Virginia State Route 620 (VA-620) to Dragon's Tooth	<p>This area has lower use levels than most other sections of the Virginia Triple Crown segment area. Peak use is during the thru-hiker season in late April to early June. Some locals know this as an alternate route to day-hike to Dragon's Tooth, so there are occasionally day-hikers.</p> <p>Parking to access this area is off a narrow, winding road near private property. When the small parking area (three to four spaces) fills, visitors frequently park in unauthorized areas, causing safety concerns or blocking private driveways. There is no cellphone service in Millers Cove (a deep ravine) in this area, which leads to some hikers becoming lost. The lack of cellphone service and challenging access also creates issues for emergency response on the south side of Cove Mountain. Managers estimate peak levels during thru-hiker season (April through June) at 50 people per day.</p>	Steep, narrow topography and safety concerns related to lack of cellphone service/challenging access and unendorsed parking on VA-620.	<p>Maintain visitor use levels per day, with the opportunity to increase use levels during times of the year outside of the thru-hiker season. The agencies have identified a capacity of 50 people per day.</p> <p>Management strategies:</p> <ul style="list-style-type: none"> – Improve and increase outreach and education of this area, including safety risks and limited parking at VA-620. – Remove the parking icon from the "camping restrictions" map posted on the kiosks.
Virginia State Route 624 (VA-624) to VA-311	<p>This trail section is primarily used by backpackers, whether long-distance trail hikers or weekend backpackers of the Virginia Triple Crown segment. An overlook on Sawtooth Ridge one mile south of the VA-311 parking area is an easy, rewarding day hike that is gradually becoming more well-known but is not as popular as the Virginia Triple Crown segment destinations. It may become more popular as visitors start using the new Catawba Greenway. Parking is shared with visitors accessing McAfee Knob, making access difficult.</p> <p>There are no designated campsites in this area because of the extremely narrow National Park Service landownership corridor, leading to some user-created sites (such as by the creek between Newport Road and Blacksburg Road and a flat area a quarter mile south of the VA-311 parking lot).</p> <p>Visitor use levels in this area peak during the through-hiker season, with up to 75 people per day.</p>	<p>Narrow National Park Service landownership corridor limits overnight use.</p> <p>Day-use limiting attributes associated with encounter rates that facilitate high-quality hiking experiences.</p>	<p>The agencies have identified a capacity of 95 people per day, which is an increase from current peak levels of 75 people per day.</p> <p>Management strategies:</p> <ul style="list-style-type: none"> – Encourage day-hikers to park at Virginia Tech Catawba Sustainability Center and/or Roanoke County Catawba Center. – Continue to monitor and remove illegal campsites and fire rings. – Increase efforts to notify backpackers about camping restrictions. – Evaluate designating campsites.

Analysis Area	Review of Direction and Knowledge	Limiting Attribute(s) (and Indicator)	Visitor Capacity (and Strategies)
Lamberts Meadow to VA-652	<p>This trail section is used primarily by backpackers, long-distance day-hikers, and trail runners. There are user-created campsites in this area, as a result of backpackers and thru-hikers (Tinker Ridge and near US-220/US Route 11 [US-11]) and unhoused people, hitchhikers, and other non-recreational campers (sites close to the highway along Tinker Creek near the train tracks). Wildfires have been started on Tinker Ridge, possibly because of illegal campfires. Trash and refuse are often left behind by non-recreational campers who often camp for extended periods in this area. Lamberts Meadow Shelter and Campsite were closed for several months until Roanoke Appalachian Trail Club could purchase and install two bear boxes. Increased law enforcement in recent years has attempted to improve turnover, but there are many obvious, large campsites.</p> <p>The Appalachian Trail Conservancy and Botetourt County have collaborated on plans for a new parking lot near the Appalachian National Scenic Trail and US-220. A new, large apartment complex directly adjacent to the trail in Daleville will likely lead to increased use in this area. The Roanoke Greenway system has plans to link with the Appalachian National Scenic Trail at Tinker Mountain and the City of Roanoke plans to enhance the already large trail system in Carvins Cove.</p> <p>Managers estimate peak visitor use at 100 people per day during thru-hiker season (April through May) and on weekends in the spring and fall.</p>	The narrow National Park Service landownership corridor, safety concerns at the US-220 crossing and the I-81 underpass via VA-779, and a large bear population in this area.	<p>The agencies have identified a capacity of 125 people per day, which is an increase from current peak levels of 100 people per day.</p> <p>Management strategies:</p> <ul style="list-style-type: none"> – Improve and increase outreach and education of this area as an alternate location beside the three major destinations of the Virginia Triple Crown segment. – Continue to promote Hay Rock as an alternate hike. – Move forward with a new US-220 parking lot and continue law enforcement and Ridgerunner presence in the Daleville/Troutville corridor. – Evaluate designating campsites.

Figure 7. Visitor Capacity for Key Analysis Areas



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Chapter 6

Implementation Plan and Contributors



Divider photo: Hikers at Dragon's Tooth (copyright: Diana Christopulos, Roanoke Appalachian Trail Club)

CHAPTER 6. IMPLEMENTATION PLAN AND CONTRIBUTORS

IMPLEMENTATION PLAN

This Visitor Use Management Plan reflects the desire of the Appalachian National Scenic Trail cooperative management partners to proactively manage for visitor use. Through implementation, the partners will strive to achieve and maintain the identified desired conditions for visitor experiences and resources. With ongoing monitoring, the partners will continue to adaptively manage for high-quality visitor experiences and protection of the natural and cultural resources found in the Virginia Triple Crown segment of the Appalachian National Scenic Trail.

Partnership

The partners involved in this effort are characterized by passion, team spirit, and a desire to see the Virginia Triple Crown segment continue to be a place for challenge, reflection, and discovery. The strategies, monitoring, and adaptive management efforts identified in this plan were developed through discussion among the plan contributors. Implementation of these efforts will require coordination among the partner organizations. Additional organizations will likely be invited to participate as specific strategies are implemented.

Timing

Projects within the plan are intended to be implemented over the next 15 to 20 years. As with any long-range plan, certainty decreases over time, and opportunities and challenges may arise with implementation. On an annual basis, projects within this plan will be considered for incorporation into the partner organizations' annual work plans. The partners will monitor accomplishments annually and may adapt, as necessary.

Funding

Funding for the strategies within this plan will come from a variety of sources. Some strategies may require multiple funding sources. Due to the varied nature of funding, implementation is contingent upon identifying successful fund sources. Strategies in this plan are described at a conceptual level and the feasibility of individual strategies will be studied further before and during implementation.

In recent years, various partners have funded key projects related to managing visitor use. The Virginia Department of Transportation is funding the McAfee Knob Trailhead pedestrian bridge on state land that abuts the National Park Service parking lot on the south side of VA-311 and the National Park Service trailhead on the north side. This project is currently estimated at \$3.43 million, and construction is planned for 2024-2025. Another example is the shuttle service to McAfee Knob trailhead, provided to reduce trailhead parking demand. The National Park Service funded a shuttle service feasibility study. With the support of partner organizations and local stakeholders, Roanoke County requested and was awarded fiscal year 2023–2024 demonstration project funding from the Virginia Department of Rail and Public Transportation for a McAfee Knob Trailhead shuttle from the I-81 Exit 140 park-and-ride. Roanoke County offsets any additional operating cost of the shuttle service that exceeds the grant funding awarded from Virginia Department of Rail and Public Transportation.

Community Engagement

Public involvement was critical to the success of this planning effort and will continue after completion of the plan. When appropriate, the partners will seek additional feedback from the community as specific strategies are implemented.

Environmental Compliance and Consultation

The management strategies identified in this plan will be accomplished over the years as the plan is implemented and will be updated and adjusted as needed during the implementation phase. Individual actions directed by this plan will be evaluated for their compliance needs at a time when those projects are ready for implementation. It will be up to individual land management agencies to assess the compliance needed to implement strategies.

Implementation of some strategies within this plan will be dependent on consultation with Tribes and agency partners as required by NEPA, NHPA, and Endangered Species Act. For example, during review of the draft plan, the Virginia Department of Conservation and Recreation, Division of Natural Heritage Resources noted that significant communities and rare plants exist within the project area. The program recommended continued coordination with the Virginia Department of Wildlife Resources, US Fish and Wildlife Service, and the Virginia Department of Conservation and Recreation as the plan is implemented.

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Divider photograph: Hiker resting at Tinker Cliffs (Photograph credit: Robert Aberreg, Roanoke Appalachian Trail Club)

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Appendix A: Resolutions



Divider photograph: McAfee Knob in winter (Photograph credit: B. Wilson, National Park Service)

APPENDIX A. RESOLUTIONS

INTRODUCTION

Local government resolutions related to the Virginia Triple Crown Visitor Use Management Plan will be attached in this appendix.



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