A Strategic Plan for Managing Backcountry Recreation

In Great Smoky mountains National Park

GREAT SMOKY MOUNTAINS NATIONAL PARK
107 PARK HEADQUARTERS ROAD
GATLINBURG, TENNESSEE 37738

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EXECUTIVE SUMMARY

For several years, many individuals have been concerned about the conditions of trails and backcountry in Great Smoky Mountains National Park, the most heavily visited national park in the United States. People who work for the Park or who enjoy its many wonders have been and remain profoundly worried about the effects of so many people pursuing activities from hiking to horse riding, from camping to day-visits. This document describes future actions that the National Park Service will take to improve the Park's trails and backcountry.

The Park and its trails are of international caliber and a source of local and national pride. Several trails follow Native American routes that date from before Europeans first encountered the region, many others evolved from paths, woodsroads, or railroad grades established by early settlers. In addition, a remarkable period of trail building occurred during the Park's earliest years, thanks to the efforts of the Civilian Conservation Corps (CCC). That effort converted many of the routes that predate the Park into a system of recreational trails providing access to the Park's interior. Techniques applied by CCC workers in the Park were documented and applied throughout the nation during other CCC era projects. Today, just over 800 miles of trails comprise the Park's formal trail system, along with 18 shelters, 83 designated backcountry camping areas, and five vehicle-accessible horse camps.

Unfortunately, the condition of the Park's trails and backcountry is deteriorating. Reasons for the declining condition are complex, but they are clearly related to the type and amount of activities occurring, the behavior of those who visit the backcountry, and the lack of sufficient means to maintain the trails or repair problems. Specific problems were documented during recent assessments of trails and camping areas (Marion 1994 and forthcoming). A faculty member of Virginia Tech's Department of Forestry, Dr. Jeffrey L. Marion, completed the assessments at the Park's request. The Park sought the assessments because it needed objective information about conditions along the Park's trails and at its backcountry camping areas. This work was completed under a cooperative agreement with the National Park Service. The assessments document that the trails suffer from extensive amounts of soil erosion, wet or muddy soil, water running freely along trail treads, and a lack of effective drainages. And, they document that many campsites are large, barren of vegetation, and close to other campsites. These conditions will continue and deteriorate unless changes are made.

The project that culminated with this document began in September, 1994. The National Park Service sought the assistance of a Research Associate from Virginia Tech's Department of Forestry, Mr. Peter B. Williams, to identify options for improving the situation found along backcountry trails and at backcountry camping areas, again under a cooperative agreement. The project applied methods that emphasized facilitated discussion between Park staff members, local

horse riders, and local hikers. In addition, national conservation, hiking, and horse riding organizations were contacted, along with Park concessionaires who operate horse riding stables. The purpose of these discussions was to expand the effort's understanding of the current situation by exposing these individuals and groups to the known situation and asking them for their ideas about other related issues or concerns. Examples of the information gathered during this effort most often pertained to the Park's backcountry management structure, project funding, trail construction and maintenance, volunteerism, and interactions between visitors who hike and those who ride horses.

In September, 1995, Virginia Tech submitted its report containing recommendations for the National Park Service's consideration. Following their review, the current document was produced. It contains actions that the National Park Service believes will improve the situation along the Park's trails and at camping areas without compromising opportunities for enjoyment.

Several actions detailed in this document are considered most essential:

- To improve administration of the backcountry and to increase public access to relevent Park decisions, the Park will create a **Backcountry Stewardship Coordinator** position.

- To better maintain and repair backcountry trails and camping areas, the Park will establish and implement an **Integrated and Comprehensive Backcountry and Trails Program** beginning with a continued increase in cooperative trail projects involving the Park's trail crew and volunteers. Eventually, the program will include ***expanded professional trail crew efforts,*** expanded programs for supervised and unsupervised ***volunteer work,*** ***Backcountry Hosts,*** expansion of the Park's current ***Adopt-A-Trail*** program, and an ***Adopt-A-Campsite*** program.

- To remain aware of conditions along backcountry trails and at camping areas, the Park will begin a long-term **Monitoring Program** that builds upon the work of Virginia Tech.

- To promote more responsible enjoyment of the backcountry, the Park will expand upon existing **Information and Education** materials that emphasize Leave-No-Trace ideals.

- To ensure a consistent direction in the Park's backcountry efforts, the Park will adhere to a **Vision Statement, Priorities, Goals, and Objectives** for backcountry management.

- To improve the trails and camping areas, the Park will take **specific actions** that include ***reconstruction, relocation, redesignation,*** or ***eventual closure*** of trails in the worst conditions, following the timeline established in this document.

Successful implementation of the ambitious actions described in this document requires much hard work by those who care about and for the Park. Many people must be involved because more drastic steps are necessary if the actions fail. It can be done, but it will take time, patience, and enthusiasm. Although the work that went into this project and document was intensive, the really major work has yet to be done.

Many people and organizations assisted this project. Appreciation is extended to the National Park Service Mid-Atlantic and Southeast Regional Offices and the Friends of Great Smoky Mountains National Park for providing funding. Additional assistance in the form of photocopying was provided by the North Carolina Department of Natural Resources and Community Development, Division of Parks and Recreation, Asheville office. Many of the most original ideas, however, were provided by the employees of Great Smoky Mountains National Park and members of numerous -local riding and hiking organizations.

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INTRODUCTION

This document describes future actions that the National Park Service will take to improve the trails and backcountry of Great Smoky Mountains National Park. For the document's purposes, backcountry is defined as *largely natural, undeveloped, remote, and often protected areas or wildlands where people visit, but do not remain, and where their activities do not impair the free-play of natural processes and do not require motorized means of transportation.*

The efforts that led to this document began because of a troublingly unbalanced equation: a fixed, perhaps even shrinking set of available resources is insufficient to address overwhelming problems along the Park's trails and in its backcountry. Those efforts also began with a simple question: **how can we change that equation in a way that might work?**

Reaching an answer to that question required understanding the existing and potential resources along with the scale and scope of the problems so as to select workable options. If we are to have any realistic hope of balancing the troubling equation, each option chosen must either expand the resources or reduce the problems.

Changing the equation needed the ideas of many people ranging from those who work for the National Park Service to those who simply care about national parks and backcountry recreation. To bring as many of these people together as possible and to spark a great willingness to share ideas, the effort that led to this document applied a strategic planning approach together with collaborative means. Such an approach allowed those who participated to focus on three sets of guiding questions (Figure 1). In addition to having guided discussion, these questions serve as this document's structure.

I) **What is the current situation?**
what are the physical, biological, and **social conditions? what are the National Park Service's responsibilities and capabilities? What are the issues and concerns of those who enjoy or help care for the Park?**

II) **'What is the current. direction?**
Is the current situation acceptable? Why? Why not? To whom? If nothing changes, what **likely will result? Where do we seem headed?**

III) **How do we go Where we want?**
Where do we want to -go? Are we headed there? what resources are available to take us **there? can** those **resources be** expanded?

Figure 1 Three Strategic Questions.

Compared with many National Park Service planning efforts, the effort that led to this document was non-traditional because it gathered some of the most essential information throughout the planning process, as opposed to before it. Some of the information gathered

included general responses of interested individuals and organizations to the very process itself and specific ideas for fulfilling Park administration mandates. Although easily overlooked, there is a distinct difference between a recommendation and the guidelines that such a recommendation must follow. When participants in a planning process are willing to learn about and work within Park administration guidelines, then they can contribute many ideas that might be overlooked by others, especially ideas and information about how a possible recommendation might affect them. By bringing more people together who are willing to understand and respect existing guidelines, a broader selection of options becomes available.

Many Park employees offered their ideas about what might or might not work, as did many other people who hike, ride horses, or otherwise care about the Park's character and contents. Together, each of these individuals sought to understand current backcountry conditions in the Park, which of those conditions is a problem, to whom it is a problem, and why it is a problem. Then, they offered ideas for workable solutions. They did not negotiate a compromise from preliminary positions. Instead and more constructively, they learned from each other and suggested ways to address various interests and concerns in a manner that would benefit all those throughout the nation who care about the Park. As a result, they changed that original equation by suggesting ways of expanding the resources available to repair or avoid backcountry problems. They discussed how to promote greater consideration toward and care of the backcountry, in part through educational brochures and informational contacts. They also suggested ways volunteers might help repair or maintain the trails-- seasonal trail maintenance, integration of volunteer efforts with current or expanded NPS programs, and more. And, they offered ideas for how the Park's efforts might expand to facilitate more volunteerism, tackle the Park's most technically demanding trail work, and provide the most suitable information to backcountry visitors.

Whether the actions will mitigate existing and future problems remains to be seen. Ideally, the increase in resources together with a decrease in problems will balance the equation and lead to improved, sustainable conditions in the backcountry. That is our goal; that is our direction.

The Project's Process

This document is the result of a cooperative process between the National Park Service, Virginia Tech, and many people who ride horses, hike, or otherwise care about Great Smoky Mountains National Park and its trails. Throughout this process, the National Park Service has retained all decision authority, as required. The extensive, initial phases of this project and its participatory approach was not intended to make decisions, but to offer Park management a set of recommendations that many people, including Park staff members, agree should be workable. The only viable way to gauge whether an idea is workable without actually implementing an action is to ask people for their thoughts.

Following the initial phase, Peter Williams, a consultant from Virginia Tech who facilitated that phase, compiled a draft report. That report presented the issues and concerns related to the Park's backcountry and trails, along with the ideas and recommendations offered by many individuals for addressing those issues and concerns and improving the Park's trails. The National Park Service reviewed that report and adapted it to become this document.

Of those people participating in this project, no one has consented to its final suggestions or offered any commitment other than broad support for the project's general, participatory approach. Also, no one claimed to speak for or represent anyone else unless that participant was an officer of a club or organization and was authorized to speak for its members. Meetings during this project occurred at the request of an individual or organization. Every meeting's purpose was identical: provide or gather information about 1) the current situation and its apparent trends, 2) the significance of that situation or its trends, and 3) what might be done to ensure that the Park's character and contents remain for future generations. By reviewing existing scientifically gathered information, learning about NPS policies and mandates, and then sharing ideas, participants came to understand more about the situation and about perspectives other than their own. They also became better prepared to offer constructive suggestions.

The participation that occurred during this effort would not substitute for the strictest requirements of the National Environmental Policy Act (NEPA) (U.S. *Code*, volume 42, section 4321 and following). Still, the participation has been essential because it allowed the effort that led to this document to identify more completely the issues and concerns related to the Park's backcountry and trails. It also has expanded the number of ideas available for addressing those issues. Early and continuous participation was imperative for workable recommendations because it allowed people to understand the project's intentions, attracted their ideas, and avoided much of the occasionally reflexive opposition that an effort such as this can attract. This project would not have worked 'without the understanding, ideas, and general support that is received.

The Document's Structure

This document begins by reviewing the current situation. First and foremost, it discusses existing mandates that the National Park Service and its employees must follow. Actions described in this document must stay within the confines of those mandates if they are to be workable. The review then explains what is known about the Park's trails and backcountry camping areas. It also presents issues and concerns raised by those who participated in this project. Workable recommendations must address the Park's situation, including the concerns of those who care about it.

The second section evaluates the current situation's direction. There, one will find discussion about the effects of various activities, how those effects differ, likely trends in those effects, and what ideas are available to address them. That section anticipates, with the best information available, future backcountry conditions in the Park.

The document's third section contains its recommendations. Together, these proposals provide an answer to the third question: how do we go where we want? One must look at that section as a whole. A single proposal, taken out of context, may seem disturbing at first. By looking at all the recommendations together, however, one should see that they provide a means to improve the trail system's condition while also increasing the Park's capacity to provide visitors with opportunities for its enjoyment.

In that third section, one finds materials delineating the vision behind this document's recommendations and, when possible, specific and measurable items recommended for gauging

success. The document's heart also is in that third portion: recommended modifications to the system and to how the system is maintained and managed.

Assumptions about Implementing the Recommendations

Recommendations require one understand the reasoning behind them, the importance of success, and the consequences of failure. Congress has given the National Park Service a challenging mandate for administering national parks. The American people's expectations, represented in that mandate, are high and the National Park Service must comply with their wishes. Later sections of this document discuss the mandate in greater depth. At this point, however, it is important to note that, because of limitations on the fiscal resources provided by Congress, fulfillment of that mandate is no longer possible without major changes. Those changes can be drastic, like regulating types or amounts of activities, or they can be constructive, like providing more opportunities for individuals and organizations to help fix the problems.

This document does not assume the National Park Service should provide every means for fulfilling the recommendations. Unless many more people, especially those who enjoy the Park's trails and backcountry, are willing to help, the National Park Service must return to the original equation, the one with less participation and assistance from outside groups. If that point is reached, Park employees will be forced to make painfully difficult decisions so that they can fulfill their Congressional mandate and comply with the wishes of the American people.

Likewise, Park employees must fulfill their part of our joint responsibility for successful implementation. We must not expect other organizations or individuals to accept anything less. The Park unquestionably needs assistance from those who enjoy it. Without help, tough decisions must be made. Nevertheless, if the National Park Service wants the assistance of partnerships, we must also treat as partners those who are willing to join our stewardship efforts.

The overriding goal for this project is that its recommendations be workable. Because of the willingness of many people to offer their time and thoughts, the proposals that follow are workable and possible, provided each person, group, and organization who cares about the Park is willing to continue or begin offering ideas and assistance. There are, however, no guarantees, only challenges. Everyone who helped in this effort must continue to work together to see that it ultimately succeeds. We must jointly increase the number of people involved in repair and maintenance, and educate as many people as possible to leave no trace of their visit. More than anything else, the Park will benefit from visitors who act responsibly towards it and other visitors, and who act as stewards for future visitors. The children and grandchildren of today's visitors need people who are willing to support and participate in efforts to care for the Park's trails, shelters, and campsites.

HISTORIC ORIGINS OF THE CURRENT TRAIL SYSTEM

An understanding of the Park's current backcountry situation is often helped by understanding the history of its trail system. Great Smoky Mountains National Park's current system of trails is extensive and, in many ways, it is one of the Park's most distinctive features. The system has evolved over many years and, in some cases, perhaps even centuries. What follows is a brief description of that evolution. The description likely will raise as many questions as it answers. It should not be considered comprehensive. Although such a description can help place the current trail system into an historical context, the absence of material that is both existing and concise presents an awkward situation because an extensive research effort needed to examine the trail system's history is beyond the capacity of this project. It is hoped that the following material provides a start for a more focused effort to uncover the trail system's historic origins.

Earliest Routes

Much of the region's history prior to the last 300 years is undocumented, even within Cherokee mythology or oral history (Mooney 1982). This makes it difficult to determine the earliest beginnings of the current trail system.

Anecdotal evidence suggests that original portions of these routes may have been made by American bison. Certainly, there were significant herds in this area, as mentioned in numerous journals and correspondence from that period (Ramsey 1967). It is possible that great herds moving across the mountains followed the same route year after year. Over generations the herds, seeking to avoid the narrow gorges that rivers cut through the mountains, would have found the best routes for them to cross the difficult terrain of the Smokies. Their routes might have appeared as moderately wide trails with intermediate grades similar to those of wagon roads. Native Americans could have followed these same routes to hunt, access the mountainous interior of the Smokies, or trade with other tribes.

By the late 1760's, when Daniel Boone and other early settlers of European descent first pushed west of the Appalachians, the region apparently had few human settlements, although their journals suggest a previous and dense population (Ramsey 1967). Evidently, the Choctaws, Chickasaws, and Cherokees, to the south, and member tribes of the Miami Confederacy, to the north, had reached an agreement that the region north of the Little Tennessee river and south of the Ohio river would serve for hunting and warfare, but not for settlement. If correct, these writers were describing an area approximately that of contemporary Tennessee and Kentucky. One journal author from that period wrote,

> That part of these two states embraced between the boundaries mentioned [Tennessee and Kentucky], was one great park, where the skill of the uncivilized hunter was practiced, and a central theater, upon which the desperate conflicts of savage warriors and bloody rivals were perpetuated (Ramsey 1967, p.74).

A two-hundred-and-thirty-year-old description of this region as ***one great park*** is no less than remarkable.

Native American Trails and Routes

When the Park was established in 1934, at least eight major routes known to have been used by Native Americans existed (Wilbum, Grossman, and Stupka 1938; Wilbum 1940a, 1940b). Several of the trails or routes are unconfirmed and others may have existed as well. By the time of the Park's establishment, European settlers had converted most portions of these routes to roads. Other sections had become abandoned.

Today, several sections of the Park's formal trail system lie in the same location as these routes. In other places, either existing paved roads or abandoned woods-roads are now found. Names applied by Wilbum and others (1938) and by Wilbum (1940b) are, from east to west, Cataloochee Indian Trail, Balsam Mountain Indian Trail, Indian Gap Indian Trail, Bote Mountain Indian Trail, Tuckaleechee and Southeastern Indian Trail, and Ekaneetlee Indian Trail. They provide no names for the trails they believe may have existed through Dalton Gap and Deals Gap in the western end of the Park.

Appendix A of this document contains expanded descriptions of each route. Research for this effort uncovered no reference to names applied by Cherokee or other tribes, so Wilbum's nomenclature is used.

Settlement and Timber Era

From the 1830's until the 1930's, human activity within what is now the Park expanded greatly as European settlers pushed into the area from the east and west. They were drawn by what they saw first as a bounty of land and then as a harvest of timber, as well as the beauty of remoteness. Shadows of this era remain along with more obvious remnants. Examples include scattered remains of former homesites and the often still tended cemeteries throughout the Park that serve as a reminder of this era to the living descendants of those who experienced it.

Today, the Park's road and trail system retains many of the routes that first appeared during this era. Roads ran into nearly all the major watersheds and trails ran from there (Thompson 1933). Several of the earlier trails and routes were adapted to new purposes. For example, Cataloochee Indian Trail became Cataloochee Road (Wilbum 1940a) and Bote Mountain Indian Trail became Bote Mountain Road, constructed with the assistance of Cherokee tribe members (NHA 1994). Indian Gap Indian Trail became a toll road and served as a primary route across the mountains (Wilbum 1940b).

Most routes from this era served practical purposes. Very few served a recreational need because the greater needs were utilitarian. Routes connected homes or communities, facilitated trading, or allowed access to timber. This project's research could not determine how many trails served for recreation or when trails with such a purpose were first constructed. Evidently, however, several trails to waterfalls or summits predate the Park's establishment, as shown on maps from the period (Thompson 1933).

Because of the large number-of trails, roads, and railroads constructed during this period, detailed documentation of specific routes will not occur in this document. Instead, most significant for the purposes of this project are those roads, railroads, or trails no longer a part of the trail system. Some of those might be reopened, yet, to replace sections of trail that are now in damaged condition. Many of the routes are spurs, meaning that they do not connect with another route. Enlisting some of these routes as part of a reconfigured trail system may require new sections of trail. Specific discussion of these routes is found in the section dealing with recommended modifications to the trail system, rather than here in the history section.

Civilian Conservation Corps and the National Park Service

In 1926, the U.S. Congress endorsed a Great Smoky Mountains National Park (Runte 1987). The Congress authorized the Secretary of the Interior to accept as much as 704,000 acres from either the States of Tennessee or North Carolina or from private donors. The estimated cost was $1 0,000,000.

The effort to establish what became Great Smoky Mountains National Park first began in 1894 with a petition by the North Carolina Press Association requesting Congress for a national park in their state. By 1899, the Appalachian National Park Association had organized in Asheville, NC, for the purpose of pursuing establishment of a national park in the region, possibly in North Carolina, Tennessee, or Virginia. Unlike many parks established about the same time in portions of the western U.S., such an effort in the eastern U.S. meant repurchasing lands from private owners, something Congress was unwilling to pursue itself. Congress authorized the process of establishing the Park in 1926. Citizens of North Carolina and Tennessee rose to the occasion. Support was broad and even school children donated lunch money. Their donations, together with those of religious institutions, business leagues, and many individuals from well beyond the state lines, eventually raised one half of the needed amount. John D. Rockefeller, Jr., contributed the remaining $5,000,000 dollars in memory of his late wife. In 1934, the Park was formally established by an Act of Congress, although National Park Service operations there had begun earlier.

Coinciding with the Park's establishment, the Civilian Conservation Corps began its short, yet productive life in 1933. That spring, the Park's first CCC camps opened just six weeks after President Roosevelt signed the Federal Unemployment Relief Act establishing the Emergency Conservation Work program of which the CCC was the central part. By the beginning of World War II, the program's life was nearly complete. It became an independent agency in 1937 and, by 1941, Congress acted to de-authorize the program as war preparations became paramount.

The trail system of Great Smoky Mountains National Park took on national status during the CCC period. Although much of the system constructed during this period made extensive use of old roadbeds, railroad grades, and existing footpaths, much new work was also completed. Many of the Park's famed roads and trails were first constructed or were converted from existing routes, including most of its Appalachian Trail (AT) section. Quite significantly, a Park employee, Guy B. Arthur, one of the nation's premier trail builders, produced a manual, Construction of Trails (USDI 1937), that became the standard guide for CCC efforts throughout the country. The methods he described became widely applied wherever CCC trails were built. Many of the trails he' or others designed for the Park during this period still remain in remarkably good condition after 60 years.

No history of the CCC's diverse effort in the Park focuses on the trail system. Although not compiled, many of the materials seem available; yet, no one has documented the system's progression. Fortunately, the 1937 CCC manual Construction of Trails is available, so techniques for the original trail construction are documented. Also, the Park's Maintenance Division maintains many of the original drawings for the actual trail construction projects, including bridges, fords, and rock walls.

Recent Times

Since the CCC effort, no comparable amount of trail construction has occurred in the Park. An NPS Master Plan effort in 1964 proposed more construction, but other components of the plan called for construction of additional roads and new facilities. Those components drew opposition that eventually led to rejection of the plan.

More important than a reduction in new trail construction has been a trend throughout the Park's history toward increasing numbers of annual visitors. Although the accuracy of individual figures may vary, their trend is no less revealing: over 2.5 million people by 1955; 4 million by 1960; 6 million by 1965; 8 million by 1975 (USDI 1981a). Currently, annual visitation is thought between 8 and 11 million people, with a sizable portion of that number reflecting people who enter the Park multiple times during the year. Whatever the actual number, no other park in the National Park system is likely visited more than half as often. Several surveys, however, support the widely held opinion that most people who visit the Park spend little or no time away from roadways or visitor centers (ARMS 1975, Peine and Renfro 1988). More recent information about visitation patterns is unavailable.

As the number of visitors has increased, Park staff members have become increasingly alarmed at the real and potential effects of greater and greater numbers of people. Three approaches are available to offset those effects: restrictions on visitors or their activities; maintenance, repair, or rehabilitation of locations where those effects occur; and informing or educating visitors about how they can leave no trace of their passage. Park staff members have applied examples of each approach to address concerns about the backcountry. Although Park efforts have included maintenance and rehabilitation of trails and campsites, as well as information and education of visitors, their primary tool has often been regulation.

One reason for the emphasis upon regulation has been the Park staff members' application of a *carrying capacity* model for understanding and responding to backcountry recreation. The model was introduced in the early 1960's (Wagar 1964). Unfortunately, some people are easily mislead by the model if unfamiliar with the specific ideas behind it. For some, it suggests, erroneously, that a preordained figure can be deduced by scientific study or agency experts. Likewise, some people assume it also means that limiting visitor numbers will resolve any wildland recreation issue. Applied to maintenance, a capacity-oriented perspective might suggest wrongly that reducing trail mileage will increase the capacity to maintain a trail system. In both cases, these assumptions ignore the importance of behavior, ignore the differences between how various activities affect a setting, and ignore the key role of trail design and construction or campsite location. How and where an activity occurs is at least as important as whether it occurs. When focusing upon the number of visitors, one's options for responding to perceived problems tend to remain limited to those options that reduce the number of visitors or the mileage of trails. Alternatives to these ideas will appear throughout this document.

In part, funding restrictions have also played a role in the reliance upon regulation. As a general indication, trail crew staffing for 1995 is 21 people, including 11 permanent positions and 10 seasonals. This is in contrast to the 1973 trail crew with 52 positions, of which 50 were seasonal and 2 were permanent foreman positions. Park staff members attribute the change in staffing to several reasons, including Park budgets that have been flat or reduced in the face of inflation, recent changes in NPS hiring practices, local Park budgeting priorities, and staffing decisions by the Park's Maintenance Division. In addition, reaching backcountry visitors to provide informative materials can be difficult because many of them prefer to avoid visitor centers and other locations traditionally used to distribute materials. The exact reasoning for relying more on regulation than maintenance or information is complex and the previous description is likely inadequate.

Concerns that visitors negatively affect the Park and other visitors had reached a point by 1972 that a draft Backcountry Management Plan, produced as part of a Park-wide planning effort, proposed closing the Appalachian Trail (AT) to horse riding and, in selected areas, limiting the number of overnight visitors to the number of bunks available at shelters. Areas that would have been affected by those proposed restrictions on overnight stays included the AT's entire length in the Park and the summit of Mt. LeConte. Prior to 1972, over one-third (35%) of the AT's section in the Park had been previously closed to horse riding. Maintenance demands and concerns about trail conditions led to the 1972 proposal to close remaining sections. That proposed action was never implemented. The closure would have effectively eliminated much of the trail mileage available for high-elevation riding in the Park. Horse riding enthusiasts successfully pursued a compromise. It led to the current situation whereby 50% of the AT in the Park remains open for riding. Of the closed section, no major reconstruction effort occurred to repair the problem sections and, today, they remain among the trail sections most in need of repair (Marion 1994).

Park staff members responded to concerns about crowding at backcountry overnight areas by establishing a backcountry reservation system and a backcountry registration system. Several

versions of these systems have been tried since the first one in 1972. The present system requires backcountry campers to acquire, at no cost, a *backcountry use permit* through a self-registration process whereby campers complete their own permit. Two backcountry permit stations are staffed and volunteers can provide visitors to those stations with assistance completing the form. In addition, campers are required to stay in designated campsites and some of those sites are rationed, meaning that Park staff members have placed a limit on the number of campers and horses. Although the regulations allow some exceptions, this policy of requiring visitors to camp only at designated sites is intended to concentrate the effects of camping and dilute the effects outside those designated areas.

The most recent concerns continue to echo those of the last several decades. In general, the concerns parallel the equation described at the beginning of this document: trails and other backcountry areas need help, backcountry campsites and shelters are too often fouled by manure or human waste, there are not enough resources available to provide the needed help, and something has to give. This is the difficult point where efforts began that led to this document.

THE TRAILS AND BACKCOUNTRY OF GREAT SMOKY MOUNTAINS NATIONAL PARK

Located along the mountainous State border between Tennessee and North Carolina, the 514,885 acres of Great Smoky Mountains National Park include 477,670 acres recommended for inclusion into the National Wilderness Preservation System. The Park is administered by the National Park Service, an agency of the United States Federal government's Department of Interior.

The Park is one of the most topographically, biologically, and climatically diverse areas known (GSMNP 1990, USDI 198 la and 1981 b, USDI 1982). Its lowest point, at the mouth of Abrams Creek in Tennessee, is 840 feet above sea level; its highest point is 6,642 feet, atop Clingmans Dome. This difference of over 5,800 feet makes it possible to gain a vertical mile within the Park's boundaries. Because of its remarkable diversity, the Park is an International Biosphere Reserve and a World Heritage Site, two special titles accorded by the United Nations in recognition of the Park's biological diversity and the National Park Service's leadership in preserving it.

Areas that qualify as backcountry comprise more than 95% of the Park. As such, most of the Park's diversity is there, too, including more tree species (more than 100) than in all of northern Europe, more than 1,600 species of plants (approximately 400 are rare by some measure or another), and greatly diverse and largely unknown species of amphibians, insects, and other animals. There are more salamander species (more than 20) than in any other comparably sized part of the world. Freshwater fish, including native Brook Trout, are plentiful in the Park's many miles of brooks and streams, attracting many anglers. Many bird species either reside in the Park or find it an important part of their migratory route. Additional native Park animals include more than ten endangered or threatened species and seven species that have been reintroduced following their elimination from the local area.

At least eight different types of forest exist in the Park, each one noted for its particular mixture of tree species. The composition of several of these types, however, is threatened by damage occurring either to Frasier fir (*Abies fraseri*), flowering dogwood (*Cornus florida*), or red spruce (*Picea rubens*). Air pollution, non-native fungi, and pests each contribute harm. The Park's large number of plant varieties includes approximately 375 non-native species, called exotic species. At least 25 of these species pose significant threats because of the non-native plant's ability to invade areas, out-compete native plants, and, therefore, unnaturally change natural, historic, or cultural scenes.

Geology, topography, and soils play a crucial role in supporting the Park's natural diversity (USDI 1982). The primary geologic formations are members of the Ocoee series, a group of sedimentary rocks 600,000,000 to l,OOO,OOO,OOO years old. Formations range from intensely

metamorphosed rocks of the Park's southeast to less altered rocks of its northwest. The Park's geology provides parent material for its six soil types. Park soils generally become more rocky, thin, and susceptible to erosion as elevation increases, although highly organic soils, commonly found along drainage bottoms, are also susceptible to disturbance. The most dominant soil type by area is also associated with steep slopes and a notable potential for erosion. Notwithstanding the potential for erosion, many areas of the Park contain soil that is permeable or otherwise erosion resistant, as shown by the area's severe topography despite its age.

Climactic diversity and rainfall distinguishes the Park as much as anything else. Travelling from the Park's lowlands to its highlands is ecologically comparable to a journey from North Georgia to Maine, an equivalent distance of nearly 3,000 miles, yet all within the Park. Annual precipitation is 80 inches in some areas, more than enough to qualify as a temperate rainforest. That the soil's potential for erosion is often offset is demonstrated by the Park's topographic prominence despite such rainfall. One of the reasons the soils are more stable than one might expect is likely the protecting influence of lush vegetation. The careful balance struck between topography, soil, and vegetation, however, can be upset if a disturbance occurs.

Some of the Park's features are the result of human activities. Numerous shadows of former structures exist, including old homesteads, stone walls, fence posts, and abandoned roadbeds or railroad grades. Although restored or representative examples of buildings are accessible by road, many of the faintest remnants are seen only in the backcountry. For many people, the Park's special historic and cultural qualities are amplified by the presence of cemeteries that predate the Park's establishment.

The Park's natural and cultural wonders attract people. According to the best estimates available, the Park is visited between 8 and 10 million times each year and its backcountry is visited between 500,000 and 700,000 times each year (Table I). Popular backcountry activities in the Park include hiking, horse riding, and camping. The best figures available suggest that approximately 95,000 backcountry camper-nights (one person, one night), 80,000 horse riding trips (one person, one day), and 42 1,000 day-hikes (one person, any portion of a day regardless of time spent or mileage covered) occur each year. The horse riding figures do not include any concessionaire operations because separate networks of trails are maintained by concessionaires for their riders. Park visitation figures suggest that, during the 15 years from 1979 to 1993, the total number of Park visitors is up (~15%) and, comparatively, backcountry camping is up about the same, private horse riding is up twice as much (~30%), total backcountry visitation is up about three times as much (~45%), and day-hiking is up nearly four times as much (-60%).

To offer opportunities for people to enjoy the Park, the National Park Service maintains an extensive system of trails, campsites, and shelters. Currently, that system includes 802 miles of trails, 83 backcountry camping areas, and 18 backcountry shelters. Yet, as numerous scientific studies all show, every *visit, regardless of activity, to any backcountry, regardless of location, changes that backcountry to some degree for some length of time,* notwithstanding that some activities inherently contribute changes that are more significant and last longer than others (Hammitt and Cole 1987).

Table I Fifteen Years of Visits to Great Smoky Mountains National Park categorized According to Activities.

Visitation Category	Year[1]		Percentage Change from 1979 to 1993 [2]
	1979	1993	
Backcountry			
Camping	81,000	95,000	+17%
Horse Riding	62,000	80,000	+29%
Day-Hiking	269,000	421,000	+57%
Total (Backcountry) [3]	412,000	597,000	+45%
Park Total (millions)	8.0	9.3	+16%

Management actions are necessary if the Park is to provide opportunities for backcountry recreation today without compromising the capability of providing future generations of visitors with similar or better opportunities. Each such action focuses on either visitors or the environment. For example, a regulation may either prohibit or require visitors to do something. Alternatively, visitors' environmental effects may be offset at least to some degree by maintaining trails, campsites, and shelters and by repairing problems as they appear.

Picturing the Current Situation

The current situation is complex. One way to approach it is with a simplified picture that starts with a system of trails, shelters, and campsites. That system is a component of a larger, mostly natural setting-- a national park. The setting has contents and physical presence, and character and emotional meaning. One purpose of a national park, as we will soon see, is to provide future visitors with opportunities for enjoyment that are comparable to those opportunities available to current visitors. To realize this purpose, a national park requires the care of stewards. The picture, then, is of a predominately natural setting with a system of trails and camping areas

providing **opportunities** for visitors to enjoy the setting and needing **the** care of **stewards if the** system is to provide similar future opportunities (Figure 2).

To understand the current situation's complexity, one might begin by identifying directives that guide Park management because those directives should reveal the Park's purpose (Rainey 1991). Often, directives are legislative mandates, and the National Park Service is legally bound to comply with them. The legal nature of these directives means that they provide this project with boundaries it must not exceed.

The next step is to describe the system's condition. Such a description appears in the following section and begins with the physical trail conditions (Marion 1994) followed by those of campsites, shelters, and horse camps. Many parts make up the Park's trails and backcountry. Because of various scientific studies, we understand much about some of those parts. Other parts, however, have not been studied in detail, although some studies in similar protected areas generalize safely to the Park's current situation. Throughout this effort, we must rely upon the best information available, recognizing that we will never know everything about the current situation because it is so complex and ever-changing.

The current situation is affected by the people who come to the Park and how they act when they are there (Hammitt and Cole 1987). So, we also need to know about current visitors-- why they visit the Park and what they do there. Some effects of people, if not dealt with, can conflict with the Park's purpose. Park employees, sometimes with the help of others, can offset those effects with either administrative actions, such as regulations directed towards people, efforts to

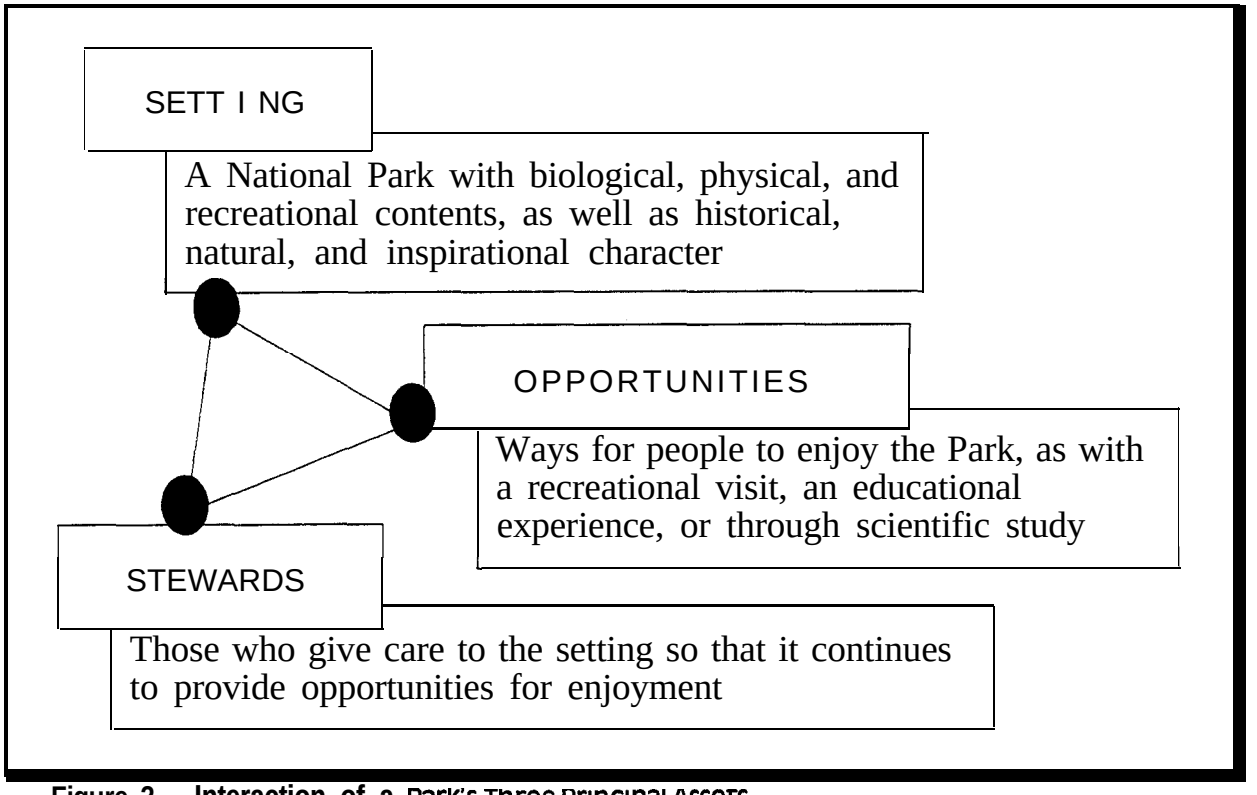

Figure 2 Interaction of a Park's Three Principal Assets.

inform visitors, or maintenance directed towards trails or other backcountry features. To understand the situation, we need to know about the current capability to maintain that system, existing informational and educational efforts, and current regulations. Together, this information portrays the current situation and places it within a context.

Understanding the current situation is important because not all individuals react alike. Two people, for example, might interpret a situation differently, especially if each is pursuing a different activity. Part of the current situation is what people think about it and what they say is important to them about it. Perhaps most importantly, we must start by understanding National Park Service responsibilities and capabilities, for these are the boundaries within which we must operate to find workable solutions.

Mandates Guiding Park Actions

Every national park is unique and represents a complex set of values and resources. Although the content and character of each park is special, each park also is administered according to guidelines that are quite similar. Those guidelines consist of Congressional legislation, National Park Service policies, and local park policies (Figure 3). Guidelines tend to become more specific as one moves from Congressional Acts to local park policies. Accordingly, some guidelines are the same for every park, while some are unique to each park. Mandates, however, become superior as one moves from local policies to legislation. A local park policy must not compromise a superior mandate.

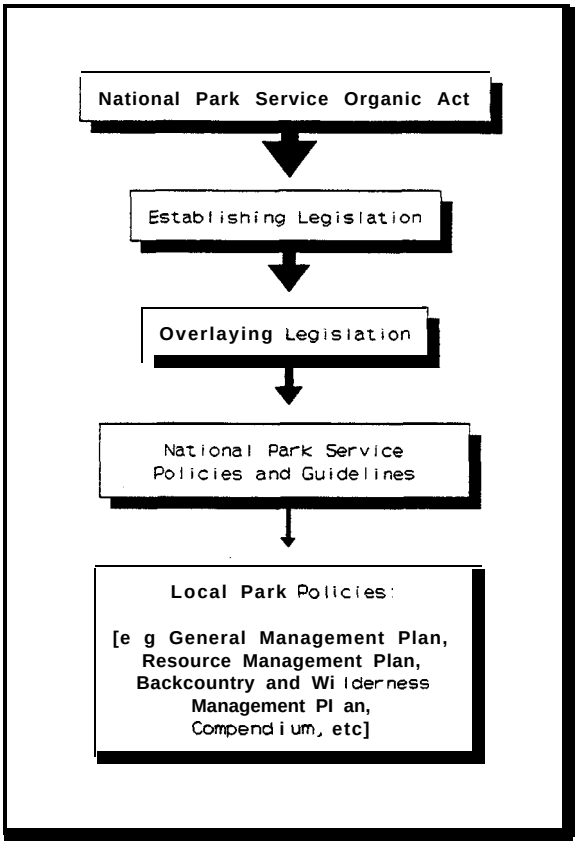

Figure 3 Sources of Park Administration Mandates.

This review reveals the inherent flexibility of NPS mandates and underscores the role of judgment in determining whether current conditions exceed mandated ones. NPS mandates provide guidelines helpful to Park stewards. NPS employees and others should recognize, however, the flexibility inherent in policy. When a recommendation, decision, or action is within the guidelines and strives to support the agency's mandate, it is appropriate, even if a more strict or narrow interpretation of policy suggests otherwise. Operating outside the guidelines, however, oversteps the mandates and, therefore, is inappropriate and not workable.

National Park Service Legislation

National parks, such as Great Smoky Mountains National Park, are administered by the National Park Service, an agency of the United States Department of Interior. The US Congress established the agency on August 25, 1916. The Congress also enacts legislation that guides the National Park Service's management of individual national parks.

The agency's primary legislation is *the National Park Service Organic Act* (U.S. *Code,* volume 16, section 1 and la- 1). That Act provides the National Park Service with it's fundamental direction by defining both the agency's purpose and the fundamental reason for all national parks. The National Park Service is the United States Federal government's premier agency dedicated both to conservation and enjoyment. The agency's purpose is:

> to promote and regulate the use of the Federal areas known as National Parks . . . by such means and measures as conform to the fundamental purpose of the said Parks . . . which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the eniovment of future generations. . . .
>
> These areas derive increased national dignity and recognition of their superb environmental quality. . . . The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public values and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established. (U.S. *Code,* volume 16, sections 1 and la-l with emphasis added)

Congress establishes a national park, therefore, to conserve an area's contents and character for future generations while providing current visitors with opportunities for enjoyment that do not detract from that content or character. The job of the National Park Service is to promote national parks and regulate today's visitors to ensure that tomorrow's visitors have similar opportunities or, if an area has been or is impaired, better opportunities. Clearly, Congress believes environmental quality is a paramount measure of a park's capability to provide for future enjoyment and it instructs National Park Service employees to conserve environmental quality.

For those who visit a national park, enjoyment often means recreation. Recreation, however, can change a park. At times and in some places, change to a park's contents or character may be enough for some people to consider it impairment. To fulfill their conservation mandate, a park's staff members must decide whether recreation has led to such impairment that the agency's purpose has been compromised. In the past, National Park Service employees often made many of those decisions without gathering sufficient information from people outside the agency. Unfortunately, such an approach can lead to a lack of support for decisions because, among many other reasons, some people may believe the decisions are based upon inappropriately limited information.

Today, decisions about impairment are often made in a participatory and collaborative manner, incorporating the interests and opinions of many individuals and organizations outside the agency.

Participants may be visitors, local residents, or concessionaires. Employees or members of conservation organizations can also be helpful participants, as can those of recreation organizations. In addition, a park's staff members, representing every park operations division, should participate because they offer a broad range of ideas and will be responsible for implementing many of the recommendations they and the public ultimately decide are acceptable. This approach to management is prescribed in Management Policies of the National Park Service (USDI 1988), a point discussed shortly in more detail.

In line with the contemporary approach to crafting proposals and making decisions, if those participating agree that impairment has occurred, then they must recommend a response that, while sensitive to diverse visitor interests, protects a park's character and contents. After all, those contents and characteristics are the preeminent reasons Congress establishes national parks, as clarified in *U.S.* Code, volume 16, section la-l. Without the features, there could be no opportunity to enjoy them either today or in the future. The primary mandate provided by the National Park Service's Organic Act, therefore, is to conserve a park's character and contents in public trust for future generations while, wherever possible, providing opportunities for contemporary visitors to enjoy that same character and contents.

Park Legislation

Congress creates each national park with what is referred to *as establishing legislation.* Compared with the Organic Act, this type of legislation more specifically defines the reason for Congress's decision to protect a particular area. For Great Smoky Mountains National Park, the legislation is found in several Acts including an authorizing Act of 1926, an establishing Act of 1934, and an Exclusive Jurisdiction Act of 1942.

With its authorizing Act, Congress formally allowed the process of creating Great Smoky Mountains National Park to begin, although discussions about such a park had occurred in North Carolina since at least 1894 (Runte 1987). The authorizing legislation set a minimum area for the potential park of 150,000 acres and a maximum of 704,000 acres. It also states that the area is meant "for the benefit and enjoyment of the people" and that the Park's administration "shall be exercised . . . by the National Park Service, subject to the provisions of the [Organic] Act of August 25, 1916" *(Statutes at Large,* 1934, volume 48, section 964). Congress acted to make the acquired area part of the National Park System on June 15, 1934, by accepting approximately 400,000 acres from the States of North Carolina and Tennessee, assisted by a generous $5,000,000 donation from John D. Rockefeller, Jr. Although neither the authorizing Act nor establishing Act delineates the Park's purpose much beyond the Organic Act, it does reconfirm the Organic Act's importance-- the Park is held in public trust for future generations.

The Exclusive Jurisdiction Act of 1942 *(Statutes at Large,* volume 56, section 258) provides the Park's most specific Congressional mandate. With this Act, Congress accepted jurisdiction from the States of Tennessee and North Carolina for lands within the Park. Congress also defined the scope of operations within the Park by declaring an exceptional need

> for the preservation from injury or spoliation of all . . . natural curiosities, or wonderful objects therein . . . [including] any damage, injury, or spoliation to or upon any . . . sign, . . . tree, wood, underwood, . . . plants, land, springs . . . or other matter or thing growing or being thereon, or situated therein (U.S. *Code*, volume 16, section 403)

Taken together, the establishing legislation and other related legislation more specifically confirms the importance of protecting the Park's character and contents, especially natural contents. Congress clearly intends National Park Service employees to provide opportunities for enjoying the Park, but realizing those opportunities today must not cost future generations their opportunities to enjoy the Park's character and contents. Both provision and protection should occur; yet, when in doubt, the Park's foremost purpose is to serve as a reservoir of natural and wonderful objects for future generations.

Overlay Legislation

In addition to National Park Service legislation, national parks are often affected by special legislation called *overlay legislation.* This type of legislation gets its name because it over-lays an area, guiding decisions about how that area is managed. Some overlay legislation guides the process of reaching a decision; other overlay legislation guides a decision's form.

Examples of overlay legislation guiding the form of this project's recommendations include *the Wilderness Act* of 1964 (P.L. 88-577) and the *National Trails System Act (Statutes at Large,* volume 82, section 919, also referenced as P.L. 95-625). These two Acts define the form appropriate for many recommendations or actions in the Park. Examples of overlay legislation that guided the method for reaching this project's recommendations include *the National Environmental Policy Act* of 1969 (U.S. *Code,* volume 42, section 4901 and following, also referenced as P.L. 91-190) and *the Federal Advisory Committee Act* (P.L. 92-463). These Acts specify the means appropriate for soliciting information and ideas that balance the interests of the many Park constituencies.

The Wilderness Act

To a great extent, the Wilderness Act guides the form of most administrative decisions affecting the Park's backcountry. As many as 477,670 acres of the Park have been proposed for Wilderness designation (93% of the Park's total area of 514,885 acres). The area proposed is divided evenly between North Carolina and Tennessee. Although Congress has not acted to establish Wilderness in the Park, the Wilderness Act remains important because it specifies that only Congress may designate an area as a component of the National Wilderness Preservation System.

Since 1966, several authorization bills have been sent to Congress that would have formally established Federal Wilderness in the Park, most recently in 1987. Passage of any Wilderness proposal, however, would not change how affected areas of the Park are managed because, for the nearly 30 years since 1966 when portions of the Park were first formally proposed as Wilderness,

Park employees have been required to administer those areas according to Wilderness Act directives. In addition, directives of the Wilderness Act generally parallel those of the National Park Service's Organic Act, so most administrative directives would remain consistent regardless of whether the Wilderness Act or the Organic Act provides the source.

Because only Congress can formally designate Wilderness, NPS employees or volunteers may not usurp Congressional authority by doing anything that would compromise the area's status as Wilderness. They must comply with Wilderness Act directives from the moment an area is proposed and until Congress acts to make the area part of the National Wilderness Preservation System or to release it for other purposes.

Implications of Wilderness designation can be confusing. Some people believe the Wilderness Act requires actions that it does not and others believe it prohibits options it does not. The purpose of Wilderness, as stated in the Act, is

> To establish a National Wilderness Preservation System for the permanent good of the whole people . . . to secure for the American people of current and future generations the benefits of an enduring resource of wilderness (P.L. 88-577, emphasis added).

The National Wilderness Preservation System, therefore, is for people and its components are to be administered

> in such a manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness (P.L. 88-577, Section 2(c), emphasis added)

The Act implicitly distinguishes between an area's public purposes and administrative actions necessary to realize those purposes. The Wilderness Act does not contradict a Superintendent's discretionary authority to administer a park. As the Act states it,

> except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motor boats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area (P.L. 88-577, Section 4(c), emphasis added, parentheses in original).

The Act makes clear that mechanized or motorized equipment is inappropriate for public purposes, like recreation, education, or scientific study that is not serving administrative purposes. Such equipment, however, is occasionally appropriate for administration of a Wilderness area, provided that the result meets the Act's requirements for such an effort (Stankey 1990). More specifically, efforts necessitating the equipment must protect or rehabilitate the area's character and contents as Wilderness for enjoyment or study by future generations.

Accordingly, an inappropriate administrative decision under the Wilderness Act is one that compromises an area's character or contents, as when efficiency or economics are the sole rationale for an action. Maintaining a trail with vehicles, for example, such that the trail's width, design, or character is altered to accommodate the vehicle, as opposed to the trail remaining only what is necessary for simple recreation, is inappropriate.

This standard is quite similar to that of the NPS Organic Act, already applicable in all national park backcountry areas. The standard is a form of *the minimum-tool principle.* When applying the principle, one should consider each available tool, how each tool is likely to affect an area, and the advantages gained by the tool. A tool, in this sense, might be an implement, a mechanism, or a machine, but it might also be a regulation, a sign, an informational brochure, or a map.

Selecting the minimum tool requires judgement. If one judges that a particular tool is the minimum necessary to rehabilitate or protect a Wilderness area's character or content and that one can offset any effects that might alter the area's character or content, then the tool is appropriate even if it is mechanized or motorized. If, however, one judges that the tool or its effects compromise a Wilderness area's character or contents, then the tool is inappropriate even if it is neither powered nor mechanized. The same reasoning applies in NPS administered backcountry, regardless of Wilderness status. Borrowing from the previous example, maintaining trails with vehicles such that the trail becomes altered to accommodate the vehicle is inappropriate in the Park's backcountry regardless of Wilderness status, but one may find justification for such equipment during a particular project, depending upon the specific situation and whether one is willing to complete the work required to offset any of the equipment's effects that alter the backcountry's contents or character.

In a national park, administrative discretion for such decisions resides with the Superintendent. In Great Smoky Mountains National Park, the current chainsaw-window, available for Park trail maintenance each spring, is an example of such discretion. Additionally, a distinction is often made between occasional reconstruction efforts and routine maintenance. According to both the Wilderness Act and the Organic Act, anyone working in the Park's backcountry should not use mechanized equipment as a matter of routine when alternatives are available, even if those alternatives seem to require greater effort. Nevertheless, major reconstruction projects that, upon completion, leave an area with characteristics closer to those envisioned in the Wilderness Act and the **NPS** Organic Act appropriately could involve mechanized or motorized equipment.

The National Trails System Act

The National Trails System Act (P.L. 95-625) guides the form of administrative decisions affecting the Appalachian Trail (AT). Extending over 2,000 miles from Maine to Georgia, the AT runs along the Park's ridge-crest for just over 70 miles from Fontana Dam to Davenport Gap. The Act establishes that "the Appalachian Trail shall be administered primarily as a footpath (emphasis added)," but it does not establish hiking as the exclusive activity. The accuracy of this interpretation is clarified in additional documents associated with AT management. The Act calls for submission of a Comprehensive Plan for managing the trail. Regarding horse riding, the 1981

plan, re-authorized in 1987, states "riding is limited to those sections of the Trail which have traditionally accommodated horse use" with the understanding that the AT's "natural and cultural resources or social values" must not be degraded (AT Project Office 1987). Such is the case for 35 miles of the AT open to horse riding in the Park.

Several principles guide all AT management. First and foremost is cooperative management. Volunteers, as opposed to state or Federal agencies, shoulder most of the trail's maintenance and management in cooperation with those agencies and other interested groups. Second, wherever possible, the trail is managed as a simple footpath with diverse appearance reflecting local character. Third, diverse character and activities are welcome, with special emphasis placed on areas retaining primeval appearance. And, fourth, travellers along the AT are held responsible for themselves and their actions, with as little regimentation as possible and education as the primary means to ensure compliance (AT Project Office 1987).

National Environmental Policy Act

As the National Park Service decides upon a course of action, its methods are determined largely by *the National Environmental Policy Act* (NEPA, P.L. 91-190). This Act is complex and lengthy. Congress intended it to ensure protection of natural, social, and economic environments by, in part, establishing and legislating a structure for members of the public to participate in a Federal agency's decision processes when a significant action is proposed that might disturb any of those environments (Hoogland 1990). A significant action is not defined as just one that involves potential or proposed environmental disturbance. The definition also encompasses actions that include the adoption of rules, regulations, or changes in policy (Bergman and Mackentham 1992).

Technically, many options for improving the Park's backcountry would not trigger a full and often lengthy NEPA process because they would qualify as a categorical exclusion (CE), meaning that they do not have a significant, new effect on the environment (Bergman and Mackentbam 1992). Examples of actions categorically excluded from requiring a NEPA process include alternatives outlined prior to selecting a specific action, routine maintenance and repairs of trails, minor trail relocation or conversion of former woodsroads or railroad grades to trails, minor changes in amounts or types of visitor activities, or designation of trailside camping areas (USDI 1985). In addition, no action described in this document exceeds the existing Environmental Impact Statement (EIS) of the Park's General Management Plan (USDI 1982). For these reasons, a public review process as prescribed by the NEPA is unnecessary for the actions described in this document.

Nevertheless, the sometimes antagonistic opinions about Park trails and backcountry activities suggest that public review of this document is important and should be followed. Review by itself, however, is not an adequate substitute for constructive participation. Unlike review, participation attracts valuable ideas and support, but only if it occurs early and throughout a process, as occurred during the project that led to this document.

Federal Advisory Committee Act

Methods guiding appropriate participation in a National Park Service decision process are also specified in the *Federal Advisory Committee Act* (FACA, P.L. 92-463). In some ways, FACA may be more relevant to this project than NEPA. Congress's purpose for the Act is to ensure adequate and appropriate non-Federal and public participation in Federal decision processes. Prior to the Act, no legal avenue existed to challenge exclusive, special access that sometimes was available to particular groups or individuals. A strict interpretation suggests that only a very formal sequence of participation is available, including posting of all meetings in the *Federal Register*, exacting minutes of every meeting, and many other complicated and often cumbersome procedures.

FACA, however, does not apply to several particular forms of advisory meetings, according to current Judicial interpretations (Northwest Forest Resource Council v. Espy, et al. [D.D.C. 19941). For example, the Act does not apply to any meeting intended to obtain advice, as opposed to consent. It also does not apply to any meeting initiated by a non-Federal group to express the group's views. And, it does not apply to any meeting occurring for the purpose of exchanging facts or information, as opposed to making decisions without public review or participation. As described earlier, each meeting that occurred as part of the participatory project that led to this document met one or more of these three tests.

Other overlay legislation

In addition to those Acts reviewed, other Acts guide this project, including the Archeological Resources Protection Act of 1979, the Historic Sites Act of 1935, and the National Historic Preservation Act of 1969. Those interested in the specifics of these Acts may find Mantell's Managing National Park Service Resources: A handbook on legal duties, opportunities, and tools (1990) a helpful resource. In addition, the Park's General Management Plan (USDI 1981a) supplies an exhaustive listing of applicable legislation. It is available in many libraries.

National Park Service Policies

In addition to legislation, parks are managed according to National Park Service policies and local park policies. NPS policies are compiled in Management Policies (USDI 1988). As with legislation, NPS policies either guide a process's methods or the form of its products, regardless of whether a product is a recommendation or an action. NPS employees are required to follow National Park Service policies so as to carry out their Congressional mandates consistently and professionally (USDI 1988).

Policies guiding a decision process

Planning projects, such as this one, must apply processes that are appropriate according to NPS policies. Most relevant to this effort is policy related to public participation. According to Management Policies,

> positive actions will be taken to identify and involve the public as individuals and through public interest groups and organizations at the earliest possible stages in the planning process and before planning decisions have been made. . . Opportunities for public participation may include public workshops and meetings, informal work sessions on particular issues, and public review and comment on draft documents (USDI 1988, chapter 2).

Other policies regarding planning processes relate to types of projects that are more typical than this one, such as a General Management Plan or Resource Management Plan. This project is non-traditional because it gathered certain critical information during the planning process, as opposed to prior to the process, and some of the information gathered includes responses of interested individuals and organizations to the very process itself and specific ideas about fulfilling Park administration mandates.

Policies guiding a decision's form

This document addresses recreational activities that affect the backcountry, its trails, and its visitors and that are attributed to people, their activities, or efforts to manage them. Additionally, the Park contains areas proposed for inclusion within the National Wilderness Preservation System. Several sections of Management Policies contain specific guidelines for decisions about Wilderness areas, visitors and their activities, and backcountry trails, campsites, and shelters.

Trail Maintenance. According to NPS policy, a trail is a component of a park's *access and circulation system*, as distinguished from *visitor facilities* or *maintenance facilities.* Guidelines concerning trails state that

> all trails will be carefully located, designed, and managed to allow for a satisfying park experience and to protect resources. . . . Backcountry trails will offer visitors a primitive outdoor experience and will be unsurfaced and modest in character, except where a more durable surface is needed. Artificiality in the form of nonnative materials should be avoided on backcountry trails. . . . Equestrian trails and related support facilities, such as feed boxes and hitch rails, may be provided where consistent with park objectives and where site conditions are suitable (USDI 1988, Chapter 9, emphasis added).

The purpose of a backcountry trail, according to Management Policies, is to provide opportunities for a primitive experience without infringing upon that experience by way of artificial or otherwise incompatible construction or maintenance techniques.

A contradiction exists in these excerpts, however, because an exception is made for trail locations where a more durable surface is needed, yet the sentence related to equestrian trails suggests that suitable, perhaps preexisting, site conditions are necessary. A strict interpretation of the policy for equestrian trails might suggest that, in contrast with other trails, no exception is appropriate for modest modifications to that site. Such an interpretation is contradictory. Modest modifications are appropriate for any trail, where modest is understood as minimally influencing a park's character, contents, and natural processes.

Visitor Regulation. As stated in the agency's Organic Act, management of backcountry visitors through regulation is a central duty of the NPS. The objective for managing visitors, according to NPS policy, is to protect park resources while providing opportunities for safe, public enjoyment and minimizing conflicts between visitors. Several means are available for fulfilling this objective, including

> general or special regulations; permit or reservation systems; and local restrictions, public use limits, closure, and designations implemented under the discretionary authority of the superintendent. Any restrictions . . . will be limited to the minimum necessary to protect park resources and values and promote visitor safety and enjoyment. . . . (An) activity may be restricted or prohibited when, in the judgement of the superintendent, its occurrence, continuation, or expansion would result in the derogation of the values or purposes for which the park was established (USDI 1988, Chapter 8, emphasis added).

The discussion of visitors that is found in Management Policies emphasizes regulatory options and overlooks the importance of integrating regulatory actions to manage visitor activities with maintenance actions or informational actions. For example, a maintenance action might include trail work that manages the effects of trail activities. Likewise, an informational action might include distributing a pamphlet that provides instructions to visitors about how a person can minimize his or her effects. In addition to regulations, maintenance of the Park's resources can contribute to protecting both the setting and the opportunities it offers, just as informational materials can promote among visitors the understanding they need to leave no traces of their presence. These tools-- regulation, maintenance, and information-- must work together.

Wilderness Management. NPS policy for managing designated or proposed Wilderness clarifies the directives of Congress found in the Wilderness Act, but it adds no new directives. The purpose of areas designated or proposed as Wilderness is to preserve the character and contents for future generations. The only difference between managing an area as Wilderness and managing one as NPS backcountry, according to NPS policy, is that more care must be taken when selecting a tool because the acceptable standard for choosing a mechanized or motorized tool is more strict for a Wilderness area. Mechanized and motorized equipment is not prohibited. As Management Policies states it,

> If some compromise of wilderness resources or character is unavoidable, only those actions that have localized, short-term adverse impacts will be acceptable (USDI 1988, Chapter 6).

As under the Act itself, discretionary authority for mechanized or mechanical tools resides with the Superintendent.

Appropriate Activities. *The Code of Federal Regulations* (CFR), volume 36, legally defines activities that are appropriate in the Park's backcountry. Although regulatory, these restrictions also supply a mandate that must be followed. A Superintendent may further restrict activities that are otherwise allowable according to the CFR when a determination is made that

> such an action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities *(Code of Federal Regulations,* volume 36, section 1.5).

According to the CFR, hiking, horse riding, and camping are relevant to this document and appropriate in the backcountry, with the understanding that such activities must not compromise the Park's character and contents for future generations. The CFR establishes several mandates associated with horses.

> The use of horses or pack animals [is prohibited] outside of trails, routes or areas designated for their use . . . [and] the use of horses or pack animals are prohibited [on the Appalachian Trail], except in locations designated for their use *(Code of Federal Regulations,* volume 36, sections 2.16.b and 7.100, respectively).

Bicycle riding in the backcountry is inappropriate, according to specific language within the CFR. The Superintendent, under the CFR, may allow bicycle riding only when provided

> written determination that such use is consistent with the protection of a park area's natural, scenic, and aesthetic values, safety considerations and management objectives and will not disturb wildlife or park resources *(Code of Federal Regulations,* volume 36, section 4.30).

Because such a determination does not exist, this document does not address the activity of riding bicycles in the backcountry. In addition, bicycles are mechanized means of recreation and, therefore, are inappropriate in the Park's backcountry, especially in light of Wilderness proposals.

Within a park, the Superintendent may further restrict an activity that is otherwise allowable if the effects of that activity compromise the park's purposes and overwhelm the capacity to offset those effects. Such decisions are examples of a Superintendent's *discretionary authority* to decide the appropriateness of an activity, although exercising such discretion may require *special regulations* or *public notification.* The judiciary defers to a Superintendent's administrative discretion, as recent court decisions show *(Sierra Club v. Andrus 487* F. Supp. 443 [1980], *Bicycle Trails Council of Marin v. Babbitt* [1994]).

When strong evidence establishes that an activity is inconsistent with protecting park values or ensuring visitor safety, or the activity threatens other management objectives, a Superintendent may determine that it is inappropriate and prohibit it. If an activity has occurred for any length of time, yet is changing a park beyond the available means to offset those changes, then the Superintendent has the responsibility, authority, and discretion to restrict that activity or, if necessary, prohibit it, especially if all available avenues for improving a situation are exhausted.

Local Park Policies

Local park policies further refine the instructions given to park employees and, by extension, the effort that led to this document. The primary component of a park's policies is its General Management Plan (GMP). A GMP is a formal document required for each park and it defines a park's management direction. A GMP is not complete until it has been reviewed by the public and its contents are determined to represent general consensus. Included in a GMP are all proposed new changes in a park's facilities, trails, and roads. Other planning documents elaborate on the GMP's general directives. Those documents include a Resource Management Plan (RMP) and a Backcountry Management Plan (BMP).

General Management Plan

Guidelines found in the Park's GMP (USDI 1981) include the Park's purpose, appropriate management practices, broad goals, and direction for managing its trails. According to the GMP, the Park's purpose is

> to preserve these exceptionally diverse resources and to provide for public benefit from and enjoyment of them in ways that will leave the resources-- and the natural processes of which they are components-- essentially unaltered.

This purpose conforms to that of the Organic Act and establishing legislation, and it is nearly identical with that of the Wilderness Act. To comply with this purpose, the GMP directs that efforts to care for the Park

> be undertaken to restore and/or *[sic]* continue the park's environment in the condition that would have prevailed without interference by nonnative plants and animals and by modem technological man.

In addition, efforts to manage visitors must promote the goal of providing opportunities that increase appreciation of the Park's natural, cultural, and aesthetic values. Appropriate backcountry activities are defined broadly to include walking, fishing, horseback riding, and other activities, presumably including hiking and camping and not bicycle riding.

The GMP offers some directives that are relevant to any consideration of the Park's trail system, including its backcountry campsites and shelters. The GMP states,

> facilities for horseback riding will be kept at approximately the 1975-1976 level; overall impacts from the use of horses will be contained by shifting use from fragile or degraded areas to areas more capable of absorbing the impacts (such as former roadways) and by improving control of the effects of stock on vegetation. . . . Proposed changes in existing development will result in a net increase in hiking trails. Horseback riding facilities are to be kept at approximately the 1975-76 level.

Neither the National Park Service's Management Policies (USDI 1988), the GMP, nor this document considers a trail as a facility, as in *visitor facility* or *management facility.* Roads and

> such an action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities *(Code of Federal Regulations,* volume 36, section 1.5).

According to the CFR, hiking, horse riding, and camping are relevant to this document and appropriate in the backcountry, with the understanding that such activities must not compromise the Park's character and contents for future generations. The CFR establishes several mandates associated with horses.

> The use of horses or pack animals [is prohibited] outside of trails, routes or areas designated for their use . . . [and] the use of horses or pack animals are prohibited [on the Appalachian Trail], except in locations designated for their use *(Code of Federal Regulations,* volume 36, sections 2.16.b and 7.100, respectively).

Bicycle riding in the backcountry is inappropriate, according to specific language within the CFR. The Superintendent, under the CFR, may allow bicycle riding only when provided

> written determination that such use is consistent with the protection of a park area's natural, scenic, and aesthetic values, safety considerations and management objectives and will not disturb wildlife or park resources *(Code of Federal Regulations,* volume 36, section 4.30).

Because such a determination does not exist, this document does not address the activity of riding bicycles in the backcountry. In addition, bicycles are mechanized means of recreation and, therefore, are inappropriate in the Park's backcountry, especially in light of Wilderness proposals.

Within a park, the Superintendent may further restrict an activity that is otherwise allowable if the effects of that activity compromise the park's purposes and overwhelm the capacity to offset those effects. Such decisions are examples of a Superintendent's *discretionary authority* to decide the appropriateness of an activity, although exercising such discretion may require *special regulations* or *public notification.* The judiciary defers to a Superintendent's administrative discretion, as recent court decisions show *(Sierra Club v. Andrus 487* F. Supp. 443 [1980], *Bicycle Trails Council of Marin v. Babbitt* [1994]).

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This document does not consider mileage as a relevant, primary reason for any action. The objective is to improve the system, not expand or contract it. Any change in mileage, whether an increase or decrease, is incidental to this objective.

Resource Management Plan

A park's RMP is a formal document compiled by park staff members and approved by the Superintendent. It defines specific, non-routine actions proposed to protect and preserve a park's natural and cultural resources, and it provides justification for allocating funds to those various projects. The Park's RMP (GSMNP 1995) contains, among other components, a listing, explanation, and relative priority for projects judged by Park staff members as needed to address their primary concerns. The listing is updated annually, most recently in March, 1995. Among the current items are two pertinent to the scope of this document. One pertains to improving the backcountry and trail system, and the other one addresses monitoring visitation patterns and economic impacts.

This project fulfills the need to plan for Improving the Backcountry Trail System (Project Statement GRSM-N-043). The *problem statement* in the RMP illustrates the concern that increases in hiking, horse riding, and backcountry camping during the last several decades have led to demonstrable problems. Many of these problems have been quantified by scientific assessments of trails and campsites. Often, these and other problems are indicated in verbal and written complaints or limited visitor surveys. The objective for this project, as defined in the RMP, is to produce a comprehensive strategy for mitigating the problems.

A second Project Statement, entitled Monitor Visitor Use Patterns and Determine Economic Impacts (RMP Project Statement GRSM-N-164), also relates to issues and concerns addressed through this effort. Its application would support this project's efforts. Studies of visitation patterns and concerns have been conducted in the Park several times since 1956. A well-designed, repeatable effort to understand backcountry visitors, however, has not. This lack of information about backcountry visitation is not restricted to the Park. Roggenbuck and others (1994) point out that relatively little information is available from any source about differences between frontcountry visitors, backcountty day visitors, and backcountry overnight visitors. If provided such information, those people making decisions about the Park's backcountry and its visitors would better understand visitors' needs and concerns. Better understanding would reduce the possibility that some decisions, although intended to protect resources for future generations, lead to unnecessary loss of opportunities for current visitors. This is not suggesting that protection of resources should be compromised to answer the preferences of current visitors. Rather, better understanding helps identify current preferences that are compatible with the mandate of providing for future generations. Information necessary for that understanding is continually needed.

Backcountry Management Plan

Details of the Park's backcountry efforts are found in its BMP (GSMNP 1993). Although some of the material reiterates mandates found in previously reviewed materials, such as legislation or other planning documents, the BMP also contains specific policies about visitor management, trails maintenance, trail signs, backcountry structures, patrol and reporting practices; day-visitors, and information and education. It also addresses research related to recreational activities.

Guidance relevant to this project involves campsites, shelters, trails, and backcountry visitors. For the trail system, the BMP establishes that major rehabilitation projects greatly affecting areas outside the existing trail corridor require a disturbance assessment performed by staff members of the Park's Resource Management and Science Division and approved by the Superintendent. Projects that do not significantly affect areas outside the corridor are categorically excluded from this requirement, as are short relocations. New trails, however, require formal procedures concluding with the Superintendent's determination. Closure of trails, whether temporary or permanent, must follow standard procedures, including final acceptance and authorization by the Superintendent. The same is true for campsites and shelters.

Following the BMP, construction materials must consist of native materials, such as trees, soil, and rocks, whose removal is neither concentrated nor blatant. Finished work is to blend into the setting without seeming artificial or requiring non-natural materials such as cement, concrete, or dimensional, chemically treated, or preserved lumber, although exceptions can occur when no alternatives exist. Scenic vistas are appropriate at selected locations and maintained as necessary.

Motorized equipment is not appropriate without a written proposal approved by the Superintendent, although the option of a seasonal window-- an extended length of time-- is available to provide periods of blanket authorization for work requiring chainsaws. Primary justifications acceptable for motorized vehicles are new trail construction, major reconstruction, or trail relocation. Convenience, such as commuting to a work site, is not an appropriate or acceptable justification. Routine maintenance-- other than seasonal clearing of wind-felled trees-- also is not appropriate justification.

Education of visitors is a primary component of backcountry management and emphasized in the BMP. A visitor who has learned to leave no trace of their visit helps reduce demand on limited Park maintenance resources. Education efforts also help better match visitor expectations with the actual Park.

Monitoring of visitors, their satisfaction, and their effects is another important direction of the BMP. Programs to provide this need are discussed. Specific projects are described in the RMP, examined earlier.

Compendium

A park's Compendium lists all restrictions established under a Superintendent's discretionary authority to further restrict activities in light of a park's particular situation. Because these restrictions pertain to a specific park or park area, they are more specific than those found in either the *Code of Federal Regulations,* volume 36, or in legislation. The Park's Compendium

(GSMNP 1994) is updated annually where needed, most recently in July, 1994, and is available to the public upon request. Arrangement of its contents follows that of the CFR and includes explanations. Excerpts from the Park's Compendium that are related to backcountry 'trails, camping, and non-concession horse riding are found in Appendix B of this document.

The Park's Compendium does not provide mandates comparable to legislated mandates. Instead, it contains regulations based on interpretation of those mandates. Although relevant to this project, restrictions of the Compendium do not necessarily limit alternatives because the Superintendent retains the option to revise them if provided sufficient and convincing justification.

Current Backcountry Conditions

Evaluating whether the Park fulfills its mandates requires an assessment of current conditions. Such an assessment should illustrate where either problems or opportunities exist. The more one knows about the location and scope of problems or opportunities, the better one is prepared to consider alternatives for mitigating problems or realizing opportunities. Current conditions fall into the three categories of setting, opportunities, and stewards (see figure 1). Setting includes trail, campsite, and shelter conditions. Opportunities are provided by the system's design and reflected by the responses of visitors to others. Examples of stewards include NPS programs, cooperative non-NPS programs, volunteer organizations, and others. Stewardship programs include informational and educational materials, trail maintenance and construction activities, and administrational efforts.

Setting

Understanding the backcountry setting means understanding current conditions of trails, campsites, and shelters. The setting is perceived separately by each visitor, so statements about results should not place values on the conditions. Such a statement is seen more properly as a response to *opportunities* and often is an issue or a concern. It is appropriate, however, to identify where conditions seem furthest from those intended for the Park and what trail characteristics are associated with those conditions. Knowing the scope of a problem helps one consider alternative responses.

Trails

The character and contents of the Park's backcountry setting are amplified and, in some ways, distinguished by its trails. Trails provide virtually the only access to the backcountry's many natural or cultural features and they have a remarkable history of their own. The Park's trail system consists of 802 miles of formal trail, including 412 miles in North Carolina and 390 miles in Tennessee (see Table II). In addition, a system of *Quiet Walkways* exist. The walkways extend for short distances from various locations along major Park roads. They are intended to entice people out of their cars and to offer a peek into the woods without requiring the preparation or time of an extended trip. Walkways generally are comprised of paths informally established

Table II Components of Great Smoky Mountains National Park Trail System and Their Mileage.

Trails	Park-- North Carolina	Park-- Tennessee	Park System-- Total
Maintained for Horse Riding and Hiking (State %) [1]	320 (78%)	197 (51%)	517
-- Percentage of Park System	(40%)	(25%)	(65%)
Maintained only for Hiking (State %) [2]	92 (22%)	193 (49%)	285
-- Percentage of Park Svstem	(11%)	(24%)	(35%)
Formal System Total Mileage	412	390	802
- Percentage of Park Svstem	(51%)	(49%)	(100%)
Appalachian Trail (AT) Maintained for Horse Riding and Hiking (AT %)			35 (50%)
-- Percentage of Park System			(4%)
Total Appalachian Trail Mileage (within Park)			71
- Percentage of Park Svstem			(9%)
Quiet Walkways	unknown	unknown	unknown

[1] Horse riding is restricted to trails maintained for the activity.
[2] All trails are available for hiking, but some are intended and maintained only for hiking.

Sources: Marion 1994, GSMNP Trail Map & Brochure (1994), GSMNP files.

over time by visitors, as opposed to trails designed and constructed with an intentional layout or destination. Walkways are a component of the Park's trail system although the paths do not extend into what is commonly considered backcountry and the paths do not have a set trail alignment. Because they are mostly informal, their precise mileage is unknown.

Hiking and horse riding are popular activities on Park trails. Currently, 517 miles of the total system are maintained for horse riding (64% of the Park total), including 320 miles in North Carolina (78% of the NC total) and 197 miles in Tennessee (51% of the TN total). All remaining

trail miles are maintained only for hiking, although hiking is not restricted to those trails. Hiking-only trails usually are narrower and neither designed nor maintained for the heavier combination of horse and rider.

Although types of activities are important, Park trails are also greatly affected by the large number of people who visit the Park and enjoy its trails. Data collected by Van Cleave and others (1990, 1993a, 1993b) during 1988, 1989, and 1990 illustrate the situation (Table III). Information provided in those reports shows great variety in the numbers of people on different trails, and on the same trail during different months. Generally, data show the number of visitors is highest during July and August, and is high again during October when the fall foliage colors appear. The spring wildflower season-- generally from March through May, depending upon location and year-- is another popular time to visit the Park, but data are limited to compare this period to other periods. During the spring wildflower season, soils are typically more wet than during most other times, and both soils and plants are quite sensitive to damage.

Limited information is available about the relative amounts of different activities. On many horse/hiking trails, the rough proportions are expected to parallel those seen in Table I. These figures suggest that, over the course of a year, about 16% of visits are on horseback. On some horse/hiking trails or at particular times of year, the proportion likely is different. For example, many horse riders avoid riding during August when yellow-jackets are common-- a stung horse is dangerous on a trail-- and the heat is hardest on the animals. On the other hand, popular riding times are during the spring wildflower season and the fall foliage season. During these periods, the percentage of people riding horses as opposed to hiking may be higher, at least on some trails, as limited data suggests (Van Cleave 1990, 1993a, 1993b). Generally, however, the most frequently travelled trails shown in Table III are restricted to hiking.

Background. A trail's design, construction, and maintenance must be appropriate for the type and amount of activities anticipated (Hammitt and Cole 1987, Proudman and Rajala 1981). A properly designed and maintained trail supports the type and amount of expected activities without compromising an area's purpose. At the same time, however, an activity that exceeds a trail's design capacity or a trail program's maintenance capacity leads to decaying trail conditions. Selected basic trail features are diagramed in Figure 4.

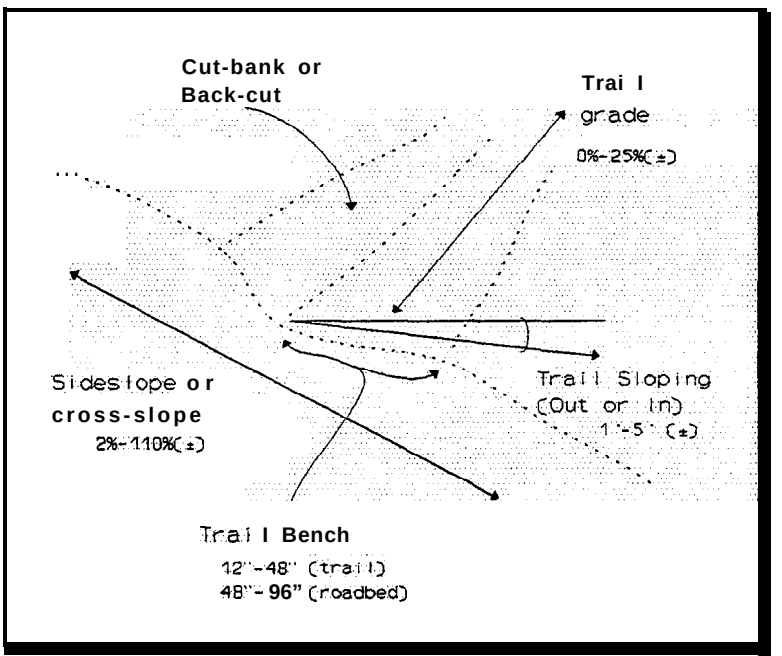

Figure 4 Diagram of a Trail Cross-Section Showing Selected Tread Features.

Table III Known Visitation Amounts for Selected Park Trails.

Trail	Average number of people per day	
	Trailhead	Terminus or Past Primary Destination'
Alum Cave [2]	375	142
Appalachian Trail to Charlies Bunion [2]	553	76
Chimneys [2]	707	255
Ramsey Cascades [2]	179	83
Albrights Grove [2]	16	13
laurel Falls [2]	1487	32
Trillium Gap [3]	1384	50
Rainbow Falls [3]	266	27
Bote Mountain [4]	20	unknown
Anthony Creek [4]	76'	12"
Rich Mountain [4]	31	9
Gregory Bald Trail [4***]	24	17
Rough Fork [4]	117	13
Caldwell Fork [4]	42	unknown
Bradley Fork [4]	191	unknown
Palmer creek [4]	13	9

1 As applied here, terminus refers to the less popular end of the trail. Traffic on some trails falls off dramatically beyond some primary destination that occurs prior to the terminus.
2 Data from summer, 1988, assessed with mat-counters.
3 Data from summer, 1989, assessed with mat-counters.
a Data from summer, 1992, assessed with mat-counters.
' Beyond existing horse camp.
.* On Russell Field trail just above junction with Anthony Creek Trail, not at junction with Bote Mountain Trail.
*** Excluding June data which are exceptionally high because of spring wildflowers (50+ people per day).

Source: Van Cleave 1990, 1993ab.

A trail's tread-width is related to its **alignment** across the slope. Proper alignment depends upon the terrain that the trail must cross and it affects construction and maintenance costs (Figure 5). Tread-width is an even more important determinant of cost in the Park's steep, mountainous terrain than in areas with less steep slopes. This increased importance is because a wider tread, compared with a more narrow tread, requires much more excavation on a steep slope. More excavation complicates trail construction because of the effort necessary to construct a stable back-cut, diagramed in Figure 4. In some locations, stabilizing a back-cut requires a *retaining wall*, often constructed from rocks. Alternatively, establishing a necessary tread-width in some locations may require what is referred to *as cribbing* to build up a section of trail, again often using rocks. All this makes the construction cost more.

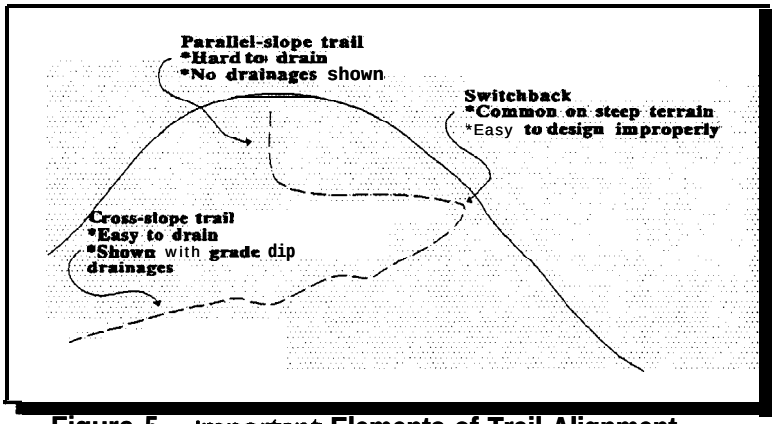

Figure 5 Important Elements of Trail Alignment.

Although a trail's alignment determines the amount of excavation and construction necessary to install a desired tread-width and, therefore, influences construction costs for the trail, alignment also makes its tread either durable and easy to maintain or unstable and difficult to drain. A trail that ascends nearly parallel to the slope will have a grade that approaches or equals the terrain's slope. A parallel-slope alignment allows a maximum rate of ascent, but it produces a trail with minimum cross-slope. Although the trail will gain elevation quickly, require less length to complete the ascent, and need less excavation to install the desired tread-width during the climb, the lack of cross-slope means water can only run directly down a trail, regardless of drainage installation. A trail that traverses a slope and has a moderate grade, however, is easy to drain because the cross-slope is sufficient. This is especially true when the trail's tread is properly pitched away from the face of the slope at a slight angle-- a technique called *outsloping*. Although traversing a slope requires greater trail length and more excavation to establish a stable trail bench, the result is a durable, sustainable trail.

Proper trail alignment on steep terrain also often requires installation of *switchbacks*. A switchback allows a trail with a mostly constant grade to ascend a steep slope without going completely around a mountain. Although a switchback is often necessary, switchbacks are difficult to design and construct well. A poorly designed or constructed switchback is prone to people cutting between the upper and lower segments of trail and to water eroding the turn or the segment of trail below the switchback. One of the most important, yet difficult considerations when one designs or constructs a switchback is outsloping. As a trail's tread approaches a switchback from above, the outsloping must be rolled in towards *the* slope to become *insloping*. This change in the tread's pitch allows it to carry water along the edge of the trail that is into the slope. Water on the trail will then drain off at the outside of the switchback where the trail turns

and begins travelling in the opposite direction across the slope. By draining the water at the trail's switchback comer, one keeps it from draining onto the trail segment below the switchback. When the trail exits the switchback's lower end, the tread is outsloped again.

Draining a trail tread is perhaps the most important design, construction, or maintenance action one can take. A trail unavoidably diverts water from naturally flowing either along the ground surface or in the portion of the soil that is exposed when the trail is cut into the slope. In addition, a trail's grade causes water that enters the trail either to flow along it or, if the trail is flat, to stand as a puddle. Flowing water erodes soil; standing water can become mud. Drainage, however, diverts water off a trail and back to a more natural flow along the ground surface. Unless one properly drains a trail and then maintains those drainages, erosion and mud will occur regardless of the type or amount of activities occurring on the trail.

Several techniques for draining a trail are common. When designing a trail, one can layout *grade dips.* For example, a trail ascending with a 10% grade can descend at 3% for 10-20 feet and then return to a 10% ascending grade. The slight descent will cause water to divert off the trail at the low point between the two grades. Alternatively, one can retrofit drainages by installing them after a trail's bench is completed or as problems appear over time. Examples of these drainage techniques include collection drainages to keep water from entering a trail and diversion drainages to divert water off of a trail. A *lateral drainage ditch* along the side of a trail, a *"Y-shaped drainage"* above a trail, and a *"T-shaped drainage" are* examples of collection drainages. Diversion drainages extend across the trail's tread and divert water to the trail's low side. Examples include *drainage dips, wood water-bars,* and *rock water-bars.* In each case, the drainage extends outside both the high-side and low-side of a trail, often with a rock or pile of rocks to keep people and water from going around the drainage. By extending outside the tread, the drainage is most likely to catch and divert any water flowing down the trail.

Drainages require a minimum amount of cross-slope because flat ground allows water to form puddles instead of draining. Wherever possible, a trail location should allow for drainage and should occur on no less than a slight slope. If a trail must cross flat terrain, then the tread often requires elevation. Several tread-elevation techniques are available, including *stepping-stones* or *bog-bridges* for hiking trails, *boardwalks* or *puncheon* for horse/hiker trails, or *turnpiking.* Stepping-stones are moderate sized rocks placed a short stride apart. Bog-bridges are longer logs that are elevated on short logs. The longer logs serve as a tread. Boardwalks and puncheon are also elevated above the ground, but they are constructed with dimensional lumber and designed to support horse riding. Tumpiking refers to an elevated section of rock, gravel, and soil constructed across a flat area and designed to support hiking or horse riding.

Two types of backcountry trails are maintained in the Park: trails maintained for both horse riding and hiking and those maintained solely for hiking. All Park trails are available for hiking, but horse riding is restricted to those trails that are intended to support horse riding. There are two reasons for this constraint. First, a horse's height, weight, gait, and shoes lead to design implications that increase the amount of work necessary to design, build, and maintain trail. Secondly, a trail designed to accommodate horses has some necessary attributes that may restrict opportunities for certain experiences. For example, some hikers prefer a trail that is more

narrow and simple than is possible for most trails designed and maintained for horse riding. In the Park, a horse/hiking trail-- although available for hiking-- is constructed and maintained for the effects of horse riding and the general needs of horse riders for a wider and taller trail corridor and a more substantially constructed trail tread. A hiking-only trail, however, is typically designed and maintained for the different, often lesser effects of hiking and the different needs of hikers for a less substantial trail corridor and tread. NPS regulations prohibit horse riding on Park hiking trails.

Different design requirements of the two types of trail can lead to different costs. A horse/hiking trail costs more to design, build, maintain, or reconstruct than a hiking-only trail. Part of the cost difference is due to the wider trail bench on horse riding trails; another part is dependent upon the local soil and terrain that the trail must cross. The width of a trail's bench varies on horse/hiking trails and some sections can be as narrow as any other trail. Generally, when designing a sustainable trail in a popular area like the Park, a horse/hiking trail requires a width between 24" and 48", compared to a hiking-only trail that requires a 12"-30" tread. When a former roadbed or railroad grade serves as a trail, however, the width tends to depend less on the intended activity and more on the former one. Another consideration is the number of people on a section of trail because that number also greatly affects tread width, regardless of whether hiking or horse riding occurs.

Terrain, soil, and the type and amount of anticipated activities are the most important considerations of trail design. In sections with especially difficult circumstances, such as wet soil and steep slopes, constructing or repairing the trail to support horses can cost at least 10 times more than if only hiking is expected. In other places, where soil is dry and the terrain not steep, or where large numbers of hikers are anticipated, the difference may be much less. For example, a section of trail with wet and organic soils commonly will turn to mud regardless of whether horse riding or hiking occurs, but constructing the trail to prevent mud will cost more when the design requirements include horse riding, as opposed to just hiking. A comparison of the activities' effects is found in a later, separate section of this document. Generally, designing and constructing a horse/hiking trail is more complicated compared to a hiking trail because the horse/hiking trail must accommodate a horse's greater weight, the capacity for horseshoes to cut through material, and the wider and more uniform gait of horses. Exceptionally popular sections of hiking trails, however, are also more complicated and several Park trails fall into this category.

The Park's preeminent trail, for many people, is the *Appalachian Trail (AT),* running for 71 miles from Fontana Dam to Davenport Gap, mostly along ridges that can provide spectacular views and respite from summer heat below. Five distinct segments totaling 35 miles of the AT in the Park are maintained for both horse riding and hiking (50% of the AT's total mileage in the Park). The AT section between Newfound Gap and east to Icewater Springs shelter is among the most popular in the Park and is restricted to hiking only. During 1989, as many 670 people per day hiked some distance from the trailhead, although less than a third of these people went much more than one-half mile (Table III).

Numerous miles of unofficial or abandoned trails also exist. An extended shortcut or an abandoned trail that is still passable is called a ***manway*** by local residents and Park staff members.

Manways comprise a portion of the unofficial trail system and some are quite gullied. Several visitors have injured themselves while travelling these routes. Unofficial routes also include many miles of old roads and railroad grades that remain from the nineteenth and early twentieth centuries.

Trail assessments provide information about either a trail's location, condition, or maintenance needed (Williams and Marion 1992, Appendix D). A *rapid assessment* can identify location and inventory signs or trail features. A *trail assessment,* compiled by trained workers, provides more detailed information about conditions along a trail or trail system. A *prescriptive maintenance worklog,* compiled by experienced trail workers, can catalog existing conditions and maintenance actions necessary to repair any problems. The advantages of a worklog is that it describes the work needed, the availability of natural materials for accomplishing the work, and the condition of existing work. With such information, trail crew scheduling can occur along with budgeting or contracting.

Marion (1994) provides the most recent, detailed assessment of Park trail conditions. His assessment applied *trail assessment* techniques and does not include any Quiet Walkways. Little specific information is compiled about the current condition of walkways. Field work for the assessment occurred in 1993. Marion's (1994) report of findings includes a complete description of his team's survey methods. His work follows earlier assessments completed by Bratton and others (1978a, 1978b, 1978c, 1979), Whittaker (1978) and Renfro (1985). Comparison between Marion's (1994) findings and previous studies, whether in the Park or elsewhere, are difficult because few standardized procedures have been adopted. Marion (1994) discusses this issue and several others related to comparisons across time. These questions are relevant to all trail assessment efforts, especially those that are part of a monitoring effort.

Conditions. Marion's (1994) effort assessed 72 trails totaling 328 miles (41%) of the Park's 802 mile system. Of the trails selected, most (67%) are maintained for horse riding. This percentage nearly matches that of horse trails for the whole Park (Table II). Trails were selected by Park staff members to encompass those generally believed in the worst condition, although a diverse set of trail conditions and locations are represented.

Extrapolating from the conditions of one group of trails to those of an entire trail system requires a study designed around assessing trails selected in a statistically appropriate manner. Some forms of statistically valid selection emphasize random selection and other forms apply structured selection. At least two methods of random selection exist. The more traditional method is defined by drawing or picking items randomly from a pool of possible choices. Another method, however, is defined by whether one is willing to exchange any item selected with any other choice in the pool of alternatives (Shavelson and Webb 1991). Although Marion (1994) assessed trails that were picked without a random drawing, the willingness Marion and Park staff members to exchange any trail selected with virtually any other suggests that some extrapolation to the complete trail system is appropriate. In addition, although Park staff members believed the selected trails would represent the worst trails in the Park, results show that many sections of the selected trails are in good condition. For this reason, Marion's (1994) results are

quite representative of the entire Park trail system and, again, some degree of extrapolation is entirely appropriate.

The current document assumes that Marion's (1994) assessment of 41% of the Park's trails produced figures that account for SO%-60% of the trail system's total, but also recognizes that the actual figure is not precisely known. The low end of the presumed range is a 50% figure because that is about 10% above 41% and should compensate for selecting trails believed to be in poor condition. Another 10% is added to reach the range's high end of 60%, 20% above 41%, in case 10% does not sufficiently compensate to the selection procedures.

Results from Marion's (1994) work show localized occurrences of significant soil erosion and wet soils (Table IV) and great variety in the density per mile and effectiveness of trail maintenance items such as drainages (Table V). A localized occurrence of particular condition is typical for any trail because terrain, soil type, and the presence of water varies along its length, as can the type or amount of activities.

A common measure of a trail problem is its total distance, but this can be deceptive. A large problem in the middle of a long section of trail can affect both the real and perceived quality of the entire section even when, for the entire trail, the cumulative distance of that particular type of problem is not great. At times and for some people, a section of trail may seem enough of a problem that it reduces opportunities outside its immediate vicinity and detracts greatly from the entire trail's quality. Opinion, then, determines an important portion of a problem's significance.

Of the current conditions along the Park's trails, **soil erosion** is the most common problem, measured by total linear distance. Erosion is the loss of soil by wind or water. Recreation can loosen a trail tread's soil and make it more vulnerable to erosion. Soil loss is a problem when it occurs after a trail's construction and is significant. Marion (1994) obtained two measures of soil erosion: root exposure and significant soil erosion. Both measures are defined in a detailed manual provided with his report. Significant soil erosion, defined as greater than one foot below post-construction depth, is found on 14.6 miles of trail (4.5% of the assessed miles). Of the trails assessed, significant erosion occurs on each trail an average of 239 feet per mile or 1,071 feet (0.2 miles) per trail. Root exposure, defined as exposure of the tops and sides of many moderate or large roots, is found on 2.4 miles (0.7% of the assessed miles). Although root exposure typically shows loss of soil from erosion, it also can show soil compaction. Soil compaction occurs when an activity such as hiking or horse riding compresses soil more tightly than would naturally occur.

The most severely eroded sections of trail surveyed include the Bote Mountain Jeep Trail (the upper 1.7 miles of the Bote Mountain Trail) and Rainbow Falls Trail. Bote Mountain Trail is maintained for horse riding and is very popular for both hiking and horse riding. Rainbow Falls is a hiking-only trail. Much erosion along Rainbow Falls Trail, from the trailhead to the falls, also occurs off of the established tread because hikers have made shortcuts between legs of the trail. Two sections of the AT also have greatly eroded tread: from Newfound Gap to Ice Water Springs shelter, and from Clingmans Dome to Silers Bald. Another section of the AT, from Miry Ridge to Spence Field, contains several particularly deteriorated segments, especially near Thunderhead Mountain. Horse riding has been prohibited for about 20 years on the AT's currently most damaged sections, with the section between Russell Field and Spence Field the

Manways comprise a portion of the unofficial trail system and some are quite gullied. Several visitors have injured themselves while travelling these routes. Unofficial routes also include many miles of old roads and railroad grades that remain from the nineteenth and early twentieth centuries.

Trail assessments provide information about either a trail's location, condition, or maintenance needed (Williams and Marion 1992, Appendix D). A *rapid assessment* can identify location and inventory signs or trail features. A *trail assessment*, compiled by trained workers, provides more detailed information about conditions along a trail or trail system. A *prescriptive maintenance worklog*, compiled by experienced trail workers, can catalog existing conditions and maintenance actions necessary to repair any problems. The advantages of a worklog is that it describes the work needed, the availability of natural materials for accomplishing the work, and the condition of existing work. With such information, trail crew scheduling can occur along with budgeting or contracting.

Marion (1994) provides the most recent, detailed assessment of Park trail conditions. His assessment applied *trail assessment* techniques and does not include any Quiet Walkways. Little specific information is compiled about the current condition of walkways. Field work for the assessment occurred in 1993. Marion's (1994) report of findings includes a complete description of his team's survey methods. His work follows earlier assessments completed by Bratton and others (1978a, 1978b, 1978c, 1979), Whittaker (1978) and Renfro (1985). Comparison between Marion's (1994) findings and previous studies, whether in the Park or elsewhere, are difficult because few standardized procedures have been adopted. Marion (1994) discusses this issue and several others related to comparisons across time. These questions are relevant to all trail assessment efforts, especially those that are part of a monitoring effort.

Conditions. Marion's (1994) effort assessed 72 trails totaling 328 miles (41%) of the Park's 802 mile system. Of the trails selected, most (67%) are maintained for horse riding. This percentage nearly matches that of horse trails for the whole Park (Table II). Trails were selected by Park staff members to encompass those generally believed in the worst condition, although a diverse set of trail conditions and locations are represented.

Extrapolating from the conditions of one group of trails to those of an entire trail system requires a study designed around assessing trails selected in a statistically appropriate manner. Some forms of statistically valid selection emphasize random selection and other forms apply structured selection. At least two methods of random selection exist. The more traditional method is defined by drawing or picking items randomly from a pool of possible choices. Another method, however, is defined by whether one is willing to exchange any item selected with any other choice in the pool of alternatives (Shavelson and Webb 1991). Although Marion (1994) assessed trails that were picked without a random drawing, the willingness Marion and Park staff members to exchange any trail selected with virtually any other suggests that some extrapolation to the complete trail system is appropriate. In addition, although Park staff members believed the selected trails would represent the worst trails in the Park, results show that many sections of the selected trails are in good condition. For this reason, Marion's (1994) results are

Table V Presence and Condition of Tread Drainage Features on Park Trails.

Category and Effectiveness	Assessment total[1]	Percentage of Category Total	Density per mile[2]
Drainage Dips			
Effective	837	20%	3.05
Partially Effective	1522	37%	5.68
Ineffective	1778	43%	5.99
Total (drainage dips)	4,137	100%	14.72
Water Bars (both wood and rock)			
Effective	1671	44%	4.67
Partially Effective	891	23%	2.52
Ineffective	1242	33%	3.40
Total (water bars)	3,804	100%	10.59

[1] Based on 328 miles of trail (41% of the Parks formal system). The current report assumes that figures in the table shown here represent 30%-50% of the figure expected for the Parks entire system, and that indicator values for the full system are between two and three times the total figures shown here.

[2] Approximately 1 water bar or drainage dip occurs every 209 feet on the trails surveyed and 1 effective drainage of either type occurs every 684 feet.

Source: Marion (1994).

Trillium Gap Trail, and the Appalachian Trail from Icewater Spring Shelter to Newfound Gap. Of these trails, only Trillium Gap is maintained for horse riding and, even there, the frequency of horse riding is low because, in part, parking for a vehicle with a trailer is often difficult to find. Exposed roots often occur when a trail is not properly benched into the side of a slope during construction, meaning that it was not dug into the slope enough to provide a wide and stable tread. Alternatively, exposed roots may appear if a trail's tread slumps down a slope for one reason or another.

Relational analysis shows that root exposure is associated with the trail's popularity (number of people per day) and is less likely to be found on trails located along drainage bottoms. Proper trail construction and maintenance can eliminate root exposure, although this means cutting roots to establish a properly wide tread. In most cases, cutting roots to install or maintain a tread will not harm trees to the point of killing them. If an area is considered sensitive to removing roots,

one may decide either to relocate the trail tread to an alignment requiring less construction or to elevate it on sections of boardwalk, turnpike, puncheon, or bog-bridges. These techniques are reviewed in trail maintenance guidebooks. Individual visitors can help by staying on intended treads and by letting Park employees know if a section of tread has begun to slump.

Wet soil is also common, with 11.3 miles of the surveyed miles affected. On a trail tread, such soil is a problem because it is easily damaged or churned to mud. Also, some people tend to go around muddy areas, although doing so easily leads to more mud and makes the tread wider than intended. Extreme cases of muddy soil can be 50 feet long, 15 feet across, and 2 feet deep. Occasionally, cases of wet soil located separately along a trail can occur quite close together and produce an even more magnified perception of mud. Muddiest trails include Long Bunk and Little Cataloochee, both in the Cataloochee area. Overall, the Cataloochee area contains exceptionally high amounts of wet soil. The Park receives consistent complaints that refer to wet soil on Russell Field Trail in the Cades Cove area, although Marion's (1994) report shows other trails as more problematic. The discrepancy between the complaints and Marion's (1994) report may stem from, on the one hand, a concentration of problems around where several reconstruction efforts have recently occurred or, on the other hand, the trail's popularity.

Relational analysis suggests that increased maintenance, relocation away from drainage bottoms, or decreased amounts of horse riding will reduce wet soil. Again, this finding is supported by trail maintenance guidebooks, referenced earlier, and other trail assessments (McQuaid-Cook 1978; Summer 1980, 1986; Whittaker and Bratton 1978). Informing visitors to remain within the intended tread and to expect some muddy sections may lead to fewer new incidents of excessively wide, muddy sections of trail.

Water running on a trail, as opposed to across a trail, also presents problems because running water can erode soil and, as with wet soil, some people will go around these areas. Walking outside an established trail tread will cause the tread to widen. In some extreme cases, a trail section is indistinguishable from a streambed. Trails with the most frequent occurrence of this problem are Fomey Ridge and Little Cataloochee, although several other trail sections also are nearly creek beds, including a section of the Lakeshore Trail known as Pinnacle Creek and sections of Indian Gap Trail, Jonas Creek Trail, and Enloe Creek Trail. Because of the Park's topography, trails often are located along streams. Trails most likely to have water running on them are in the Oconaluftee area.

More frequent drainage installation, careful drainage placement, and increased maintenance of those drainages can reduce or eliminate the problem of water running on a trail, as discussed in trail maintenance guidebooks. Extreme cases, however, may require relocation of the trail.

Trail with multiple treads is another problem in the Park, although the total lineal distance is not great (6.4 miles, 1.8% of total miles assessed). A trail section with multiple treads is a problem because it represents significantly greater width than sections of trail before or beyond the location, and greater width than when the trail was constructed. Multiple treads commonly occur where people, whether hiking or riding, perceive the trail's condition as a problem and leave the intended route so as to avoid that problem. Additionally, especially in open areas, people walking or riding two or more abreast may produce multiple treads. Sections of trail with

multiple treads are most frequent on Rainbow Falls Trail and Lead Cove Trail, and generally most common in the Cataloochee area.

Relational analysis shows that the problem of multiple treads is associated with wet soils, excessive tread grade, greater amounts of horse riding, and trails positioned on lower slopes. The problem may be addressed by installing or more frequently maintaining tread drainages or otherwise addressing reasons people leave the intended tread. In addition, informing people that walking or riding abreast leads to problems may promote greater tendency to stay within the intended tread. Prohibiting horse riding on trails with this problem is another potential solution.

Marion (1994) also provides an assessment of current design and maintenance conditions of backcountry trails. One of the more important design features to **assess** is **trail grade (see** Figure 4). A trail's grade refers to its angle of climb or descent expressed as a percentage ratio. In many places, a grade of more than 15% leads to problems. To simplify assessment procedures, Marion (1994) instructed surveyors to assess as excessive all trail sections with a grade greater than 20%, a lenient value. Nearly five miles of the Park's trail system exceed 20%, revealing sections where tread construction likely is very important, and, in some cases, relocation should be considered.

Marion's (1994) trail assessment procedures intentionally do not assess the presence or effectiveness of every possible trail reconstruction technique. This is because the assessment reviewed current conditions, not potential conditions. Unless a particular trail construction technique appeared frequently on the trails surveyed, the assessment would not reveal its effectiveness. Several techniques, described in various trail maintenance guidebooks, likely would alleviate trail problems as well or better than the options Marion (1994) revealed through statistical analysis of his available data.

Tread drainage is one category of tread maintenance that is both essential for a stable trail and relatively easy to assess. As shown in Table V, many more drainage dips are ineffective than are effective. Ineffective water bars also occur in great numbers. Because drainage items are needed fairly uniformly on trails, this document assumes that the 41% of the system assessed during Marion's (1994) study represents 30%-50% of the necessary drainages. Assuming this estimate is correct, it means that, for any category, the value for the entire trail system may be between two and three times (200%-330% of) the reported value shown. For the trails that were assessed, an average of one drainage occurs every 209 feet and one effective drainage occurs every 684 feet. These values do not reflect whether a sufficient number of drainages exist because surveyors were not assessing where additional drainages are needed. It is common for some fairly long stretches of trail to require only infrequently installed tread drainages, especially if the trail is well built. During this current project, however, an informal survey of ten trails occurred. The trails were selected because Marion's (I 994) report identified them as having problems. That informal survey showed that sufficient tread drainage is very often lacking and that the lack of drainage is often associated with tread problems.

A central need for Park trails is more frequent drainages, improved construction of those drainages, and reconstruction and continued maintenance of existing drainages. The severe topography, high amounts of annual rainfall, and large number of visitors will constantly combine

to stress any efforts to drain the trails. Increasing the number, type, frequency, and maintenance of drainages is necessary to protect the Park's trails from damage to natural and historic features, loss of trail quality, and loss of opportunities for visitors to find enjoyment.

Backcountry campsites and shelters

Opportunities provided by the Park's backcountry setting also depend on backcountry campsites and shelters. A related component of the backcountry trail system is the network of designated camping areas and shelters (see Table VI). That network facilitates overnight backcountry visits and protects Park contents by requiring that visitors camp in designated areas. Some exceptions apply (Appendix A explains applicable regulations), but nearly all backcountry camping occurs in these areas. There are 83 designated backcountry camping areas. For lack of a better definition, a camping area means a location marked on the Park maps and in whose general vicinity visitors are required to camp. Of those 83 camping areas, 15 are rationed, meaning no more than a fixed number of campers are allowed at any one time. Rationing is accomplished by a backcountry reservation system handled by the Ranger Division's Communications operation. Horses are allowed at 49 of the 83 areas. Horses are prohibited at camping areas located along trails constructed only to accommodate hiking. Most backcountry campsites are found below the 3,000 foot elevation, although there are exceptions including several over the 5,000 foot elevation.

There are also 18 open-faced camping shelters in the Park, including 13 along or associated with the AT. A total of 214 bunks are available at these shelters. Of the shelters, horses are allowed at 13 of the total number and 9 of those on the AT. Most shelters are found above the 4,300 foot elevation and have chain-link fencing across the open face to keep out black bears.

Background. The intention of a designated campsite system is to concentrate visitor activities so that the effects of those activities also are concentrated. Concentrating camping at designated campsites protects areas of the Park where camping is not allowed. In contrast, a dispersal camping policy, when applied strictly, requires people to camp where no previous camping has occurred so as to spread camping as lightly as possible across the entire area. A third alternative is at-large camping. Under an at-large policy, people camp wherever they wish.

Currently at the Park, the actual policy in effect is more akin to concentrated at-large camping because no specified camping sites exist within the camping areas (Marion forthcoming). People are required to camp in a general area, but within that area they can disperse. This can lead to problems separating campsites within a camping area from sites where previous campers have deposited their personal waste. In addition, such a policy can lead to more disturbance associated with camping than other policies. And, such a policy is difficult to enforce because a visitor can easily stretch the camping area's informal boundary.

Vehicle-accessible horse rider camps, commonly called horse camps, also are a component of the Park's network of backcountry camping areas. The primary reason for any horseback rider staying at one of these camps is access to the backcountry trail system. This distinguishes the horse camps from other developed campgrounds in the Park where access to the trail system is not necessarily a reason for visiting. These horse camps, therefore, are a component of the backcountry trail and camping system although they are located in frontcountry areas and provide

Table VI Great Smoky Mountains National Park Backcountry Campsites and Shelters.

Backcountry Camping Area Category	Total Number for Category	Percentage of total
Designated camping areas	83	100%
Rationed	15	18%
Horses allowed	49	59%
Rationed and horses allowed	8	10%
Number of campsites (total)	309	n/a
Undesignated (illegal) campsites	68	n/a
Shelters	18	100%
Rationed	18	100%
Open to horses	13	72%
Number of bunks	214	100%
		Capacity (people, horses)
Vehicle-access Horse Camps	5	(120,120)'
TN camps	1	(12,12)*
NC camps	4	(27,27)**

Total capacity.
Average capacity.

Sources: Marion (forthcoming) and 1994 Park Trail Map.

rustic accomodations such as horse stalls, toilets, and trailer-access. Five camps exist. Four are located in North Carolina and have an average capacity of 22 people and 22 riders. The fifth camp is in Tennessee and has a capacity of 12 people and 12 horses. No assessment of these camps has occurred that is comparable with assessments of backcountry campsites and shelters.

Conditions. Marion (forthcoming) provides the most recent assessment of backcountry campsite and shelter conditions. That work inventoried the physical effects of camping by applying a standardized set of procedures that are repeatable in the future. Careful procedures allowed surveyors to distinguish campsites from each other. The assessment does not capture the structural integrity of shelters, but it does capture the individual and cumulative condition of backcountry campsites, including soil and vegetation, location and description, and total area.

There are 309 legal and distinguishable campsites among the Park's 83 designated camping areas. Another 68 undesignated campsites also exist. An average of 3.8 distinguishable campsites are found at each designated camping area. One camping area has 12 separate campsites. Obvious erosion occurs on 13 campsites (4% of the total) and bare soil is widespread at another 114 campsites (29%). The typical campsite has lost much of its vegetative cover, is mostly covered by pulverized organic litter, and has bare soil limited to its core area. The area of one extreme campsite is 23,948 square feet, equivalent to a square with sides 155 feet long.

Of the shelters or legal campsites associated with designated camping areas, most campsites are located within sight of a trail (60% are within 25 feet). Also, many campsites are located within sight of other ones (47% of sites are visible from two or more other campsites). Of the designated, rationed camping areas, a typical associated campsite has an area of approximately 1700 square feet that includes 650 square feet of lost groundcover vegetation and 850 square feet of exposed soil. A median is the value separating the total number of campsites in two, meaning that 50% of the sites fall above and below this figure (this is not an average or mean of all values). Of the designated, unrationed camping areas, each associated campsite has contains approximately 900 square feet that includes 520 square feet of lost groundcover vegetation and 470 square feet of exposed soil. However, for all campsites, visibly damaged trees are rare (median <1) and the typical campsite has only a single firesite (median value).

Opportunities: Issues and Concerns

The Park's backcountry setting provides opportunities for people to enjoy it and the opportunities are assets of the backcountry area. Protecting the setting while providing opportunities for enjoyment requires stewardship such as management actions, informational materials, or maintenance efforts. At times, opportunities may be limited by stewardship efforts, such as restrictions, although the limitation is typically intended to offset problematic effects associated with those opportunities.

If a person responds negatively to a setting's condition or a steward's action, one may categorize the response as either an issue or a concern. Typically, two or more parties disagree over an issue, while two or more parties share a concern (Blahna and Yonts-Shepard 1990). It is possible for two parties to share a concern that a third party considers an issue. It is also possible for two parties to share a concern, yet disagree about a detail, making the detail an issue. For example and speaking generally, horse riders and hikers are concerned about the Park's trail conditions and seem to agree that trails need improvement. Sometimes, however, an issue arises when members of one group disagree with those of the other about whether a particular condition

is a problem and at what point it qualifies as a problem Not every issue is a problem, however, because differences can also present possible solutions.

Assessing whether the setting's condition agrees with Park mandates requires, among other sources of information, an understanding of visitors' responses to the setting and its opportunities. Visitor responses alone, however, are not a sufficient measure because they must be reviewed in light of Park mandates. Without the guidance of mandates, there can be no continuity or consistency in Park administration. Nevertheless, if a visitor's response fits within the inherent flexibility of Park mandates, then that response helps Park staff members and others decide whether the Park's conditions are acceptable. This is especially true when the responses of many visitors are considered together.

Visitor responses also allow one to consider the effects on opportunities of either existing or potential stewardship efforts. This is an important piece of information. Without it, one is unable to understand the effects of existing efforts or to consider comprehensively the possible effects of various alternatives. By listening to visitors explain how they respond to the setting's contents, character, and opportunities, one better understands what is important about the Park. Extending that discussion to include their ideas about existing problems and ways to address those problems, one better understands what is workable.

Opportunities are often assessed with social science techniques from the fields of psychology, sociology, or management. One means for assessing opportunities is to ask people for their reactions to the Park, its contents, other visitors, and administrative actions. Typically, a researcher employs a survey instrument to characterize visitors and their responses, although qualitative assessment of interviews is becoming more common as another technique for pursuing detailed understanding of selected issues.

No recent social science survey of backcountry visitors is available for the Park. A survey was completed in 1993, but has not been submitted to the Park nor reviewed by other social scientists. Therefore, it is incomplete and unavailable for this project. In lieu of the information collected through such assessments, it remains necessary to understand what people think about current conditions.

During discussions that occurred as part of this project, several hiking or horseback riding organizations offered their comments during meetings or through letters or telephone calls, as did many conservation organizations, Park staff members, and other people who expressed an interest in the Park's backcountry or trails. From the fall of 1994 to the spring of 1995, several newspaper articles addressed this project and its issues. Some people, after seeing this coverage, contacted the Park to offer their opinions. The opinions reported with this document do not represent results of a survey. Also, other issues and concerns likely exist beyond those communicated to this project.

Because no scientifically designed survey was completed, no effort is made to apply statistical analysis or derive the number or percentage of individuals associated with any particular opinion. Instead of focusing on characterizing those people who have concerns, this project focuses on the concerns alone. The information is anecdotal; yet, it also is very helpful because it highlights issues and ideas that might not otherwise be considered. In the presentation that follows, the

comments are grouped into topics and subtopics. They are not ranked or treated according to who or how many people mentioned the concern.

Generally, there are five broad groupings of people who care about the Park. These groups are NPS staff members, general Park visitors, hikers, horse riders, and conservation organization members and staff. Within each of these groups, there are some people who live locally and others who do not. These groupings are broad categories and, therefore, each group is quite diverse, although the degree of diversity likely varies. There is also some overlap between the groups because they are comprised of some people who are interested in several activities or are involved with a conservation organization and an activity-oriented organization such as a riding or hiking club. Because no available and current survey characterizes these groups well, none of the following discussion reflects group characteristics. Only the concern itself is emphasized.

Setting Conditions

Backcountry stewardship requires understanding the opportunities provided by the setting, as well as understanding unsatisfied or lost opportunities. Issues and concerns about Park conditions generally fall into one of three categories. Trail condition is one category, campsite and shelter condition is another, and trail system contents is a third.

Trail Condition. Trail conditions directly and indirectly affect opportunities for enjoyment. Visitors find the quality of a trail lessened by conditions they consider poor, although different visitors may disagree about whether a particular condition is substandard. Similarly, visitors may perceive conditions as lost opportunities for future enjoyment by others. Unsafe conditions can directly detract from enjoyment, especially if one is injured, and they can indirectly detract from the quality of a visit if one's worries about personal safety cloud one's perception of Park wonders.

Comments about trail condition include those that address either the presence of physical conditions or the absence of constructed or engineered conditions. Most comments about trail condition qualify as concerns because widespread agreement exists that particular conditions are undesirable and, therefore, problems. One concern is excessively **wide trail tread,** as when multiple treads occur or when people walk or ride around some difficult section. Another is the presence of **mudholes,** often associated with excessively wide trail tread. Many people-- horse riders, hikers, and Park personnel-- agree that mudholes should be prevented and, where they exist, the trail reconstructed. In contrast, another concern is that some locations have **insufficient tread width,** as may occur where vegetation encroaches on the corridor, where the tread bench has slumped below its original location, or where soil has slumped onto the trail bench from above. **Steep, undrained gullies** are also a common concern. Where they occur, relocation or reconstruction often is necessary. **Switchback shortcuts** are another concern because the shortcuts are scars that detract from a trail's quality and they allow water to run down steep slopes and erode soil or even wash-away trail tread.

At issue among some people is **the presence of horse manure.** Some people, usually hikers, find trail conditions and their enjoyment lessened by horse manure, but other people, usually horse riders, find trail conditions unaffected by manure. A related issue is **horse urine in mudholes.**

Some people are greatly bothered when they must traverse a mudhole that has manure and urine plainly evident. Other people are not bothered at all. People participating in discussions related to this project offered several opinions to explain this difference. Part of the difference in opinion may relate to an individual's proximity to the mudhole. Hikers must walk through or next to the mudhole-- with its smell and flies more immediate-- while horse riders are elevated above the mud by their horse. On the other hand, part of the difference in opinion may relate to the individual's experience with stock animals and corrals.

Although many people believe that the Park's backcountry should challenge people and that one challenge is the experience of crossing unbridged streams, a common concern is that several streams have **unsafe stream crossings** and need a bridge. These include the Hannah Mountain Trail across Abrams Creek, the Little River Trail across Little River, and the Goshen Prong Trail at Little River Ford. The **absence of tread engineering,** especially what is called *tread hardening* or *tread elevation* is another concern. Tread engineering refers to major construction or reconstruction, as opposed to intermittent installation of drainage or other items. Tread hardening in a backcountry setting does not involve paving or asphalt. It does include actions such as replacing muddy soil with rocks or gravel and properly draining the location. This concern is related to the physical condition of trails because a well constructed trail will have necessary tread engineering items and few mudholes, gullies, or excessively wide sections.

Campsite and Shelter Condition. Opportunities for enjoyment are influenced by campsite and shelter condition, sometimes even if one does not stay the night. The presence of unexpected conditions or the absence of expected conditions can detract from the quality of one's visit and reduce one's enjoyment of the Park.

Comments about backcountry campsites and shelters involve location, condition, and visitor behavior. Concerns about the backcountry reservation system are discussed under the heading of *Management* because it is a function of NPS administration. A concern about location that is associated with condition is that **some campsites are too accessible.** Examples of this include Ledbetter Ridge (#10), West Prong (#18), Pretty Hollow (#39), Lower Chasteen Creek (#50), Mount Collins Shelter, and Kephart Shelter, although relocating or removing any one of these sites may not eliminate camping at its existing location.

Several concerns related specifically to horses at campsites and shelters. The concerns are **riding gear (tack) inside shelters, the condition of hitch racks,** and **horse manure in the immediate area of a shelter,** as may occur when a horse is ridden or led to shelters for loading *or* unloading. Some of these concerns are related to **unpleasant smells.** Several of these concerns are also associated with **the location of hitch racks.** Riders need to tend their horses when they are visiting a shelter, but some hitch racks are located too far from a shelter to allow for this. Another concern associated with horse riding is **the introduction of non-native plant species** to the camping area.

Other concerns treat horses and hikers similarly. For example, **accumulation of horse manure or human waste** in or around campsites, and **pollution or disturbance of water sources** whether by horses or people, both are common concerns. The conditions that lead to these two concerns affects opportunities because health and aesthetics are potentially threatened.

A specific concern addresses the January 1994 **closing of Ice Water Springs shelter** on the AT. Because of its proximity to Newfound Gap, the shelter consistently attracted more people than it can accommodate. Without it, however, long-distance hikers must travel 15 miles between Mount Collins and Pecks Comer shelters because no alternative camping opportunities are available.

Trail System Contents. Opportunities for enjoyment are perhaps most influenced by the available contents of the trail system, as represented on official trail system maps and by Park regulations. If one wishes to pursue an activity without being bothered by the effects or presence of someone pursuing another activity, the contents of the trail system determines the possibility of realizing this wish. Likewise, if one wishes for complete freedom to go to a particular place in the Park, the design of the system determines whether this wish is realistic.

Concerns about trail system contents either related to trail purpose, trail system design, or trail denotation. The **designed purpose of trails** is a central concern for this project because, in numerous locations, current type or amount of activities exceeds a trail's design capacity. Redesign and reconstruction of trails where problems exist must occur, or changes in the activity type or amount must occur. In some cases, designation of a trail as horse trail or hiking trail occurred without concern for the trail's existing design or construction. This approach to trail designation has contributed to current problems. A related concern, therefore, is **the need for established criteria for designating trails.**

Trail system design concerns typically relate to trailhead access, intersections between public trails and concessionaire trails, and the distribution of trail mileage between different activities. Consideration of the latter concern is most difficult. Approximately seven times more hikers than riders visit the Park (see Table I), yet horse trails account for 65% of the trail mileage. On the other hand, an average horse can cover about twice the distance as an average hiker per day, and all trails (100%) are available to hikers, not just the 35% designed and maintained expressly for that activity.

Trail denotation refers to special route names, such as the Appalachian Trail (AT). Two concerns exist. The first is that **the denotation of the AT** along the Park's primary ridgeline poses a conflict for some hikers and some horse riders. Both hikers and riders enjoy the opportunities provided by a ridge trail, regardless of whether the trail is designated the AT. Some hikers, however, believe horses should not be allowed anywhere on the AT, an interpretation that disagrees with the AT legislation (National Trail System Act, P.L. 95-625). interestingly, because some hikers are most concerned about AT principles, while most riders are concerned about access to the ridge-- as opposed to riding on the AT-- the difference presents an opportunity for solving the issue by realigning or redesignating the AT, perhaps off of the ridge if necessary. Another possibility is to construct a new trail designed for horse riding and that parallels portions of the existing AT.

The second concern is that **two new denotations are available** to overlay existing denotations and that **this project should consider them.** The two denotations are the Benton MacKaye Trail and the Mountains-to-Sea Trail. In either situation, the proposed new denotation would not alter

existing trail administration efforts. Essentially, these denotations are co-alignments, not re-alignments or re-denotations.

Stewardship Activities

Backcountry stewardship, like broader Park stewardship, requires actions that give care to the setting so as to provide opportunities for enjoyment. Concerns about stewardship fall into three broad categories: Park administration, visitor information, and maintenance. Park administration is treated as a topic distinct from maintenance activities or programs, although there is overlap. Concerns under the heading of Park administration include administrative policy, regulations, and public participation. Visitor information is treated separately from Park administration in order to highlight *information and education* as a management tool separate from *visitor regulation* or *resource maintenance.* Maintenance refers to programs and activities that give direct care to backcountry trails, shelters, or campsites.

Park Administration. Concerns about Park administration range from philosophical to practical. The large number of concerns about Park administration reflect the interest of outside individuals and organizations. It also shows the willingness of Park staff members to think critically about their own operations and how those operations affect the backcountry's setting and opportunities.

One concern addresses **the direction of this project** and is related to **the direction of backcountry management** efforts. Some people worry that this project or other backcountry management efforts may over-emphasize conservation, while other people worry about too much emphasis towards promoting recreation. This philosophical debate between promotion and protection is at the heart of the NPS Organic Act, written 80 years ago, and central to discussions now occurring throughout the United States. To address this concern, this project brought people with opposing viewpoints into a discussion about the project's philosophical direction. The result is a set of materials referred to as the Vision Statement material. This set of material spells out the vision, priorities, goals, and objectives that follow from this effort. It is found later in this document and forms a substantial component of this project's recommendations.

Two concerns are related to a more general need for **inter-divisional coordination of backcountry** efforts. Each Park operational division has responsibilities in the backcountry. Coordinating efforts to fulfill those responsibilities is important for consistent Park administration.

The first related concern is **the role, function, and membership of the Backcountry Use Committee.** The committee is the Park's only inter-divisional, cross-operational backcountry management effort, yet it remains unclear whether Park staff members will work with the committee or around it. Also, there is some overlap between the Backcountry Use Committee and the separate AT Management Committee. Finally, no opportunities exist for members of the public to participate in any of the Backcountry Use Committee's deliberations.

The absence of a position dedicated to backcountry management is another concern associated with coordination. As with the Backcountry Use Committee, such a position could integrate and facilitate the Park's backcountry operations. Although the Backcountry Use Committee currently fulfills this role, there is a concern that specialized expertise in backcountry

management remains absent despite the many Park staff members who work in backcountry operations. Without a position description containing direct responsibility for backcountry management, the Park's trails and backcountry are quite dependent upon the willingness of the Chair of the Backcountry Use Committee to shoulder additional responsibilities. A directly related concern is **whether a position dedicated to backcountry management is feasible and realistic in the current federal budget situation.**

Several concerns relate to trail management and two predominant concerns address horses. One is **a perception that a movement exists to eliminate horseback riding from the Park.** Another concern questions **the appropriateness of horseback riding on the AT and in the Park.** Together, these two concerns are the most divisive. It is the opinion of this document that both stem from misunderstandings and some degree of self-interest. For example, some people would like to see horses prohibited because, in large part, they attribute poor trail conditions solely to horseback riding or they mistakenly believe that the Park's soils are too highly organic to support horse riding. Other people would like all trails open to horseback riding because, in some cases, they believe trails are interchangeable, that designation can occur separate from design and construction, and that concerns about horse manure are unrealistic. Every one of the previous comments was heard during this project. Yet, both lines of argument, as shown throughout this document, over-simplify the situation. On the one hand, horseback riders must recognize the greater effects on trails of horses and take responsibility for helping to offset those effects. On the other hand, hikers and others who suggest horse riding is inappropriate in the Park must recognize that greater trail maintenance capacity would alter the situation, perhaps dramatically. It is the opinion of this document that dramatic restrictions are unjustified until all alternatives have been exhausted.

One concern that is also **an** issue is the **disproportionate effect on trails of horse riding.** Some people do not accept that, compared to a hiker, a horse more easily damages a trail; other people believe that the disproportionate effect is justification for restricting or prohibiting the activity. Horses unequivocally affect trails greatly, especially particular segments of trail. Nevertheless, improved trail construction, selected relocation of some trail segments, and an increased maintenance capacity can offset this concern, at least to some degree. That is the direction of this work.

Related to the previous concern about the direction of this project, some people are concerned that **any administrative strategy built around increased maintenance is unrealistic.** They believe that the current budget situation and the mood in Congress makes such a direction foolish. They believe the direction to pursue is to reduce maintenance demands by reducing or eliminating horse riding as an acceptable activity along some or all formal Park trails.

Another concern about trail management is that **some trails are closed unnecessarily.** For example, some Park staff members have sought to close trails according to their own interpretation of GMP directives, believing that increases in trail mileage must be offset with closures elsewhere to retain a 19751976 level. As discussed earlier, such an interpretation of the GMP is erroneous. In addition, **some spur trails have been closed** in the belief that they are difficult to maintain because they require a maintainer to cover the same terrain twice. However,

there are only two types of trail maintenance: 1) seasonal patrolling, and 2) construction or reconstruction. Reconstruction efforts typically require travelling the most direct route into and out of a work site, so a circuit route is unimportant. **A** larger number of volunteers is available for seasonal maintenance, so NPS crews should not have to perform as much of the seasonal clearing that requires travelling circuits. Therefore, closing spurs simply because they are spurs is no longer necessary or justifiable. If, on the other hand, the condition of the spur trail is extremely poor or there is no attraction for visitors, then the trail should be considered for closure.

Some trails are simply closed administratively, as opposed to eliminating the trails on the ground. If a trail is justifiably deleted from the official system, then it should be eliminated physically, too. Otherwise, visitors may become confused, lost, or injured, and, as they continue to travel the trail, will keep the reason for closing the trail a continuing problem.

Similarly, **the contents and status of the formal trail system** is a concern. Although Park staff members maintain an accurate list of formal Park trails and their mileage, no single listing of official trails, their mileage, and their characteristics is maintained. Categorizing trails according to the type of activity, level of maintenance, amount of visitation, and other qualities is a helpful exercise that should be completed and then updated. as appropriate. Such a system does not exist in the Park; yet, it could be an important management tool that would facilitate maintenance of the formal system and reduction of the informal system.

Related to questions about closure and system contents is a concern that **a process is needed to select actions for maintaining, reconstructing, redesignating, or closing trails.** Currently, little documentation occurs to illustrate work needs and alternatives. Prescriptive worklogs, described earlier in this document, provide an important means for compiling this information, yet they require the time and expertise of someone with broad trails experience. In addition, they must be transcribed and presented. Such worklogs, however, provide a means for establishing priorities for completing projects and selecting alternatives from well documented options.

Some people asked about **seasonal closures or restrictions** as an administrative alternative to closing a trail to some or all activities. Unfortunately, such an option is unlikely to work. Compliance and enforcement would be difficult to ensure, although not necessarily impossible. One argument supporting such an idea is that a trail might recover from the effects of previous activities. Technically, this is referred to as a rest-rotation scheme. While an intuitively appealing notion, the scheme does not work in practice because trails are harmed at a faster rate than they recover without assistance, meaning that a trail would have to rest for many years for every year it is open. A better alternative is to assist trail recovery by proactively repairing the problem and installing construction that prepares the trail to support all-season activities wherever possible, especially on trails that are popular year-round.

In some cases where seasonal closures presently occur, concern exists that the closures eliminate too many opportunities. Specifically, **seasonal closure dates of horse camps** is a concern. Horse camps are closed on a schedule that coincides with all other frontcountry campgrounds, with the exception of some campsites that are open year-round. According to the campsite schedule for 1995, 106 of 954 frontcountry campsites (11%) are open year-round. Apparently, the horse camps are closed during some prime riding periods (late spring and late

fall), yet the camps are open during what some riders consider poor riding periods (apparently, in this area, two of the hardest things on a horse are yellow-jacket stings that can send an animal out-of-control and excessive heat, both of which are common during July and August). However, early spring and late fall. are commonly periods of the year when soil is more wet and, therefore, most susceptible to damage. In addition, spring is when new vegetation growth occurs and is easily damaged or destroyed if people or horses go outside the intended tread to avoid a muddy section. The 49 designated backcountry camping areas usually available to people with horses remain open year-round.

A concern related to campsite and shelter location is **the lack of high-elevation campsites (non-shelters).** Currently, camping along the AT is restricted to shelters. In places other than along the AT, shelters are less common, and most camping areas are at lower elevations along drainages. Work by Bratton and others (1978a,b,c) led to restrictions on high-elevation camping that are still in effect. Justification for the restrictions is that shelters provide the best means of concentrating visitor activities in sensitive areas and that high-elevation areas are quite susceptible to damage. High-elevation areas that have sparse overstories and a predominance of grasses among the understory may not be as susceptible to damage as many people presume (Marion forthcoming). Nevertheless, concentration of camping activities remains an effective method of reducing the effects of camping in popular areas.

Several concerns relate to **backcountry and Wilderness management.** A number of people indirectly or directly expressed confusion about **formal Wilderness status** and its implications, in particular some people are concerned about **the appropriateness of various management responses to** issues **or concerns.** The discussion of Wilderness and the minimum-tool principle, found earlier in this document, is intended to provide information related to this concern.

An over-riding concern is **assessing whether trail conditions are improving or decaying.** Unless people agree on the means to assess trails, they are far less likely to agree with the results. Decision-frameworks, such as those called *Limits-of-Acceptable-Change* (LAC) or *Visitor Experience and Resource Protection* (VERP), are available to guide people through the process of assessing Park resources in a participatory manner. One result of an LAC process is that acceptable conditions can be defined objectively, as opposed to the more divisive, subjective definitions commonly available. *A monitoring program* is an essential component of an LAC process because it is the means to assess trail and campsite conditions. Marion's work (1994 and forthcoming) furnishes initial material for such a program, although the trail assessment project was not designed as long-term monitoring program and may require some modification.

Related to Park management and decision-frameworks are several concerns connected to **public participation** in Park stewardship efforts. One concern is that **there is a real or perceived lack of partnerships between the riding and hiking communities,** despite past work between the Smoky Mountain Hiking Club (SMHC) and Smoky Mountains Trail Riders (SMTR) and more recent work between Backcountry Horsemen of North Carolina, the Appalachian Trail Conference, SMHC, and SMTR. Although rapid change is occurring, the breadth and depth of that change can expand greatly. Another concern is that **there is a lack of public participation in Park management** efforts. This is related to a concern that **too much public participation**

without someone designated to facilitate the interest might frustrate NPS efforts to accomplish work. Both of these last two concerns are associated with a need to **attract** and **retain commitment of private individuals and organizations as Park stewards.** The Park's backcountry trails, shelters, and campsites require work that exceeds the current capacity of the Park's maintenance program. Completing the needed work also requires funding that overburdens the current Park budget.

Some people are also concerned about **the Cataloochee Ranch and its operation's effects on trails in the Cataloochee area.** Cataloochee Ranch is located outside of Maggie Valley, NC. People not involved with the Ranch are concerned that the Ranch runs such a number of horse rides into the Park that damage to trails is occurring that would not otherwise exist. Ranch operators are concerned, likewise, about ensuring that they do whatever they can to offset their operation's effects on the Park, including working on trails and clarifying the formal relationship between their operation and the NPS.

Visitor Information and Education. An important function of Park management is informing and educating visitors. A well-informed visitor is less likely to aggravate an issue or concern and more likely to act as a steward who understands a Park's purpose. Opportunities to enjoy the Park without compromising it depend often upon the contents and accessibility of information.

Informational and educational programs are topics of concern, including **accessibility of information, distribution of information,** and **format of information.** Specifically, there is a general concern that many visitors may miss some important information because they avoid busy locations such as visitor centers, backcountry permit centers, and other places where Park information is distributed. This is especially true if the method for distributing the information requires face-to-face contact between a visitor and a Park employee. A portion of the backcountry's problems may be related to some visitors not realizing the implications of their actions. Targeting backcountry visitors is an important function of visitor information and education efforts.

There are concerns about the **coordination of the Park's map and sign system,** an essential informational tool. The Park's Backcountry Use Committee has a subcommittee dedicated to signs. In the last several years, the Backcountry Sign Committee has instituted a three-year sign inventory and replacement cycle. The objectives and details of the system are explained in the Backcountry Management Plan (GSMNP 1993). Some of the concerns appear to stem from the period prior to the institution of this system, although a current concern is the need for improved signs where concessionaire trails intersect with the formal Park trail system. Coordination of maps and signs is an ongoing, never-ending effort.

A central objective for informing and educating visitors is to promote visitor behavior that does not conflict with Park purposes. A broad area of concern, then, is **visitor behavior.** Specific concerns include **travelling in large groups, leaving garbage and litter, not complying with regulations,** and **lack of consideration for others** especially at shelters or campsites. In addition, there are **real or perceived conflicts between people,** whether they are pursuing similar

or different activities. Various individuals have described these conflicts as insufficient trust, lack of respect, or absence of common courtesy.

Maintenance. One of the more direct ways to ensure that the setting provides opportunities for enjoyment is by maintaining access to it, as with a trail program. Concerns about maintenance fall into two broad categories. The first is maintenance capacity and the second is maintenance techniques. Maintenance capacity refers to the programs and resources available to complete needed backcountry work on trails at overnight areas. Maintenance techniques refer to work items and methods for installing those items.

The primary maintenance concern is **expanding the capacity to maintain Park trails, backcountry camping areas, and shelters.** A common belief is that the current capacity is insufficient to maintain trails so that the setting is protected and appropriate opportunities are provided. Related concerns are **increasing trail work opportunities for volunteers, obtaining funding necessary to expand the maintenance capacity, instituting expanded training programs for volunteers and Park trail crew members,** and **tracking work needs and completion.**

Coordination of backcountry maintenance is another broad concern. Connected with that concern is **setting Park-wide priorities for trail work, coordinating trail efforts Park-wide** (e.g., as opposed to only at a district-level), and **effective interaction between Park trail crews and volunteers.**

The need to apply prescriptive trail worklog techniques is a notable concern. Prescriptive worklogs are a tool for documenting work needs, scheduling work projects, or contracting trail projects. They provide a guide to field crews and allow supervisors to document work progress. Any expansion of trail maintenance programs would benefit from the application of prescriptive worklogs.

An expanded volunteer **effort** leads to a concern that **the Park's trail crew be furnished the means to work with an expanded volunteer program.** A larger volunteer program likely will place different demands on the Park's trail crew, including time and staffing demands that could require funding beyond current levels. In many ways, the Park's trail crew is the key to successfully implementing most of this project's recommendations. If the Park trail crew grows as necessary to keep pace with expanded volunteer efforts, then the entire trail program's potential will be realized.

The chief concern associated with maintenance techniques is **the lack of standards for acceptable construction techniques and items.** For example, Park staff members do not apply consistent guidelines for **operating mechanized equipment in backcountry areas.** Similarly, the appropriateness of **metal culverts in backcountry locations** is a concern. Other associated concerns include proper procedures for **windfall clearing** (e.g. removing windfall from the trail corridor), **drainage construction and clearing** (e.g. width, depth, and technique), and **brush removal** (e.g. cutting brush out of trail corridors). Another broad concern is **the** need to **apply the most applicable techniques for constructing and maintaining horse trails.** For example, turnpiking-- elevating the tread with a foundation of rocks and stones-- is nearly absent from

Park trails and corduroy-- throwing sticks and logs across a mudhole which traps water and produces organic debris-- is too common.

Several concerns relate to work schedules. **Accomplishing remote trail work** is one concern and **scheduling work seasons** is another. Many sections of trail that need significant work are located in remote areas. Efficiently completing this type of work will require spike-camps and extended overnight stays in the backcountry, as opposed to day-trips. Work seasons refer to periods when trail work is accomplished. In the Smokies, August and July are the hottest months, but winters tend to arrive late and leave early. This weather pattern suggests that fall and spring are good times to complete trail projects, especially remote ones, because drinking water is more plentiful, and heat, foliage, and yellow-jackets are less. Another scheduling concern is associated with **the need for Park trail crew members to be responsive to volunteers' schedules.** The Park's trail crew has begun scheduling weekend projects to accommodate the availability of volunteers. Such scheduling needs to continue. In addition, **volunteers need to be responsible for productively using the trail crew's time** by arriving promptly and working diligently.

Summary of issues and concerns

In general, a widespread perception exists that there are problems on trails and at backcountry camping areas, although there is also some disagreement about the specifics of particular problems. The perception agrees with that of many Park personnel. The NPS, however, is not presently prepared to complete all the necessary work or to address all existing concerns. Congress is unlikely to provide the NPS with the funding necessary to accomplish this work, given the recent mood in Congress and the scale of the Park's needs. With assistance of others acting as stewards, however, attempting the job becomes realistic. In accepting that assistance and generating more public interest in providing that assistance, preparation is required on the part of the NPS and other cooperating organizations. That preparation includes structural administrative changes, redirection of backcountry maintenance efforts, and reconsideration of information and education materials and programs. Existing stewardship efforts must continue to expand along with the resources necessary for stewardship. The bottom line is that tread drainage, a position dedicated to backcountry management, prescriptive worklogs, and an expanded trails program stand out as paramount needs for stabilizing and improving the trail system.

Stewardship Efforts

Conserving the Park's character and contents and providing for the enjoyment of future generations requires stewards and stewardship. Stewards are those who give care to the backcountry setting, its contents, and its characteristics, and work to see that the setting continues to offer opportunities for visitors to find enjoyment. Complete understanding of the current situation requires a review of existing stewardship efforts. These efforts include management, information and education, and maintenance, but these are not restricted to those of the NPS. Management encompasses administrative decisions, as well as the means of reaching those decisions. The category of information and education refers to programs and efforts to promote safe and considerate enjoyment that leaves the backcountry's character and contents unimpaired.

Maintenance, on the other hand, is comprised of the programs and techniques available for constructing or repairing trails, shelters, or camping areas.

Management

Backcountry management generally relates to recreational settings or activities, although occasionally other efforts to protect or study the setting's natural contents might also apply. **As** a category of stewardship, then, management addresses the location and condition of backcountry trails and camping areas, as well as the activities occurring on them, whether recreational or administrative.

Two administrative committees of the Park are responsible for recommending decisions to the Superintendent regarding Park trails. These are the Backcountry Use Committee and the Appalachian Trail Management Committee. Membership of both includes representatives of Park organizational divisions with backcountry responsibilities, including Maintenance, Resource Management and Science, Ranger, and Interpretation and Visitor Services. The AT Management Committee is also attended by representatives of the Smoky Mountains Hiking Club (SMHC) because they are the local maintaining club of the Appalachian Trail Conference (ATC).

The purpose of each committee is to maintain consistency in decisions and to ensure representation of various operational perspectives. Issues relevant to the AT Committee are isolated to those concerning the AT and shelters along it. Those relevant to the Backcountry Use Committee include all backcountry management issues, especially those related to trails, campsites and shelters, and information such as maps and signs. Recommendations to the Superintendent about backcountry maintenance techniques and design of backcountry engineering items, such as bridges or trail reconstruction items, typically come from this committee. Currently, there are some questions about each committee's relationship with the other because of overlap among the issues, as reviewed earlier. In addition, there are questions about the feasibility of greater, more balanced public participation in these committees.

For backcountry camping areas, as with backcountry trails, the Park's Backcountry Use Committee and AT Management Committee are most often responsible for forwarding relevant recommendations to the Superintendent for approval. Most recent management decisions regarding campsites or camping areas involve new locations, relocations, or closures of either campsites or camping areas. Information from Marion's (forthcoming) assessment is expected to provide an opportunity for additional proactive decisions about location and maintenance of camping areas or sites. Because most shelters are associated with the AT, the Smoky Mountains Hiking Club often participates in discussions about possible recommendations or decisions involving backcountry shelters.

Visitor Information and Education

An important tool available for backcountry management is visitor information and education. Visitors who enjoy trails, campsites, or shelters responsibly affect those areas in ways that require less maintenance and less frequent rehabilitation, and detract less from enjoyment by others.

Information provided to those visiting the Park's backcountry is available in several forms and through several avenues. The Park's *Interpretation and Visitor Services Division* is most commonly responsible for reviewing or producing the information and, oftentimes, for coordinating its distribution. Arriving in the Park, a visitor might go to the Visitor Centers at Sugarlands or Oconaluftee and pick up a Park Newspaper or purchase a map of Park trails (GSMNP 1994b). The newspaper is printed seasonally and contains information about Park features, possible activities, and backcountry etiquette. Other versions of maps and publications, like the Hiking Trails of the Smokies (NHA 1994), are also available at the Visitor Centers. The Park's Trail Map is available at Ranger stations throughout the Park's periphery. Backcountry Registration Stations furnish visitors with more detailed information. These stations are located at the two Visitor Centers and are staffed by volunteers who provide information about current backcountry conditions, assist visitors in completing overnight permits if necessary, and dispense tips about the Park's backcountry and trails. General information about the Park is also available at bulletin boards displayed Parkwide. Backcountry-related information is occasionally distributed through the Park's low-power, limited range 1610 AM radio transmitters, located near several of the Park's entrances. Informal contacts between visitors and Park Rangers, other Park employees, and Park volunteers is another common and important source of information for visitors. An example of a recent addition to the means for contacting backcountry visitors is the Ridgerunner program operated jointly by the NPS, ATC, and SMHC. The program consists of individuals who spend most weekends during busy times of the year hiking along the AT in the Park, contacting visitors who have questions, or informing visitors who need guidance.

Another opportunity for more focused, intensive learning about the outdoors and acting responsibly in the backcountry is available through the Smoky Mountain Field School. The program is operated cooperatively between University of Tennessee, Adult Education Office and Great Smoky Mountains National Park. Short courses ranging from several hours to several days are available on a variety of topics, including occasional courses on backcountry hiking or camping.

Efforts to furnish visitors with information tailored to backcountry activities have expanded recently. New initiatives include one originating with several conservation and recreation organizations-- ATC, Backcountry Horsemen of NC, Haywood Trail Riders, SMHC, and SMTR-- who cooperated in producing a brochure and providing it to the Park. Those groups provided the Park with brochures to distribute and are also distributing the brochure themselves, helping reach some backcountry visitors who might not otherwise receive such information. The main purpose of that brochure is to promote common courtesy between the Park's horse riders and hikers and to suggest ways each visitor can help protect its resources by acting in a responsible manner. Another new initiative-- a pamphlet-- has also been recently completed. The National Outdoor Leadership School's Leave-No-Trace office took the lead in its production, with important contributions from Park staff members and members of Virginia Tech's Forestry Department. In addition, several local riding or hiking organizations provided editorial reviews of the pamphlet's contents. Distribution of the brochure and pamphlet targets backcountry visitors, rather than the general visiting public.

One difficulty in contacting visitors who are headed to the backcountry is that many of them intentionally avoid more crowded visitor centers and other locations where information and educational materials are commonly distributed. This is a concern throughout the country, as methods and means of contacting visitors are debated along with alternatives for conveying suggestions like those of the NOLS Leave-No-Trace effort. Reaching visitors individually has proven to be effective, but the great number of people visiting the Park make this difficult. With the majority of Park visitors not entering its backcountry, targeting only those for whom the information might make a difference is important.

Maintenance

Currently, there are three separate and established efforts to maintain Park trails. One is an NPS Maintenance Division Trail Crew, another is the volunteer Adopt-A-Trail program, and the third and more occasional program is cooperative trail maintenance with external trail clubs such as the ATC. A fourth effort is starting to become established because of recent work by the Park's Trail Crew and local trail volunteers.

The Park supports two Trail Crews, one in North Carolina and another in Tennessee. In total, the NPS crew currently has 21 positions, including 2 permanent foreman positions, 9 other permanent year-round positions, and 10 seasonal positions. Each crew has a foreman and its members may break into smaller crews when working in local Park areas. Most trail work is done on a day-trip basis, meaning the crews travel to the site, work, and return in one day. Overnight and multi-day trips also occur, although much less frequently than day trips. Several backcountry facilities are available for housing Trail Crew members when working remote sites. Occasionally, the Trail Crew's members work on projects that are not oriented towards trails or backcountry, as assigned by Maintenance Division supervisors and within their job description. **A** concise handbook of maintenance techniques was produced in 1979 for the Park's Trail Crew.

A volunteer Adopt-A-Trail program began in the late 1980's under the guidance of Park Rangers. The purpose of the program initially was to provide greater presence in the backcountry by having volunteers serve as non-law enforcement contacts. The program has evolved into a effort that provides basic trail maintenance as well. In 1995, nearly every mile of trail in Tennessee has been adopted, as have many miles in North Carolina where the program is going through a period of significant growth. Approximately 180 volunteers donate their time and effort annually, although indications suggest this number will be much higher in the next year or two.

Opportunities for volunteering are expanding as a fourth type of trail maintenance program is becoming established. Recently, volunteers and NPS Trail Crews have been working more closely together, most often on the North Carolina side of the Park. Oftentimes, their efforts fall outside the existing Adopt-A-Trail program. Much of this change is due, on the one hand, to the willingness of Park Trail Crew members to modify their work schedules and, on the other hand, to the expanding participation of horse riding enthusiasts in volunteer trail work projects. For example, the Smoky Mountains Trail Riders has participated in an annual spring clean-up and rapid trail condition inventory for several years. Similarly, the Haywood Trail Riders have provided assistance to the Park for much of the last decade. In the last year, however, the number

of people and groups involved has expanded greatly, in part because of discussions occurring as part of the project that led to this document. Recent efforts include trail reconstruction along the Cataloochee Divide Trail in the fall of 1994; large-scale trail clearing and drainage maintenance during the spring of 1995; chainsaw safety training provided by the Park's Maintenance Division; installation of tread drainage on Bote Mountain Trail; replacement of the hitch-rack at Russell Field shelter; and reconstruction of two sets of horse stalls, one at Walnut Bottoms and the other at Cataloochee. Already, several hundred people have become involved, and some people have volunteered especially remarkable time and effort.

Until the spring of 1995, few recent exchanges of trail skills occurred between the Park's Trail Crew and outside organizations. Cooperative trail maintenance and skills training are offered by several external groups and organizations. Several not-for-profit organizations offer trail design, construction, and maintenance skills, and can direct those skills towards either projects or training. Examples of organizations available for such efforts include the ATC Konnarock Trail Crew based in southwest Virginia and the Student Conservation Association (SCA) Wilderness Workskills Program coordinated from Seattle, Washington. The Konnarock program is a hybrid of volunteers and seasonal employees funded jointly by the US Forest Service and ATC. Its main purpose is to provide assistance to AT maintaining organizations who face technically demanding projects. The Konnarock crew has worked in the Park several times, including during the spring of 1995. The SCA Wilderness Workskills program is designed to offer a trail skills exchange and training program that is flexible and responsive to local agency needs. The emphasis of Wilderness Workskills is on backcountry or wilderness trail work where power equipment is largely absent, although chainsaws, portable power drills and jackhammers, and other mechanized equipment has been included in various programs.

Recent discussions between SCA and Park staff members led to several Park Trail Crew members participating in an SCA training program during the spring of 1995. Park staff members also have scheduled a training session at the Park this fall that will include opportunities for volunteers to participate. These training efforts illustrate the commitment of Park staff toward the actions described in this document and their willingness to invest in trails, Park employees, and volunteers, Financial assistance for the training is being generously provided by the Friends of Great Smoky Mountains National Park.

At backcountry campsites, the Park's Ranger Division is responsible for most maintenance. Typical maintenance includes removal of unnecessary fire-rings, collection of litter and trash intentionally or mistakenly left by campers in violation of Park regulations, and general monitoring of site conditions. Because of increasing demands along roads and in other frontcountry areas, Rangers have been compelled to reduce the amount of time they spend in the backcountry. This makes efforts to maintain backcountry campsites secondary to their primary responsibilities. Currently, there is no established program to actively maintain campsites such that the effects of camping are reduced, litter and fire-rings are removed, and designated campsites are free of hazardous standing-dead trees.

Some stewardship efforts are pursued independently by cooperative organizations. One of the more exciting events and one that is likely to have long-term benefits for the Park's trails is a

pending Memorandum-Of-Understanding between several horse riding and hiking organizations who are agreeing to jointly maintain sections of the Appalachian Trail. By working together, these groups will provide an example of volunteerism at its best. With their memorandum, more horse riders and hikers can focus on trails rather than each other.

DIRECTION OF BACKCOUNTRY CONDITIONS

The mandate for leaving the Park unimpaired and enjoyable is a question of trends, as well as of conditions. A primary concern is whether current conditions represent a stable situation or one that is changing. If current conditions are part of a trend towards an increasingly changed Park setting and if that trend is related to visitor activities, then we must understand the direction of that change-- whether it is toward greater or lesser impairment, and whether any existing or anticipated impairment can be offset. We also need to understand whether the trend and any associated impairment of the setting detracts from visitors' opportunities for enjoyment.

The following section discusses how trails and campsites change over time. First, a summary is presented of the effects of backcountry recreation on trails, campsites, and visitors. At issue is whether those effects conflict with Park mandates, how visitors tend to respond to those effects and to each other, and what stewardship actions or programs might offset those effects. The Park's current backcountry conditions, reviewed extensively in previous sections, fit into a trend. The following summary will establish a case for several possible directions of that trend. Each direction heads towards one of several scenarios. With the best information available, this section addresses the second strategic question: ***where are the Park's backcountry conditions going if nothing changes?***

Background

Backcountry conditions change according to characteristics of the setting, the effects of recreational activities, and the capacity of stewardship efforts to offset those effects. Stated generally, recreation changes a setting's characteristics and contents, but one can offset those changes with stewardship efforts such as informational and educational programs and trail maintenance. Scientists have studied the effects of recreation on trails and campsites most extensively since the 1960's, although earlier work also was completed. Whittaker and Bratton (1980) compare the effects of horse riding and hiking in Great Smoky Mountains National Park. Hammitt and Cole (1987) summarize some of the literature available concerning recreation's effects on backcountry settings, especially of camping. More recent work by Seney (199 1) reveals some of the more complex differences and similarities between effects of the two activities.

Backcountry recreation can affect areas near and including trails, camping areas, and other destinations such as waterfalls or panoramic views. Effects are seen commonly in soil, vegetation, water, and the habits of animals or the opinions of visitors. Some of the effects are direct and others are indirect. For example, a person may compress soil directly while hiking or riding. This may affect a nearby plant indirectly by making water absorption more difficult.

Change associated with a trail occurs most during construction, as opposed to changes related to later recreation; change associated with a campsite, however, is due mostly to camping activities (Hammitt and Cole 1987). On trails and campsites, soil is affected by two processes: erosion and compaction. Vegetation, however, is affected by two other processes: abrasion and shearing. In addition, plants can be stressed by changes to the soil that are attributed to recreation.

Erosion

Erosion is the loss of soil caused by water or wind (Hammitt and Cole 1987). On a well designed, constructed, and maintained trail, most soil loss occurs during construction when soil is removed intentionally to create a trail-bench. Ideally, after construction, such a trail remains stable, but this does not always happen. Water and wind, for example, can remove considerable amounts of soil after a trail is constructed, especially if the type or amount of activity exceeds either the trail designers' assumptions or the capacity available to maintain it. Erosion of soil from one location deposits it at another. On a trail, eroded soil is often first deposited as mud either on or off the trail.

Although both hiking and horse riding can contribute to erosion by dislodging soil and making its transportation easier (Seney and Wilson 1991), a trail is susceptible to erosion even without recreation. After rainfall or during snowmelt, a trail may cause water to deviate from its natural flow along the ground's surface. In addition, trail construction requires cutting a bench into the terrain (see Figure 4). The cut-bank or back-cut of a trail can expose wet-weather seepage. Rainfall, snowmelt, and seepage will put water onto a trail and, once water enters the trail, the trail acts like a channel, collecting water or keeping it from flowing out of the trail. Trails deviate water from its natural course. If water collects on a trail, the tread can become muddy; if water flows on a trail, it may erode, especially where recreational activity has loosened soil.

Where water collects, it can deposit eroded soil, increasing the likelihood of mud forming. This mud may appear highly organic when plant matter, like leaves and twigs, are washed onto the trail and deposited along with the soil. This appearance can lead one to believe that the soil is more highly organic than it is in actuality.

One can, however, offset erosion either by collecting water above the trail and channelling it to one central point where it crosses the tread or by diverting water from the trail frequently enough that it does not build up volume or velocity. Collection drainages include lateral drains along the edge of a trail and "Y" or "T" drainages to collect water running or seeping down a slope. Once the water is collected, it is moved across the trail tread, often in an open dip that, if necessary, is hardened with rocks. At times, covered culverts carry water beneath the trail surface, but culverts are easily clogged, susceptible to high water, and easily over looked during seasonal maintenance.

Specific diversionary drainage design depend on the anticipated volume and velocity of water. For example, a drainage can be a simple dip excavated across the trail (drainage dip), a log installed at an angle across the trail (wood water-bar), or a series of moderately large rocks

installed at an angle to the tread (rock water-bar). These forms of drainages are retrofitted to an existing trail or installed after the initial trail alignment is constructed.

Trail design also can offset erosion. A trail designer can lay out a trail with drainages, called grade-dips, by changing the grade of a trail from an incline to a slight decline for a distance of 10-30 feet before returning to an incline (Figure 5). Grade-dips tend to require little-to-no maintenance unless water begins to pool. Maintenance of installed drainages, however, must occur, usually not less frequently than once a year. Another technique for draining a trail is called out-sloping, meaning that the trail bench is sloped outward from the terrain's slope (Figure 4). One should install out-sloping when building a trail, but may also retrofit it. Outsloping requires maintenance and sometimes even reconstruction.

The purpose of trail drainage is to return water to a more natural flow off the trail and to protect trails from water flow. By draining water from the tread, one can often prevent mud from occurring, although one might also consider relocating the tread to more stable soil that is less easily dislodged. After all, mud is either dislodged soil washed down from the tread above or existing soil saturated with water and disturbed or dislodged by trail traffic. Whatever the reason, draining water from the trail will address all or part of the problem.

In addition to protecting soil from flowing water, one can also offset erosion by protecting soil from becoming dislodged. Several construction techniques are available and are referred to broadly as tread-hardening techniques. Examples of tread-hardening techniques include rock steps, log steps, and staggered steps. Rock steps and log steps are difficult for horses to negotiate unless the steps are placed far enough apart for a horse to walk comfortably. Rock steps are large rocks typically installed closely together like a staircase where a trail climbs steeply. They will work well on a hiking trail and protect soil by providing a surface that is resistant to the effects of hiking and of flowing water. Closely positioned log steps provide a similar role and, again, will work on hiking trails. They extend across the entire width of a trail's tread, are often anchored with either rocks or a log runner, and protect soil by damming it behind the log. Staggered steps, whether rock or log, can work on hiking trails or trails for horse riding because the staggered steps retain soil behind them like a soil-dam yet are negotiable by horses. At locations with more organic soils or more seepage, replacing the soil with rocks or gravel is effective, although it may appear excessively artificial and should be considered carefully. In cases with standing water or deep organic soil, techniques that elevate the tread and provide a more durable surface-- such as turnpiking, puncheon, or bog-bridges-- become necessary, although relocation of the trail should be considered if the problem likely will return.

One may consider an eroded trail unacceptable for any of several typical reasons. Depending upon the degree of erosion, an eroded trail offers visitors fewer opportunities for enjoyment and the trail can also be unpleasant or unsafe. Additionally, maintaining an eroded trail is more difficult because drainages must extend through the soil bank on either side of the tread, a task made harder as the tread becomes more eroded and deeper. An eroded trail is not an intended condition, so it is a park condition that has not been conserved. And, an eroded trail carries water during a rainstorm, sometimes leading people to travel outside the intended tread because they do

not enjoy travelling in a stream of water. When people travel along the edge of a trail, the tread tends to become wider and more eroded as soil is dislodged and eventually washed down the trail.

Eroded sections of trail, especially severely eroded sections, impair the enjoyment of current and future generations, violating a central part of the Park's mandate. In addition, these sections are an example of Park conditions not conserved. Therefore, significantly eroded trails also violate the other central part of the Park's mandate and must be considered unacceptable.

Compaction

Compaction is the compression of soil, as when hiking, horse riding, or camping packs soil tighter than it is naturally packed (Hammitt and Cole 1987). Compaction can reduce the potential for water to flow within the soil, forcing water to the soil surface. More densely packed soil allows water to move faster across its surface because, first, the soil surface no longer absorbs water rapidly and, secondly, it is smoother and does not slow the water. Compaction can also harm or eventually kill plants, leading to a loss of plant roots that previously held soil in place.

In brief, compaction of soil leads to reduced "porosity," meaning the space between soil particles. Water normally moves in this space when soil is wet. Less space between particles means that, in some cases, water is unable to flow through the soil, becomes trapped, and turns the soil's upper portion to mud. Also, it may mean water is forced upwards until it reaches the soil surface and becomes visible as either standing or flowing water. Or, it may mean water is unable to penetrate the surface where the soil is compacted, staying instead on the surface and making mud or flowing across the surface and causing erosion. As with erosion, the effects of compaction can be offset with trail design or construction techniques such as rock or log steps.

One may consider compaction unacceptable, but only with reasoning different than that applicable to erosion. Compaction, unlike erosion, does not directly reduce opportunities to enjoy a park. Instead, opportunities are reduced indirectly because compaction leads to more muddiness in vulnerable locations. This muddiness can force people outside of the intended trail tread or it can be unsafe if a horse pulls a shoe or a hiker turns an ankle. It also can be unpleasant, especially for a hiker contending with manure or mud mixed with horse urine. Also, because excessive or long-lasting muddiness is neither an intended nor desired trail condition, it exceeds desired park conditions. In some cases, however, a compacted trail tread is more durable and compaction becomes desirable.

Compaction, then, does not impair the enjoyment of current and future generations or violate the Park's mandate. Some consequences of compaction, however, do cause impairment and represent Park conditions that have not been conserved. Accordingly, excessive muddiness, as with erosion, exceeds Park mandates and is unacceptable.

Differences between the Effects of Hiking and Horse Riding

Hiking affects trails differently than horse riding. Both activities affect undisturbed areas differently than they affect established trails. Understanding the differences helps identify potential requirements of workable trail designs. Seney and Wilson (1991) show that both horse riding and hiking expose soil to erosion. They also show that horse riding makes significantly

more soil available for erosion regardless of whether trail tread is wet or dry. On trails where both activities occur yet more hiking occurs than horse riding-- as in the Park-- hiking and horse riding lead to trail problems by dislodging soil and contributing to erosion. In addition, both activities cause compaction of soil beneath the surface.

Notwithstanding that both these activities dislodge surface soil and compact soil beneath the surface, there is an important difference of scale to consider. Horse riding tends to dislodge more surface soil and to compact soil to a greater depth than does hiking (Figure 6). The amount of soil dislodged and the depth to which soil is compacted depends upon the soil type, water content, and other characteristics.

Although the difference is intuitive, Bainbridge (1974) reviewed several sources to compare the effects of horse riding and hiking. He noted that a horse's heavy weight, relatively small hoof area, and metal shoes combine to produce this difference. Veterinarians Frederick and Henderson (1970) found that a horse hoof can generate nearly 1500 pounds of pressure per square inch. Although this figure is the extreme of a range, the tremendous pressure possible beneath a horse hoof is important. Pressure generated by a heavy animal bearing a load on small, shod hooves will compress soil beneath the hoof, displace soil to the side, and lift soil as it moves on.

The combination of pressure, weight, and shod hooves can cut plant roots or remove vegetation as soil clods are lifted, although the actual effect depends on characteristics of the location's soil and topography, as well as the trail's design and construction. When soils are dry and hard or rocky, the effect is not as great as when soils are wet and softened. Likewise, when the terrain is steep the effect is greater than when the terrain is more flat. However, when the terrain is very flat and water collects, especially where soil is more organic, horse riding can lead to water-filled pockmarks and mud. Marion's (1994) findings show this relationship as well. One can, however, either design a trail that avoids areas likely to develop problems or construct it with techniques appropriate to prevent those problems.

Another effect unique to horse riding, when compared to hiking, is related to a horse's stride. Different horses tend to have fairly similar stride lengths. Although a very small horse will have a stride shorter than a very large horse, many trail horses are close enough in size that their strides are quite uniform. The effect of uniform strides on wet or organic soil is that they produce a pattern of smaller, confined mudholes across the width of the trail tread and alternating with more solid sections of soil. These alternating muddy and solid sections may run along the length of a larger

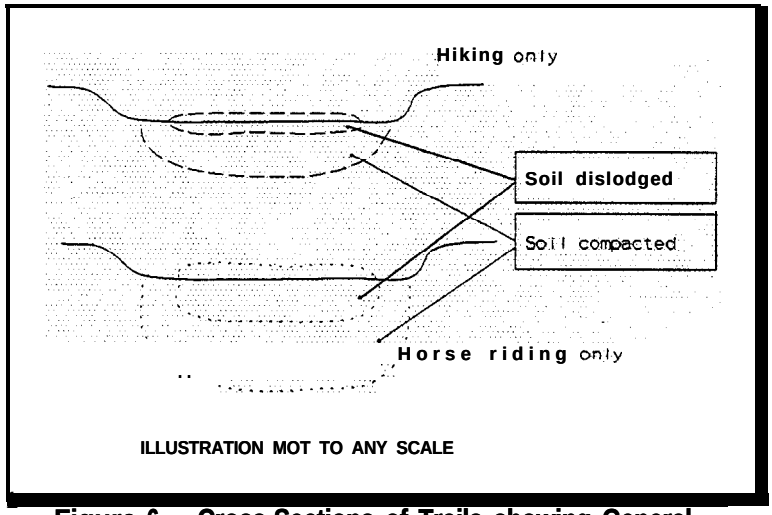

Figure 6 Cross-Sections of Trails showing General Effects of Hiking and Horse Riding. Effects are Similar, except that Changes Differ by a Matter of Degree

mudhole or quagmire. In effect, the pockmarks combine to form a single trough across the tread that contains mud and often, depending on recent rainfall, standing water. Again, however, one can design or construct a trail to avoid or prevent these problems from occurring.

Hiking, on the other hand, tends to produce mud without pockmarks, although soils that are exceptionally poor for trails will pock under either activity. At an especially bad mudhole, hikers and horse riders may begin going around the mud. By going around a mudhole, people spread their effects further onto areas never intended for hiking or riding. They also make more mud. Hiking, like horse riding, can compact soil and stress nearby plants and plant roots. Again, Marion (1994) shows the association between muddy stretches of trail and tread widening, an intuitive relationship confirmed by study. Hiking, however, usually does not lift soil the way a horse hoof often can lift it.

Several implications follow from the differences between the effects of horse riding and those of hiking. A primary implication is that the design, construction, and maintenance of hiking-only trails should be different from that of trails where horse riding is intended. The reasons for this difference lead one to understand that horse/hiking trails frequently cost much more to construct and maintain compared with hiking-only trails. Another implication is that riders can minimize the effects of their horses by riding only on trails and areas that are intended or constructed for the animals, just as hikers can minimize their effects by not going around mudholes. A third implication is that a trail's layout and existing construction determines whether it is stable under existing activities and whether it will remain stable under any newly introduced activity. This means that trails are not interchangeable without considering both the existing construction and the likely effects of any activity other than the one for which the trail has been designed and maintained.

Two implications, however, are most fundamental. The first is that-- because there are ways to offset differences between the effects of horse riding and those of hiking-- those differences alone do not imply that either horse riding or the effects of horse riding are incompatible with the Park's mandates. This is especially so if actions to offset the problematic effects are implemented and successful. The second implication, however, is that the effects of horse riding would become incompatible with the Park's mandates if efforts to offset them are insufficient and existing trail conditions continue to deviate substantially from intended conditions. Such deviation would represent impairment, a lack of conservation, and a loss of opportunities.

Camping Areas

Camping is a common activity for many horse riders and hikers. Camping effects are quite similar regardless of whether a person accesses a campsite by hiking or riding. Some specific conditions, however, are related to the presence of horses. Camping tends to affect soil and vegetation in a progressive, yet tapering manner (Figure 7). Most changes due to camping occurs early in a campsite's life. The general condition of a campsite is revealed by the condition of indicators, as explained by Hammitt and Cole (1987). For the purposes of this discussion, an indicator is any element of a campsite that changes because of camping, although trail indicators would apply to assessing the effects of horse riding or hiking.

Important effects of camping include compaction and dislodging of soil, trampling of plants, and pulverization of surface organic debris such as leaves and twigs (Hammitt and Cole 1987). These effects progress from barely noticeable changes in the types of plants on a site all the way to obvious and widespread erosion caused by water washing in a sheet across compacted soil and carrying dislodged soil and organic debris with it. In the Park, most noticeable campsites tend to be somewhere between these extremes (Marion forthcoming).

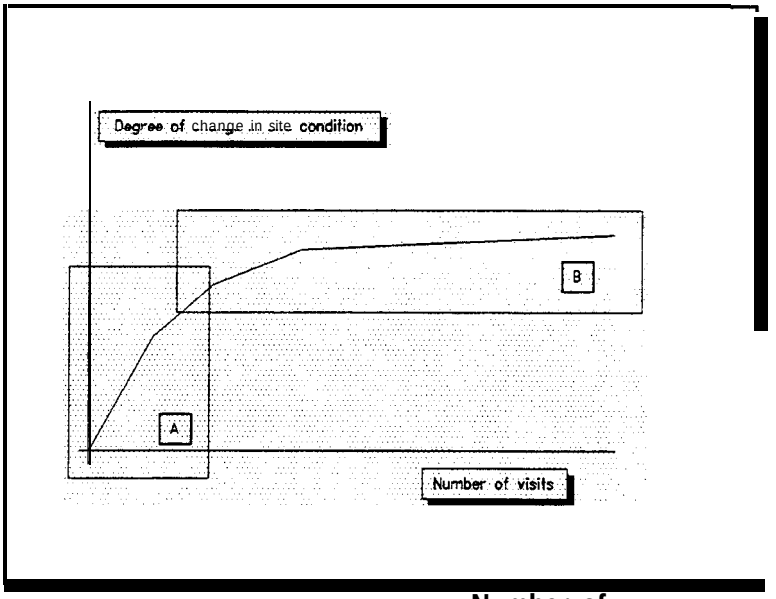

Figure 7 Relationship between Number of Visits and Recreation Site Condition. Region A: few visits lead to marked change. Region B: many more visits lead to relatively less additional change.

The pattern of change seen on a campsite does not occur in reverse when camping is removed from a previously active campsite (Figure 8). Vegetation slowly returns and compacted soil naturally loosens during a gradual return toward undisturbed conditions (Cole 1994). The rate at which a former campsite recovers and whether conditions ever return to those that existed prior to when camping first occurred depends upon environmental characteristics such as soil type, the surrounding plant community, and climate. This progression is shown in Figure 8 as a line between general conditions on a campsite before ending camping and the conditions on the site prior to any camping. In the Park, because of its lush vegetation, most locations currently affected by camping might eventually recover fully if no continued camping occurred.

Several implications follow from this understanding of how a site responds to camping and its removal. First, because most change on a campsite occurs quickly and recovery occurs slowly, an existing campsite will account for less future change than will a new one. Second, because most change occurs quickly, containing camping within existing

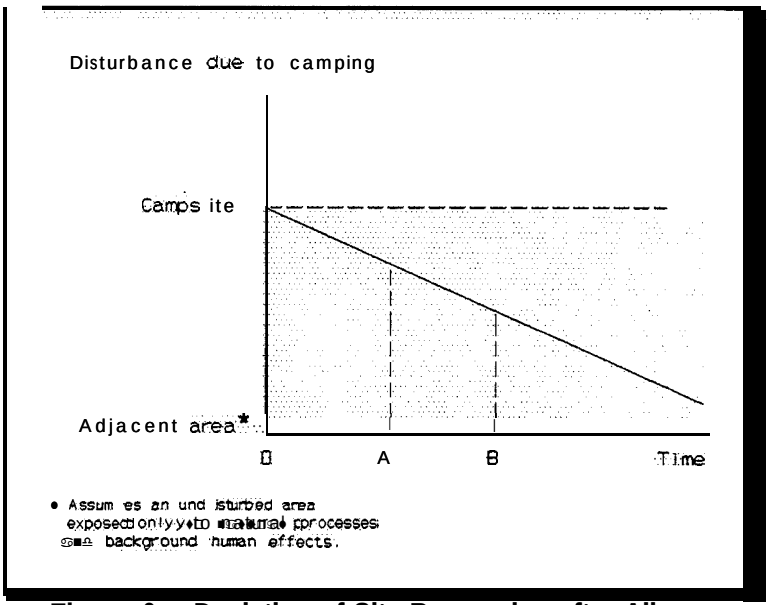

Figure 8 Depiction of Site Recovering after All Camping Ends.

campsite boundaries leads to less additional change than if a campsite begins expanding. Third, because change occurs rapidly, efforts to lessen soil compaction, such as by loosening soil, are ineffective because soil so quickly compacts again. In addition, such efforts can be counter-productive if people begin camping nearby at a previously undisturbed location because they find the uncompacted soil makes the intended site too uncomfortable. Restricting camping to designated locations is effective, although occasional maintenance and rehabilitation is often necessary to keep the site from expanding.

One's behavior greatly influences both the effect of camping and the scale of those effects. For example, large groups require more space and will compact a greater area. Similarly, a person who builds large, hot campfires directly on the ground will sterilize soil by burning all its organic material, whereas a portable stove need not affect the soil at all. A sterilized patch of ground remains recognizable for many years because vegetation cannot grow in such soil. And, a person who drives nails into trees or builds constructions, such as a lean-to or bench, damages trees and leaves a highly altered campsite for future visitors. Changes in visitor behavior will reduce these and other effects. Educational and informative brochures and programs can help, as can pleasant reminders from other visitors. Regulations also can help, most effectively when visitors expect enforcement.

Differences between campers with horses and those without are important to consider (Hammitt and Cole 1987). Although the effects of people are generally consistent, people with horses add the animal's effects to their own. Many of these differences are related to behavior. For example, a horse, if hitched to a tree, can damage the tree greatly either by pawing at its roots or by chewing on its bark. Also, a horse requires much water and, if its rider allows it, can foul water sources by trampling soft soil or by urinating. Horse manure is another difference because it can contain seeds from non-native plants and its presence and odor and the flies it can attract can greatly reduce other camper's enjoyment.

As with their own activities, however, visitors who change the behavior of their animals will reduce their animal's effects. In addition, proactive steps to design, construct, and maintain campsites can help, especially those sites where stock is expected. For example, tieing horses to existing hitchracks or bringing high-lines will greatly reduce damage to trees. Water sources can be protected by instructing riders to carry a collapsible bucket to water their animals away from a source. Other options for protecting water include constructing a watering trough or constructing an access trail to water that is well below where people collect water. Such a trail should be designed to support horse traffic. Manure problems can be addressed by locating hitchracks away from shelters or to the far side of a camping area and then instructing riders to disperse manure before leaving. Riders can reduce or eliminate the concern about non-native seeds by giving their animals weed-free pelletized feed or by assisting efforts to eliminate non-native plants.

Other Considerations

Aside from recreational activities, such as horse riding and hiking, trails and campsites are affected by other processes, too. When combined with changes in activity patterns, these processes can be especially important to consider.

Erosion and compaction are influenced by seasonal differences, such as rainfall and temperature. For example, if more hiking or riding occurs during wetter times of year, then more soil is dislodged for flowing water to erode. Because of additional standing water during these times, a person is more likely to go around mudholes and cause the holes to widen. When freezing temperatures occur, hoarfrost easily becomes mud. And, when more people ride or hike during wet periods, more people notice conditions present at such times. Some of these people may attribute conditions, at times incorrectly, to recreation or to particular recreational activities.

Trails are influenced by the number of people engaged in various activities, but not to the degree commonly assumed. In the past, many people assumed that the number of hikers or riders on a trail was particularly important. This presumption has led to incorrect interpretations of the *carrying-capacity* idea. Although many people have suggested otherwise, no area has an innate, predetermined, preordained carrying-capacity because its capacity varies according to subjective, human decisions such as what are either desirable conditions or acceptable activities (Stankey and others 1990). In addition, a few individuals behaving inappropriately can cause far more damage to an area than many people who act responsibly, so, again, the number of people is less important. And, finally, one can take steps to offset many undesirable conditions.

Although the number of visitors does influence tread width and will aggravate existing problems, other considerations-- such as soil type, terrain, and waterflow, along with trail design, construction, and maintenance-- affect physical trail conditions more. The number of people is less relevant to trail conditions than the type of activity, visitor behavior, maintenance capability, or soil and topographic characteristics. The most important reason for this is that most change occurs when a trail is constructed and that it eventually stabilizes if sufficient maintenance occurs. However, if a change occurs in the type of activity on a trail, if maintenance efforts are insufficient to offset the effects of recreation, if more visitors begin recreating during wet seasons, or if a severe storm overruns existing maintenance structures, a trail can become unstable.

Visitor numbers do affect an area's opportunities. Opportunities for enjoying a park depend upon the area's character, as well as the condition of its contents. Although the condition of trails and campsites is important, so are other considerations. For example, the number of visitors is an important characteristic of a protected area, as is the behavior of individual visitors, regardless of how the behavior affects an area's contents. Some people will no longer visit an area that they once enjoyed if they feel that too many people are there. Some people also may be bothered by seeing other visitors engaged in behavior or activities that they assume, rightly or wrongly, harms the area. Both the number of visitors and the behavior of visitors affects the condition of an area's contents, but they also affect that area's character, as it is perceived by an individual.

Addressing an area's character is challenging because people individually perceive character, and their perceptions do not necessarily agree. Occasionally, for example, changes to an area's character, possibly caused by the behavior of a few people, detract from some visitors' enjoyment, but not from that of others. At times, one can increase enjoyment of those who are bothered without decreasing the enjoyment of those whose behavior is bothersome or whose behavior is believed to produce effects that are bothersome, but this can be difficult. On the other hand, maintenance actions can offset some bothersome effects, just as informative materials can remind

a person to act in a less-bothersome, more considerate manner. Taken together, these three approaches may be quite effective in conserving an area's content and character, while simultaneously providing opportunities for enjoyment by current and future visitors. Administrative actions, carefully considered, can help balance the interests and concerns of different people. Maintenance actions, appropriately applied, can help reduce specific conditions that are either bothersome or even unacceptable. And, informational materials, tactfully presented, can help remind people of ways they can help both conserve an area and provide opportunities for its enjoyment long into the future.

Possible Future Scenarios

By understanding the current situation as part of a trend, we are better able to comprehend where the Park seems headed. If the situation does not change, those trends reveal several possible scenarios for the Park's setting and opportunities. Although predicting exact future conditions is impossible, the best available information suggests likely future conditions in general. By understanding the current direction, we are prepared to recognize whether the current situation is acceptable or unacceptable, and to whom and why that is the case.

Several situations that might follow from the current situation are illustrated in Figure 9. From an understanding of trends in the conditions seen on individual trails, the diagram shows generalized trends for the entire system of trails in the Park. If trails did not exist, as shown at time (0), there would be no trails to change. Most change associated with a trail, however, occurs during its construction, as discussed earlier. The change that occurred during construction is shown between time (0) and time (1) of Figure 9. Ideally, a trail remains stable after construction and no change occurs, illustrated as the line labeled "none." This ideal situation presumes and requires sufficient means to maintain and repair trails so as to offset inevitable change.

The Park's trail system, however, is not stable. Since the system was constructed, it has changed more than anticipated or desired, as trail assessments together with the current issues and concerns associated with the Park's trails illustrate. This trend is displayed between time (1) and time (2) as a line depicting conditions deviating from a stable situation. The current situation, then, is that the trails have changed more than intended and that the

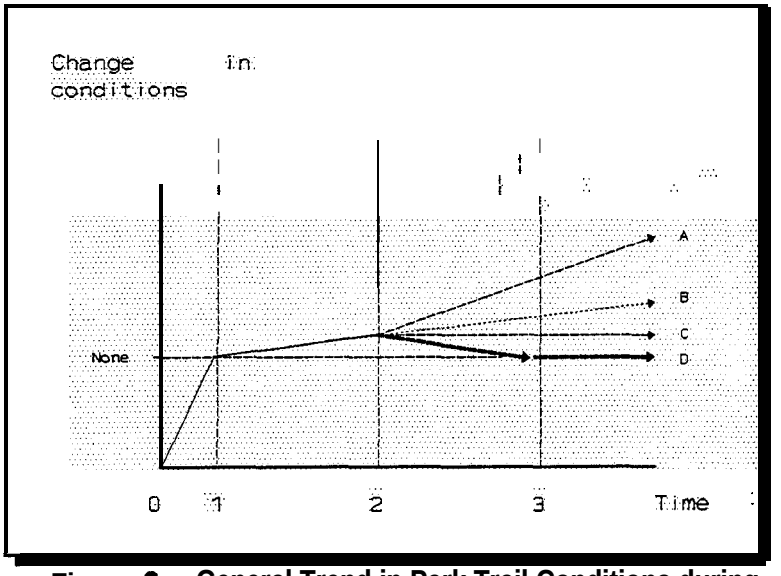

Figure 9 General Trend in Park Trail Conditions during Construction (Time 0 to 1) and Since Construction (Time 1 to 2). Four Possible Future Trends are Shown from Time 2 to 3, as Discussed in the Text.

situation is part of a trend toward more change and greater deviation from the trail system's original and intended condition.

Understanding how trails change and what likely contributes to that change allows one to anticipate future conditions. A quick review of the current situation helps this discussion. Recently, several new initiatives have added to the capacity to maintain Park trails. These initiatives include increased volunteerism and several informational efforts intended to help visitors leave fewer traces of their stay. Together, these initiatives could slow or arrest the trend toward greater change and convert it to a trend toward less or no change-- a stable system. However, several other circumstances or possibilities might continue the trend or cause it to accelerate for some period of time. For example, consider the increasing numbers of visitors riding or hiking the trails, shown earlier. Or, as another example, consider the likely effects of more people visiting in early spring or late fall when soil and vegetation are more susceptible to damage. And, as a third example, consider the potential for inevitable yet unpredictable storms or snowmelt to damage trails and overwhelm existing maintenance capacity by making repair of the damaged sections a priority over maintenance.

Possible future situations, then, range from an accelerated trend toward more change (shown as line A in Figure 9) to a stable trend with existing problems repaired and the sufficient maintenance capacity to keep the system repaired, stable, and unmistakably acceptable (line D). Accelerated change could result from increases in the number of visitors such that maintenance capacity becomes less sufficient. Continued, consistent change could result from new initiatives that only offset increases in visitation (shown as line B). Alternatively, a situation with no further change could result from the new initiatives completely offsetting any additional sources of change and also stabilizing all existing ones (shown as line C).

Some trail locations, however, have existing conditions that need repair, not just stabilization. Those conditions are the ones described earlier as unacceptable. Specific examples of those conditions are surmised from the review of Marion's (1994) assessment. Notwithstanding the current situation, likely changes in it, or potential events that might affect it, if sufficient maintenance capacity becomes available, even locations with unacceptable conditions might be repaired and maintenance, then, could keep the system stable and acceptable (shown as line D).

Implications

Comparing the current situation and potential future situations with what the Park should contain and offer, according to Park mandates, reveals inconsistencies. In addition, the issues and concerns of those who care about the Park furnish an additional level of understanding about the inconsistencies and appreciation for potential solutions to those problems.

The question, then, becomes one of how to stabilize the Park's trail system, repair locations with unacceptable conditions, and maintain the system despite potential increases in the number of visitors, changes in when people visit the Park, and inevitable storms. More to the point, the question is how to accomplish the need to improve the trail system so it can continue to provide opportunities for enjoying the Park and its backcountry.

IMPROVING THE TRAIL SYSTEM

By examining the current situation and describing the likely directions it may head, one is prepared to discuss whether that situation is acceptable. If either the current situation or direction is not acceptable, according to some appropriate measure, one is also prepared to consider how to lead the situation in a different, more broadly acceptable direction. Questions about what is acceptable are complex, and some people may offer answers that disagree with those of others. Returning to the Park's mandates, however, can help focus the discussion, but, as reviewed earlier and emphasized now, a mandate does not provide specific answers. Instead, mandates provide guidelines. People still must interpret each mandate and understand its flexibility. To interpret the Park's mandates, the current project relied upon detailed review of mandating documents and discussions with Park staff members and members of the public, including horse riding and hiking enthusiasts and conservation advocates.

Currently, as measured against mandated Park purposes and as measured by Park staff members and members of the public, **unacceptable conditions exist in places along the Park's trails and at some of its shelters and campsites.** Returning to the original picture of the current situation (Figure 2), some setting conditions are impaired because those conditions are not intended or desired ones and, as such, are examples of unconserved Park objects. Additionally, those conditions impair opportunities for enjoyment by visitors and, as such and in conjunction with the previous point, detract from the Park's intended values and purposes. Both these statements have been substantiated during the previous portions of this document. The remaining and most crucial question is: ***what to do about the situation?***

Recommended Management Direction

This project's task has been to produce recommendations for actions that will improve the trail system of Great Smoky Mountains National Park. To improve something implies changing it. Constructive change requires consistent, purposeful direction. The first step, then, towards improving the Park's trail system is to establish direction. Direction allows one to act with purpose and to prevent fate from taking control. Moreover, purpose and direction keep combinations of little decisions from implying intent where none exists. Additionally, having a clear sense of purpose ensures more rapid recovery should some unforeseen event push one from the selected course. The final portion of establishing a strategy, then, is to determine direction and priorities that will ensure consistency and make easier the task of establishing goals and objectives. With a completed strategy, one can weigh recommended management actions against the objectives for those actions, instead of against some other, perhaps more arbitrary standard.

Vision of an Ideal Park Backcountry

One way of simplifying an effort to define what is acceptable is to begin by describing the ideally acceptable situation. Such a description is often called a Vision Statement. During this project, many people worked together to help produce one for the Park's backcountry. The proposed Vision Statement represents the commitment towards which to work. It demands action and solicits involvement. In effect, it establishes a desired direction for backcountry efforts.

The proposed Vision's text, shown on the next page, describes a backcountry that offers people opportunities for enjoying or learning from an area where natural processes are predominant and people, both in and out of the National Park Service, work together to ensure that those opportunities and processes remain available for future visitors. The Vision Statement begins by depicting those qualities of the backcountry that make it important to people, according to those who have been involved with this project. These qualities are the ones people care about, will work together to conserve, and desire to keep from becoming impaired. The Vision also describes the activities that the backcountry should provide opportunities for people to enjoy. It describes the role of trails, shelters, and campsites in promoting and conserving backcountry qualities, and the importance of cooperative stewardship efforts to ensure that those qualities remain unimpaired. The Vision concludes by distinguishing appropriate backcountry activities from inappropriate ones.

Great Smoky Mountains National Park's Vision is a description of what those who care about the Park's backcountry hope to find when they visit it. The Vision provides direction for administrative actions and programs, no matter at what level or scale, and promotes consistency among the Park's efforts and the efforts of volunteers, cooperating organizations, and many individual visitors.

Priorities Necessary for Consistent Efforts

Because a Vision can be quite vague to apply, the next step towards establishing a consistent direction is to set more specific priorities. Priorities remind us of how work in the Park is to be conducted. They are not goals, but they are guides that support a steady purpose. The following priorities reflect the comments and ideas of many Park staff members and members of the public. They are organized into the three categories of setting, opportunities, and stewardship. The Park's staff members will adopt, widely publicize, and emphasize these priorities to all those people who are involved with the backcountry and its care.

Setting

- **Promote and Regulate Activities so that the Character and Contents of the Park's Backcountry Remain Unimpaired for the Enjoyment of Future Generations.**

  This priority is an abbreviated version of the National Park Service's Organic Act. It ensures that the Park's mandate is clearly evident as a guiding priority.

Proposed Vision Statement for Managing and Maintaining
Backcountry Resources of
Great Smoky Mountains National Park.

The heart of Great Smoky Mountains National Park is its backcountry, where .a person is a visitor who -does not remain. The backcountry is a predominantly natural, unmodified, and untamed area. Those qualities distinguish the backcountry from parts of the Park that contain roads, dwellings, or administrative buildings. The backcountry's naturalness makes it special. Here, one finds clean air and water, and native plants and animals, each freely responding to the others and to the seasons.

The backcountry with its naturalness is for people to enjoy. It offers a place for simple recreation-- activities requiring no motorized or mechanical means of transportation. It also offers a place to learn about the natural world and cultural heritage of the southern Appalachians through scientific study, educational programs, or an independent visit.

Access to the backcountry is provided by a system of well maintained trails, campsites, and shelters. This system complements the Park's natural character and protects-Park wonders. It concentrates the effects of people and provides opportunities for simple recreation. National Park Service employees work with members of the public to design, construct, and maintain the trails. Together with the National Park Service, these individuals and organizations seek to accommodate types and amounts of activity they agree are compatible with the Park's purpose af preserving an exceptionally diverse area and providing for public enjoyment in ways that leave its contents and character primarily unaltered.

Those who administer, study, or enjoy the backcountry do so as stewards entrusted by future generations. Many. people and organizations join their efforts to see that those who visit learn to respect the wilds, are courteous, and need few rules and regulations. They encourage visitors to actively participate in programs that care for the Park. National Park Service employees provide stewardship in cooperation with individuals and organizations who are concerned about the 'Park and enjoy visiting it.

In the backcountry, visitor activities and National Park Serviceactions are appropriate only if they minimally change natural conditions or processes and minimally affect those who enjoy the backcountry. Neither an action nor an activity is appropriate if it merely provides comfort to a visitor or convenience to a manager.

In the-backcountry, natural conditionsdominate except where carefully considered exceptions exist, such as trails, shelters, or campsites. In every way possible, even these exceptions are plain, rough, sturdy, and natural-appearing. Unrestricted visitors are expected' and invited wherever possible. Restrictions that exist are the minimum necessary to protect natural Park features, to preserve its primitive and historic character, or to provide opportunities for simple recreation.

- **Ensure Sustainable Backcountry Conditions that are Predominantly Wild, Natural, and Unmodified.**

  These qualities of the Park's backcountry are the ones that people care about most. Together, they are the reason people enjoy it and are what people would most like their children or grandchildren to see in the future.

- **Protect and Nurture the Appalachian Trail's National Significance and Special Purposes by Working Alongside Its Extended Community of Stewards.**

  The Appalachian Trail (AT) is one of the premier trails in the Park and, in several ways, it is unique among Park trails. Although many Park trails are special in their own way, the AT has specific legislation that elevates its status. One quality of the AT is that, all along it, volunteers play a central role in its maintenance and in decisions about its management.

- **Ensure that Anyone's Actions to Care for the Backcountry or to Provide Its Visitors with Opportunities for Simple Recreation are Compatible with Relevant Legislation'.**

  Legislation provides some of the most important guidelines for actions related to the backcountry. Although guidelines are flexible, they are also mandates that require compliance. Earlier material in this document reviews several of the more central pieces of legislation.

Opportunities

- **Provide Opportunities for People to Enjoy Primitive Recreation in the Park Without Compromising Its Fundamental Purpose of Conserving the Backcountry's Character and Contents for Future Generations.**

  One of the best ways for people to enjoy the backcountry is through recreation. Every possible opportunity should be available that will not compromise the backcountry setting's most valued qualities.

- **Provide Opportunities for People to Learn about the Backcountry, Its Parts, and How Those Parts Interact.**

  The Park's backcountry provides tremendous opportunities for a person to learn about the natural world. The National Park Service, cooperating organizations, and interested individuals can help individual visitors realize those opportunities by providing educational programs or informative materials.

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[1] **Examples include, but are not limited to: National Park Service Organic Act (1916 and 19781, establishing legislation of Great Smoky Mountains National Park (1926 and 1942), Wilderness Act (1964), National Trails System Act (1978), Archeological Resources Protection Act (1979), Historic Sites Act (1935), National Historic Preservation Act (1969), and the National Environmental Policy Act (1969).**

Stewardship

- **Treat the Backcountry-- Together with Its Contents and Character-- as One of the Park's Most Valuable Assets, One that Needs Service and Care If It Is to be Available Unimpaired for Future Visitors.**

  Even people who never venture far into the backcountry come to the Park because of spring wildflowers, fall foliage, waterfalls, streams, mountains, and views that are all rooted in the Park's backcountry. More adventurous people access the backcountry along trails and may stay overnight at a shelter or campsite. Trails, shelters, and campsites all need care in order to conserve the setting and its opportunities.

- **Inform and Educate Visitors and Park Employees to Enable Them to Protect and Care for the Backcountry and to Leave No Trace of Their Passage or Activities.**

  By their actions, each individual can help ensure a sustainable, high-quality backcountry filled with opportunities or, on the other hand, can hurt the efforts of others. People, however, must know how to help and that requires good information to keep each person from unknowingly burdening broader efforts to care for the backcountry.

- **Encourage Cooperation, Participation, and Responsibility from Park Visitors by Providing Incentives and Motivation for Volunteerism and for Support of Park Efforts.**

  Park visitors should be encouraged to work with Park employees and others who are serving as stewards. Their assistance, together with the work of Park employees and volunteers, can improve the current situation and allow Park staff members to avoid some difficult decisions.

- **Incorporate the Knowledge, Experience, and Ideas Available Among Park Employees, Volunteers, Visitors, and Other Agencies and Organizations in Maintaining the Integrity of This Area and in Recognizing Its Value to Present and Future Generations.**

  Those who care about the Park have valuable experience, and skills. They can offer great ideas for maintaining and improving the Park's trails and backcountry so that its most valuable and important assets are conserved together with opportunities for enjoyment.

- **Expect and Ensure Continuity and Consistency in Park Operations When Decisions Affect the Backcountry's Character, Contents, or Visitors.**

  As more people become involved with decisions, their involvement risks taking decisions in erratic directions. A desired measure of effectiveness is that the process remains consistent and responsible, rather than haphazard. Those participating in the process must, therefore, adhere to a common set of guidelines and expectations. A Vision Statement, Priorities, Goals, and Objectives establish such guidelines.

Decision frameworks. Stewardship requires decisions; effective decisions require continuity and consistency. Yet, a highly structured process might threaten creativity or reduce the willingness of some people to participate constructively. Several decision frameworks are available that avoid these problems while still obtaining the benefits of consistent decisions. Decision frameworks allow decisions to be more comprehensive and comprehensible.

Currently, two frameworks are popular among land management agencies such as the U.S. Forest Service (USFS) and the National Park Service (NPS). One is Limits-of-Acceptable-Change (LAC), and the other is Visitor Experience and Resource Protection (VERP). Both frameworks are similar (Figure 10). VERP has been solely applied to NPS-managed areas. LAC, however, has been widely applied by the USFS and adopted by several NPS-managed areas, as well.

LAC and VERP both evolved from an idea called *carrying capacity*. For wildland recreation, carrying capacity suggests that a limited number of people can recreate in an area without degrading it (Stankey and others 1990, Wagar 1964). Unfortunately, the idea of a carrying capacity is easily misunderstood as suggesting that scientific study or a bureaucratic decision can define a preordained number of people that are appropriate for an area. Such an understanding implies that an emphasis upon limitations and regulations is a preferable method for managing backcountry recreation, as opposed to maintenance and information.

LAC and VERP evolved because people recognized that the idea of a carrying capacity is much

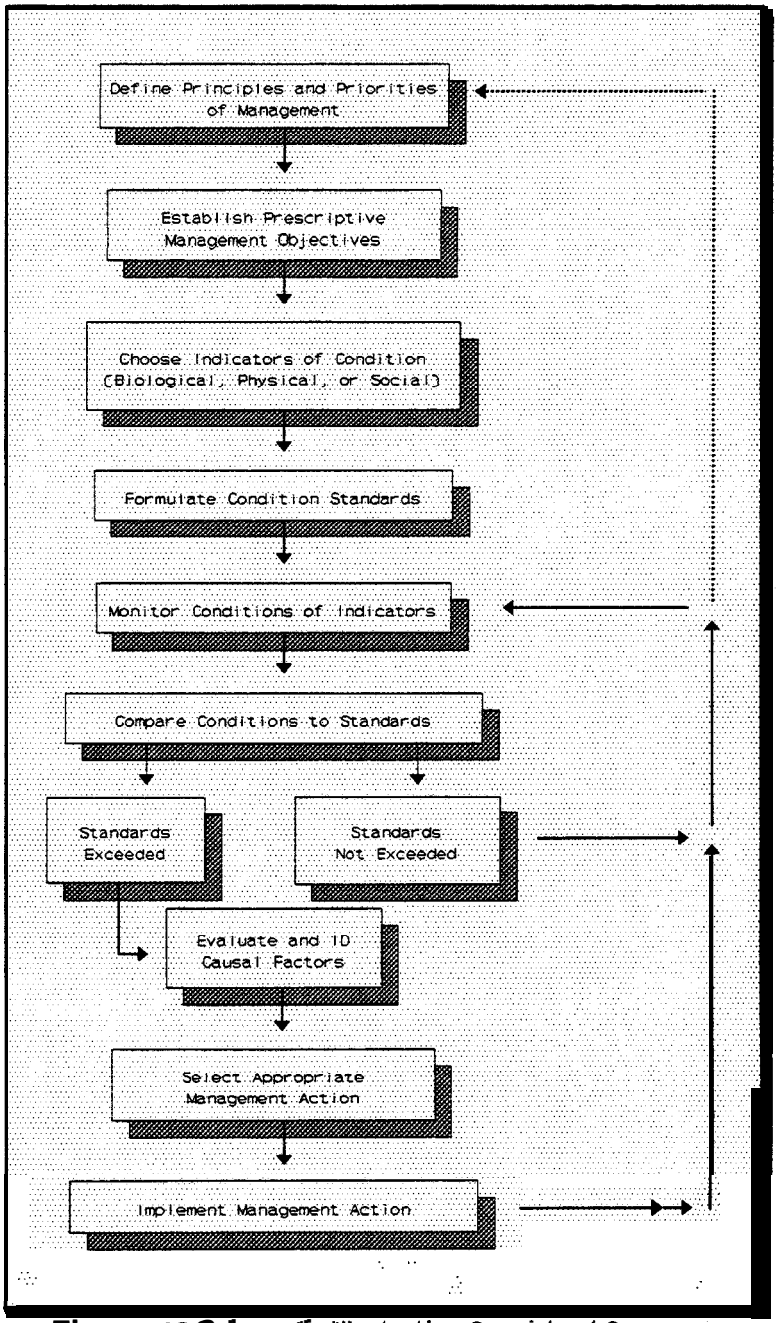

Figure 10 Schematic illustrating Consistent Sequences of LAC and VERP Frameworks for Planning and Management.

more complicated and has implications they needed to address. One of the most important and complicated implications is that acceptable conditions are often quite subjective and that to approach a subjective issue in a constructive manner requires an open, participative process,

Both LAC and VERP, when fully implemented, do not end. Those who are applying either LAC or VERP follow a sequence of steps that loop back to each other. Each process begins with establishing meaningful management objectives and then choosing relevant physical, biological, and social indicators of change or condition. Once indicators are selected, standards of acceptable conditions are established. Subsequently, actual conditions are monitored to determine where those conditions meet acceptable standards. The actual sequence of monitoring and standard-setting may vary according to the needs of a particular application. In some situations, those involved in the process may decide to monitor conditions prior to selecting standards.

Indicators are defined as any component of the natural setting that changes in response to a process or activity of interest. Some potential indicators are better than others (Figure 11). When considering the effects of recreation, an indicator's condition provides a gauge of how and where recreation has changed a setting.

A standard is a specific condition of an indicator or a rate of change in an indicator's condition. Standards typically represent the limit of acceptable conditions. When this limit is reached, a management action will be taken. At times it is possible to select likely actions in advance so that people know generally what to expect. Good standards, produced with public involvement, establish commonly shared and unambiguous statements of when resource conditions become unacceptable and what will be done if this occurs.

Each framework, applied successfully, requires a commitment to apply an involved process so as to grapple with complex issues. The complexity of both frameworks are their greatest asset and weakness. Each framework also has potential drawbacks compared to the other. LAC, for example, has been misapplied by some who ignored the importance of an open, public process. VERP, on the other hand, is based largely upon the concept and terminology of *carrying capacity*. Although VERP's text clarifies that its authors' intend a broader defmition, the phrase "carrying capacity" remains easily misunderstood as implying that the number of visitors is more important than how or where they act.

Because it is difficult to clarify the all too easily misunderstood ideas associated with the carrying capacity concept, a planning model based upon the terminology of carrying capacity begins from a disadvantaged position. For many people, the idea of a carrying capacity suggests a need to focus attention on the number of people visiting an area, perhaps according to categories of activity such as horse riding or hiking. For some people, it follows that one should pursue restrictions on that number or pursue other forms of regulatory responses as a key management tool, as opposed to treating restrictions as simply one of many tools that have individual advantages and disadvantages that depend upon specific situations. VERP documentation defines carrying capacity more carefully than the erroneous understandings just described. Nevertheless, for at least some and possibly many people, even those attempts at clarifying the meaning of carrying capacity are likely insufficient to overcome a tendency to attach apparently implicit definitions. For these reasons, VERP risks problems that LAC does not.

INDICATOR CRITERIA	CONSIDERATIONS
Quantitative	Can the indicator be measured accurately?
Relevant	Does the indicator change -according :to th-e process or activity of interest?
Feasible	How complex are the measurements? Can the measurements be taken by availabfe personnel? can the required measurements be taken within: available funding limits?
Reliable	How precise are the measurements? Will different individuals consistently obtain similar data when measuring the same indicator?
Responsive	Will management actions affect the indicator? Will visitor actions affect the- indicator?
sensitive	Will the indicator. reveal change..occurring-in one sampling cycle?
Integrative	Does the indicator reflect only its condition or is its condition i-elated to that of other, perhaps less feasi bly measured, elements?
Significant	Does the -indicator reveal relevant environ:mental:or social conditions?
Accurate	Will the measurements be close to the indicator's true condition?
Understandable	Is the indicator understandable to people who do not have specialized training in monitoring of natural areas?

Figure 11 Criteria for Selecting Indicators of Resource Condition.

Carefully applied, both LAC and VERP offer a framework for decisions about the Park's backcountry. As a priority for backcountry stewardship, the Park will discuss, select, and adopt a decision framework as the means to ensure that decisions affecting the backcountry or its visitors are continuously consistent.

- **Implement a Process for Taking Management Actions Based on Indicators and Standards of Acceptable Conditions that are Established in a Participatory Manner Open to the Public and All Park Employees.**

  Effective actions are more likely when one has indicators to show whether progress is occurring and conditions are conserved or, where necessary, improved. In addition, one way to ensure that indicators capture relevant conditions and that proposed management actions do not have hidden costs is to promote participation among all those who might be affected.

Monitoring program. Effective stewardship requires monitoring to know whether one's actions are producing desired results. Regardless of whether a decision framework is applied, monitoring is necessary in order to know if backcountry conditions are improving. By monitoring, one can assess the effects of management actions. A monitoring program also allows one to predict future conditions with greater accuracy, thereby anticipating future problems and preparing to defend actions proposed to offset those anticipated problems. To accomplish this work, however, one must carefully plan and design a monitoring program (Figure 12, page 84).

By monitoring conditions of indicators, one provides quantification of those conditions. A monitoring program typically has raters measure conditions at different locations and, eventually, at different times. One then compares those conditions so as to note change. In an LAC or VERP process, monitoring allows one to gauge the effectiveness of management actions, to "see" backcountry conditions, and to anticipate future conditions. Effective monitoring must be well-designed, efficient, and scientifically valid. Monitoring projects should include a component to assess and report rater consistency. With an understanding of rater consistency, it is possible to understand and interpret assessments.

Several monitoring methods exist that are applicable to certain types of questions. Examples include *surveys* of people's opinions, *assessments* of physical or biological conditions, *prescriptive worklogs* to determine work necessary to repair or maintain a trail or camping area, and *coincidental assessments* completed as work or maintenance is completed.

Any effective monitoring program must have seven specific components (Figure 13). Depending upon one's intent for the program and characteristics of the local area, some monitoring programs may include other components as well.

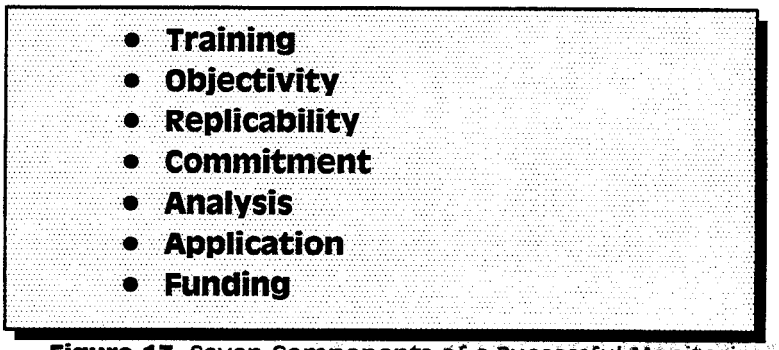

Figure 13 Seven Components of a Successful Monitoring Program.

Training promotes consistency among raters, and consistency is required for reliable data. Without consistent raters, one can confuse real change with the effect of differing opinions among raters. Without good data, monitoring results become suspect. An exceptionally simplified monitoring program might reduce complexity, but the cost is a loss of accuracy, sensitivity, and reliability, meaning the information is not sufficient for any difficult management decisions. Training, then, ensures more consistent findings from different raters and leads to more precise monitoring results.

Objectivity is also important. Both assessment and analysis must be completed without bias or prejudice. Programs operated with a real or perceived bias can threaten or destroy the work's applicability. Political agendas among the raters or among those analyzing the data make the results suspect and can convert an open and scientifically designed program into a squabble about issues unrelated to the backcountry or its care.

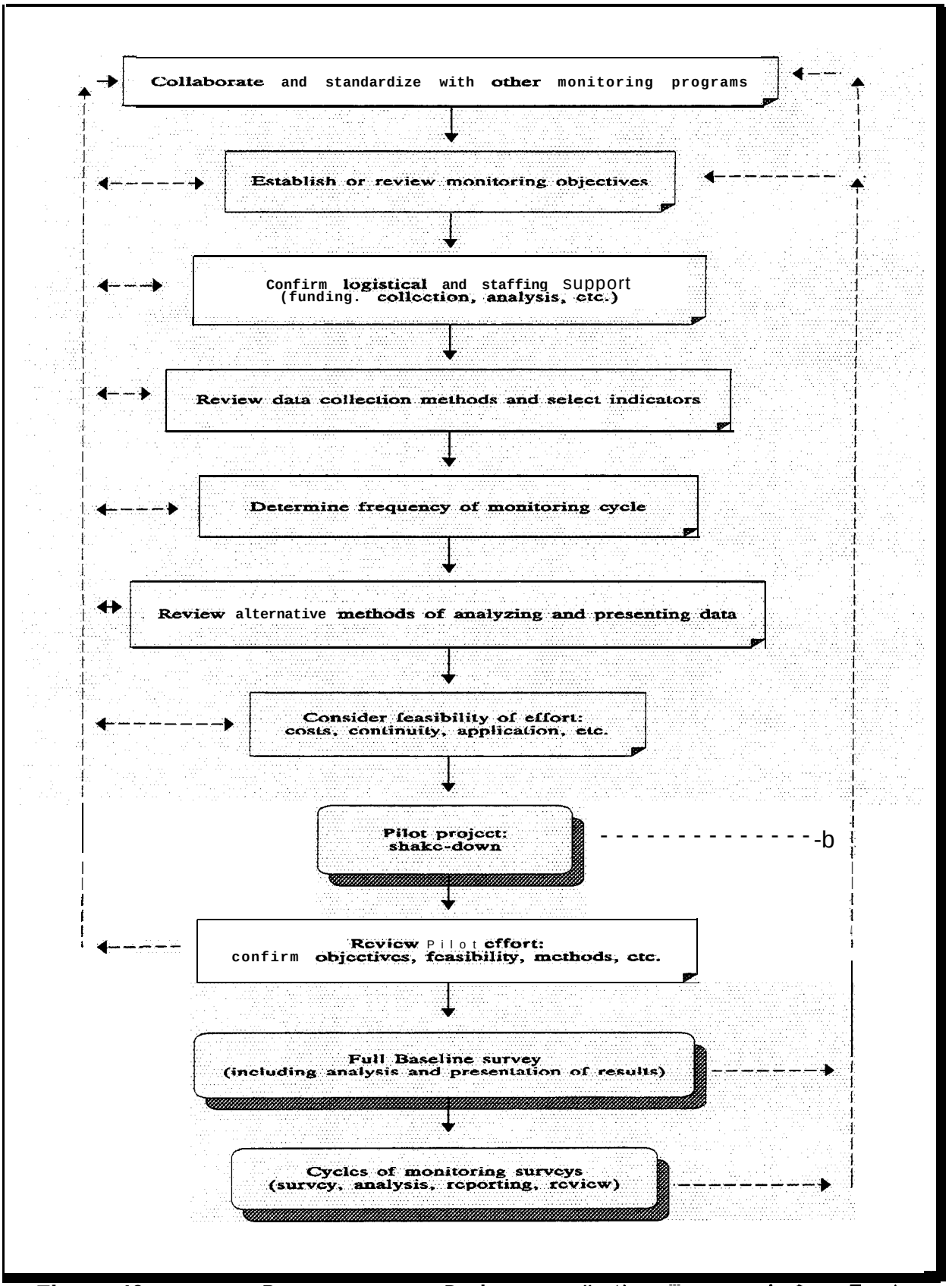

Figure 12 Monitoring Program Planning, Design, and Application. sequence is from Top to Bottom. Reflective Loops Emphasize Careful Design and Administration (left) Combined With Field work and Application (right).

To compare conditions at different times, a monitoring program must also be **replicable, a** fundamental aspect of the scientific method. Changes in condition can be quantified validly only if raters apply consistent procedures each time and in each location. Surveyors must apply extremely similar or identical methods to detect actual changes in condition. A carefully designed method can remain comparable to a previous, slightly different one, but great differences between methods lead to questions about whether the same items were measured.

All monitoring efforts require **analysis.** At times, data are collected when there is no means to assess it. Analysis requires a person with time, statistical expertise, and equipment. Monitoring is only as good as the analysis.

Commitment-- both short-term and long-term-- is necessary for a monitoring program to produce valuable information. Raters should work for extended periods so that they become skilled and proficient through practice. Good data depends upon rater commitment. Working one day a week is not enough to become technically proficient. Again, simplification might appear to be an answer, but there are costs such as reliability (eg, precision and consistency). Long-term commitment is also necessary because, with rare exceptions, neither improvement nor damage occur quickly. Unless a program is in place continuously, only part of the needed information is collected. This does not mean it is necessary to assess every trail or campsite every year, instead it means that an appropriate assessment schedule must be continuously applied.

One way to guarantee commitment is to ensure that a monitoring program has a clear **application.** As examples, a monitoring program can serve as fuel for a decision process such as LAC or VERP. It could also serve as a means to assess management actions such as trail or campsite maintenance, informational programs, or restrictions on visitors or their activities. One of the most useful applications, however, is when such a program provides people with information necessary to anticipate future conditions and to defend actions to offset anticipated conditions that are impairments of a park's purposes (Duinker 1989). A monitoring program is unlikely to be supported unless it is clearly part of either a decision process or management actions. Monitoring without application serves little purpose. One can apply a monitoring program to decide locations where management actions are needed or to assess the effectiveness of a particular action.

Another necessary component of an effective monitoring program is **funding** in the form of budgeted monies or donations. Even if raters volunteer their services, an effective monitoring program requires funding or donations because someone qualified must spend time coordinating the work, compiling the data, and analyzing the results. Equipment is also needed, such as survey tools, computers, software, paper, and pencils. Without adequate funding, a monitoring program will not produce desired or applicable information.

A carefully designed and applied monitoring program is essential for backcountry stewardship. Such a program allows one to assess current conditions and anticipate future ones. The Park will establish a monitoring program to assess the backcountry setting, visitor opinions regarding setting conditions and their opportunities for enjoying that setting, and the effectiveness of stewardship actions at offsetting the effects of visitors.

- **Establish a Scientifically Designed Monitoring Program to Study Biological, Physical, and Social Effects on the Backcountry of Management Actions and Visitor Activities.**

  A monitoring program supplies information to those who are applying decision frameworks. Such a program ensures consistent and objective understanding of backcountry conditions, how those conditions are affected by visitors and stewardship efforts, and what future conditions may entail.

Comprehensive and Integrated Trails and Backcountry Program. Backcountry stewardship addresses the setting with its character and contents and the opportunities available from the setting. Many resources are available to provide comprehensive stewardship. Each resource, however, is strengthened when it benefits from other compatible efforts. Effective stewardship, therefore, integrates those resources to compound the value of each.

To be comprehensive, such a program must have each of three components and some means must be available to integrate those components (Figure 14). Training is essential because it supports the remaining three components and promotes consistent work standards. Professional

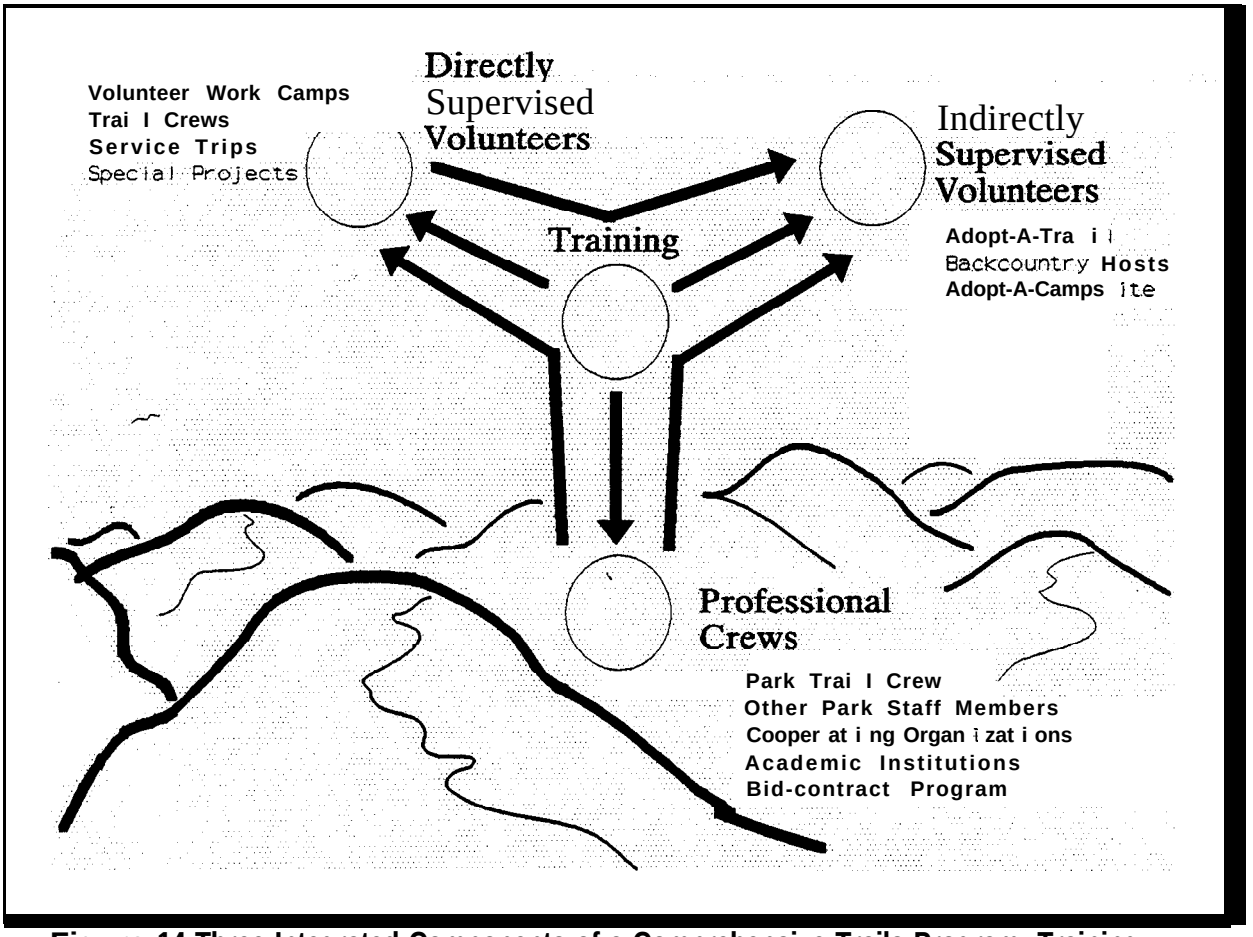

Figure 14 Three Integrated Components of a Comprehensive Trails Program: Training, Professionals, and Volunteers (both indirectly and directly supervised).

trail maintenance is another crucial component because individual professionals can supervise the efforts of others and ensure consistency. This component includes the Park's Trail Crew, and might also include professional Trail Crews of some cooperating organizations, and faculty or students of academic institutions. The third category is volunteers, whether directly or indirectly supervised.

Coordination between components of the proposed backcountry program is essential. An integrated program should comprehensively attend to the Park's backcountry and its needs. Means must be available to establish priorities for trail work, identify concerns at campsites, and balance personnel and funding between shelters, campsites, and trails. These efforts should consider the Park as a whole, not as Ranger or Maintenance Division districts. Resources should be directed to the Park's highest priority problems. To be most effective, a backcountry program must include opportunities for the public to participate. Members of the public should feel able to contact Park staff members with suggestions or concerns about the backcountry. A Backcountry Stewardship Coordinator and a Volunteer Project Coordinator, together with a revised committee structure, can provide for this need.

Several alternatives are available to fulfill needs within each of the proposed program's three components. **Training** is the core that holds a comprehensive program together. It provides direct support to professional and volunteer efforts and ensures consistency in skills and techniques. Examples of existing training opportunities include the Student Conservation Association's (SCA) Wilderness Workskills Program and the Appalachian Mountain Club's (AMC) Trail Skills Program. The Appalachian Trail Conference's (ATC) Konnarock Trail Crew provides another possibility, although it is not designed as a training program. Currently, the Park's Trail Crew provides training for volunteers, especially chainsaw safety and operation. A mixture of Park Trail Crew's training programs and external training would ensure that skills are current and shared by all those who are working on the Park's trails.

Professional efforts can assure that technical skills and proficiency are available for demanding projects and to supervise volunteer efforts. Within the Park's professional Trail Crew, several needs are apparent. The primary need is to retain a core of skilled trail workers within the Park's staff. Such a core group of people allows for necessary supervision and training of volunteers, and coordination and standardization between the professional effort and that of volunteers. The second greatest need for the Trail Crew is a continuous broadening of skills needed to reconstruct and maintain the Park's trails. With a volunteer effort properly in place that can take responsibility for less technical yet more time demanding work, the Park's professional Trail Crew can direct their effort towards more technical and remote projects. In completing these projects, the Trail Crew can benefit from familiarity with skills and techniques successfully applied elsewhere.

Enhancement of professional Trail Crew efforts can also occur through projects with cooperative organizations. The Park's Trail Crew and crews from other organizations can share their skills with each other. Together, they can adapt techniques to the Park that are successfully applied in other places. In some cases, a particular trail crew may have specialized skills they can bring to the Park, completing a project either as a demonstration or because there is a specific

need. Examples of cooperative organizations include the ATC, the SCA, the California Conservation Corps (the C's) (similar programs exist in several states), and the AMC. The Park's Trail Crew would play a crucial role with expanded cooperative trail maintenance, for they are best suited to provide guidance and supervision to ensure that the work is as expected.

Expansion of professional efforts might also include a Bid-Contract program. With such a program, Park staff members document a project's specifications and then advertise it. The Park's contracting officer accepts bids and then lets a contract. Such a system is dependent upon the skills of the project supervisor who sets the project's specifications and administers the project. Members of the Park's Trail Crew, again, can play a central role in such a program because one or more members could serve as project supervisors.

Volunteer-oriented efforts can be central to successful implementation of a comprehensive and integrated backcountry and trails program. Several forms of volunteer programs are possible, including directly supervised and indirectly supervised efforts. Either Park staff members or employees of cooperating organizations could supervise volunteer efforts.

One means of supporting such efforts are volunteer work camps, such as those operated successfully in several locations by the US Forest Service, the ATC, the SCA, and the AMC. Such camps typically provide a staging area for supplying work teams with tools and rustic accomodations. A camp might be permanently constructed or it could be mobile if wall tents and support vehicles provide necessary accomodations (showers, bathrooms, kitchen, tool cache, and sleeping quarters). Mobile work camps might work best in the Park because they could rotate to different areas either on a regular basis or as needs arise. By establishing portable camps, one would reduce the commuting time of work crews and allow more work to be accomplished. Permanent work camps, however, might be constructed in one or more locations on each side of the Park. Other opportunities could stem from greater cooperation with the Job Corps operation located within the Park and near Cherokee, NC. For example, Job Corps participants might serve as Trail Crew members or leaders, learning skills and gaining the experience of directing others.

Other directly supervised volunteer programs might include service trips, trail crews, or special projects. Service trips refer to short-term, one to two week, projects attended by volunteers who might live in widely scattered locations but come together to work in an attractive location and to accomplish needed trail work. Examples of organizations currently operating such a program include the AMC, the Sierra Club, and the American Hiking Society. Typically, volunteers pay a fee that offsets the cost of operating the program and they also provide their own transportation to the base camp. Supervision could occur through either Park employees, such as trail crew members, or through staff members of a cooperating organization.

Indirect supervision refers to the lack of supervision while work is being completed. Instead, supervision occurs indirectly by assessing the quantity and quality of work. Members of the Park's Trail Crew may be best suited for the responsibility of indirectly supervising such efforts. Indirectly supervised volunteer efforts might include Adopt-A-Trail, Backcountry Hosts, and Adopt-A-Campsite. Several examples of Adopt-A-Trail or Backcountry Host programs exist, including a currently operating Adopt-A-Trail effort in the Park. During background work for

this document, no examples of an Adopt-A-Campsite program were identified anywhere in the country, but the idea seems appropriate for the Park.

An Adopt-A-Trail program is typically oriented towards routine and basic trail maintenance, such as clearing windfelled trees, cleaning drainages, and identifying locations where more complicated work is needed. Adopt-A-Trail volunteers often select or are assigned one trail or section of a trail as their responsibility.

Backcountry Hosts, on the other hand, often work along any number of trail sections providing information to visitors about trails, backcountry recreation, and wildland ethics. Horse riders serving as Backcountry Hosts, for example, might station themselves at horse camps to talk with other horse riders about the Park and what they can do to help conserve the trails. Likewise, hikers serving as Backcountry Hosts might rove along sections of a popular trail to serve as a contact should any visitor wish to ask questions. A Backcountry Host program would provide an additional avenue to distributing specially tailored informational and educational materials to backcountry visitors.

An Adopt-A-Campsite program could coordinate volunteer maintenance of designated campsites. Responsibilities might include eliminating any unnecessary campfire rings, removing trash, identifying hazardous trees, or rehabilitating portions of the area.

The diversity of the three proposed indirectly supervised volunteer programs reflects specific Park needs. Coordination of these volunteer efforts with the professional efforts is essential for successful implementation of the proposed Comprehensive and Integrated Trails and Backcountry Program. Consistent work standards and techniques must be taught, priorities established, and logistical needs addressed. Training programs, supervision, and coordination are critically important. In addition, Park staff members can benefit from inviting the participation and cooperation of outside organizations as this comprehensive program is implemented. By working together, more ideas and resources can be brought to bear on an issue or project.

A well designed, comprehensive trails and backcountry program is indispensable for improving the Park's trails. The Park will begin careful and incremental implementation of such a program.

- **Establish a Comprehensive and Integrated Trails and Backcountry Program that Combines the Strengths of Park Employees, Volunteers, and Cooperating Organizations in a Joint Effort to Provide Stewardship to Backcountry Trails, Campsites, Shelters, and Visitors.**

  Backcountry stewardship requires hard work from both volunteers and professionals. Coordinating all backcountry efforts to efficiently utilize the available resources is vital to successfully improving the Park's trails.

Backcountry management. Stewardship is a form of management and administration that requires guidance and coordination, especially in Great Smoky Mountains National Park where the backcountry is popular and efforts to care for it are diverse and complex. Currently, the Park's backcountry management efforts are handled by two administrative committees with some overlap and some public participation. In addition, multiple efforts, including at least one program within each of four Park Divisions, attend to backcountry maintenance and field work. For example, the Maintenance Division operates a Trail Crew; the Visitor Services Division provides maps, other sources of information, and opportunities for education; the Ranger Division operates the Park's Adopt-A-Trail program; and the Resource Management and Science Division attends to non-native plants and problematic animals that at times are in conflict with backcountry recreation.

Diversity among the Park's backcountry operations and the interest and involvement of the public in this project suggests that either the current structure of committees should be refined or, in addition to refining that structure, a position should be established to coordinate backcountry efforts throughout the Park. Insufficient discussion occurred during this project to select a specific action. It is possible, however, to provide background information so a more thorough discussion can occur.

The Park's Backcountry Use Committee (BUC) is comprised of the five District Rangers and representatives from the Resource Management and Science Division and the Visitor Services Division. Recently, the individual filling the new Volunteer Project Coordinator position began attending the meetings as well, although not as an official member. The BUC is chaired by one of the Park's Resource Management Specialists. There is overlap between the BUC's functions and those of the Appalachian Trail Management Committee (ATMC) because issues or concerns associated with the AT are also associated with the backcountry and, at times, awkward to handle separately. The ATMC, in contrast with the BUC, has some limited public representation because representatives of the Smoky Mountains Hiking Club attend ATMC meetings.

One alternative to the existing committee structure would involve rolling ATMC functions into the BUC, either by making ATMC a subcommittee of the BUC or by assigning BUC the ATMC's functions without a subcommittee. Additionally, the BUC might become more available for public participation on some regular basis. The new committee might be redesignated the Backcountry Management Committee to emphasize its focus on all backcountry management questions, not just use and regulation.

Another alternative for addressing the need for greater coordination of backcountry management efforts is to establish a Park employee position dedicated to the wide responsibilities of backcountry management and part or all of the Comprehensive and Integrated Trails and Backcountry Program. The planned comprehensive program for improving the trails and backcountry must address at least eleven critical responsibilities (Figure 15). These responsibilities are diverse and essential, and they cross NPS Division boundaries. One alternative for such a position is to establish it as a member of the Superintendent's immediate staff because that is where the Divisional structure joins. As a member of the Superintendent's immediate staff, the position can help facilitate cooperative backcountry management efforts among Park staff members and between the Park and the public. Continued participation by members of the public,

especially horse riders and hikers, demands the attention of a responsive individual.

This is a large set of responsibilities, especially as the comprehensive program continues to grow. The Integrated and Comprehensive Trails and Backcountry Program will likely benefit from the expertise of a Backcountry Stewardship Coordinator. Whether that role is combined with the Volunteer Project Coordinator or is crafted to complement the Volunteer Project Coordinator is an important question that Park staff members must resolve.

A comprehensive trails program, a monitoring program directed towards the backcountry and the opportunities it provides, and implementation of an open, participatory process of making decisions about the Park's backcountry demands careful coordination. Park staff members will consider advantages and disadvantages of several possible staffing or committee configurations. They will then implement a workable means for coordinating efforts to improve the Park's backcountry and trails.

- establishing priorities and pursuing backcountry projects at a Park-wide level
- facilitating implementation of a decision framework for backcountry management
- supervision of .a program to-monitor resource conditions
- integrating backcountry effortsacross all Park 'Divisions
- coordination of training to ensure consistency
- trail relocation lay-out and design
- -compilation of prescriptive maintenance worklogs
- compliance with TUEPA and other legislation
- professional trail work facilitation
- volunteer project coordination
- volunteer 'program operations

Figure 15 Eleven Responsibilities of an Integrated and Comprehensive Trails and Backcountry Program.

. **Establish the means to effectively coordinate and administer the proposed growth or changes in backcountry management and maintenance efforts.**

Successful implementation of a backcountry program that integrates existing and proposed efforts requires coordination. Several alternatives are available and Park staff members should discuss possibilities in light of any present opportunities and any existing or likely constraints.

Goals of Integrated Backcountry Management

The final elements of the management direction for improving the trail system are proposed goals that emphasize integration of efforts. Because goals are more specific than priorities, they help promote a consistent heading by broadly stating what one is striving toward. Goals focus the Vision's direction and give substance to the priorities. The following goals reflect the interests, issues, and concerns of Park employees and members of the public who have been involved in this effort. As with previous material, the goals are presented within the three categories of setting, opportunities, and stewardship.

Setting

According to discussions that occurred as part of this project, certain contents or qualities set the Park's backcountry apart and make it special. Goals for the setting express the interest in conserving those qualities for future visits and other visitors.

- **Control or eliminate non-native plants and animals.**

  Non-native plants and animals can disrupt an otherwise fairly balanced system, as when wild hogs root up a trail or a non-native weed chokes out native grasses or wildflowers. NPS efforts to control such plants and animals have been in place for some time and are on-going.

- **Ensure that water remains unpolluted, free of contamination and subject only to natural processes.**

  The backcountry's health-- its fish, birds, and wildflowers-- depends on water, as does the health of backcountry visitors and, if they have any, their stock animals. Horses require good water, just as hikers require fresh water.

- **Reduce the intrusion of unnatural noise and pollution to the lowest levels possible.**

  Some of the backcountry's greatest assets are the relative absence of technologically produced noise and trash, and the presence of fresh air. Bird songs, babbling streams, rain drops, and other natural noises combine to produce opportunities for an experience that can be memorable. For many people, however, that experience is easily lessened if previous visitors have left litter, trash, or improperly disposed human waste. Unnatural noise can also detract from an otherwise enjoyable experience, especially in remote locations. Likewise, the backcountry's contents and character can be greatly altered-- one's opportunities for enjoyment lessened-- when air pollution damages trees, reduces views, or affects a person's health.

Opportunities

The Park's backcountry setting provides opportunities for enjoyment. Specific opportunities make the backcountry important to people. The following goals reflect the continual need to provide and conserve those opportunities.

- **Provide well designed, constructed, and maintained trails and sanitary shelters and campsites that offer opportunities for simple recreation and that do not change the backcountry more than the least amount necessary.**

  Trails and campsites offer the simplest means of accessing the backcountry and enjoying it. A system of trails and campsites ideally complements an area's content and character, minimally alters natural processes, and offers a challenging yet safe way of exploring.

- **Educate and encourage backcountry visitors to leave no trace of their presence or passing.**

  One way of reducing the maintenance burden, enhancing opportunities for enjoyment, and conserving an area for others in the future is to leave no trace of one's visit. Informational and educational efforts oriented towards promoting this idea are essential.

- **Provide visitors with opportunities to participate in interpretive programs that emphasize the backcountry's special qualities, its parts, and how those parts interact.**

  The Park's backcountry is a tremendous resource for learning and many current programs recognize this resource. Continuing and, where possible, expanding the opportunities will encourage enthusiasm toward the backcountry and an understanding its wonders.

- **Provide every opportunity for visitors to experience simple recreation that features a natural and undisturbed setting, solitude, and a physical and mental challenge.**

  Perhaps the most common way for a visitor to enjoy the backcountry is through simple recreation, such as hiking, walking, horse riding, or camping. For people to willingly volunteer their time and labor to care for the Park, opportunities for such recreation must be protected.

- **Allow no evidence of controls or restrictions except the minimum necessary to protect backcountry features and provide opportunities for simple recreation.**

  Even simple recreation can impair an area and lead to a loss of current or future opportunities. At times, controls or restrictions are necessary, but only when natural processes or recreational opportunities are threatened. Where necessary, they should be as transparent as possible so as not to interfere with the backcountry's processes or its visitors' enjoyment.

Stewardship

The backcountry setting and its opportunities require stewardship if they are to remain available for future visitors. Goals associated with stewardship are perhaps the most essential, for they articulate the means of caring and form of that care.

- **View the issues facing the Park and its backcountry not as individual problems, but as integrated concerns of all Park operations, as well as of visitors, volunteers, and local residents.**

  Many people care about the Park and its backcountry and when needed are willing to offer their assistance, ideas, or labor. Park staff members can benefit greatly from the ideas and efforts available from members of the public. A comprehensive perspective on the backcountry and its stewardship has been applied during this project and should continue.

- **Apply the minimum tool, equipment, regulation, or technique necessary to construct, reconstruct, or maintain the system of trails, shelters, and campsites, as well as other components of the backcountry.**

  Conserving natural processes while providing opportunities for enjoying the backcountry require a careful approach to management, construction, maintenance, and regulation. The minimum tool that will complete the job without compromising the reason for doing the job is the tool that is appropriate. regardless of whether it is motorized or not. Justification for selecting one tool over anther should be well thought-out and explicit about how any likely concern will be mitigated.

- **Understand both the effects of visitors and the effectiveness of actions taken by Park employees.**

  Every visit, regardless of activity, to any backcountry, regardless of location, changes that backcountry to some degree. The same is true for actions taken to offset the effects of visitation. Understanding those effects, how long they last, whether they are an issue or concern, and to whom they are an issue or concern is necessary for comprehensive backcountry management. Only with such an understanding can knowledgeable people make fair and intelligent decisions in an open, participatory manner.

- **Reduce the effects of people and their activities on the backcountry's character and contents so that the only changes from otherwise natural conditions and processes are those minimally necessary for simple recreation.**

  Simple recreation leads to change and some changes are undesirable for one reason or another. One can, however, often offset an undesirable change with maintenance and reduce future change with different behavior. By reducing the effects of simple recreation and offsetting those that remain, the Park's backcountry will remain available unimpaired for future generations.

- **Proactively and aggressively disseminate information to local media about Park efforts that is not restricted to actions or problems, but that solicits positive, educated public involvement as well.**

  Stewardship benefits from a knowledgeable and supporting public. Current efforts to inform the public have enhanced the-efforts of this project and should continue.

- **Integrate the efforts of Park staff members and volunteers.**

  Oftentimes, volunteers can amplify or complement the work of Park staff members. Integration of all efforts to care for the Park's backcountry is crucial. Without integration and coordination, however, those efforts are unlikely to realize their potential. A current emphasis on coordinating the work of volunteers and Park employees such as Trail Crew members should be expanded.

- **Involve the public in an open, participative effort to identify, clearly define, and respond to the issues and concerns facing the Park and its backcountry.**

  The Park's backcountry, trails, and campsites need help from those who enjoy them. Simply offering good, constructive ideas about issues, concerns, or their mitigation is one of the easiest and most meaningful ways to help. Continuing the open, participatory effort to involve members of the public in the care and management of the Park's backcountry will benefit both the Park and those who enjoy it. By welcoming more people into efforts to care for the Park, broader support is likely.

- **Implement a continual, iterative process to define limits of acceptable conditions based on indicators of backcountry condition and standards of acceptable condition reached through an open, public, and participative process.**

  An on-going process based on a decision framework and open to those involved in caring for the Park is necessary for the backcountry's long-term health. Without a formal process, decisions may appear haphazard and changes in Park administration or personnel can produce disconcerting changes in the direction of backcountry management. A comprehensible and effective process will constructively respond to external change without loss of direction.

Management Actions

Once the direction of effort is established, prescriptive management actions will be implemented as resources permit. The Vision, priorities, and goals state the desired direction, but they also allow the Park and others to select actions that are consistent with that direction. The material that follows contains specific objectives for an integrated backcountry management program and modifications to the existing system. These categories of actions reflect the broad direction of this document. The goals are to increase the capacity to maintain the system, increase the understanding among visitors about how each person can help reduce the effects of recreational activities, increase the opportunities for enjoyment provided by the system, and decrease the demand for maintenance.

This document's direction and the actions that follow stem from an understanding of the current situation. It reflects the ideas of those who participated in discussions during with this project, the limits and latitude provided by applicable legislative mandates, and the backcountry's contents, character, and opportunities as understood from the best information available. Each action is believed part of a sum that alters the current equation and moves the Park's backcountry contents and character in a widely desired direction. The consequence of failing to implement any single action is unknown, but the consequence of failing to move in the stated direction is more clear: continued decline in the quality of the backcountry.

Objectives for an Integrated Backcountry Management Program

Any comprehensive effort to administer a complex situation will benefit from objectives. Ideally, objectives provide such an effort with realistic and relevant targets. Each objective should be phrased in terms that are easily translatable into action and that allow progress to be assessed. A useful objective is unambiguous, quantifiable, and time-bounded. If the dimensions of an objective are clear, it becomes more obvious when the objective is attained. If the desired time period for attaining an objective expires, a clear, initial statement of the objective makes it possible to know whether the objective remains realizable or why it has become unrealistic or irrelevant. Once a desired objective is reached, Park staff members can then return to their goals for integrated backcountry management and, with appropriate participation and discussion, establish a new objective, if necessary. Accomplishment of an objective will most likely occur if an individual or group is assigned responsibility for its fulfillment. As in previous sections of this document, the objectives are organized according to the backcountry's setting, its opportunities, and stewardship efforts toward it.

Setting

The backcountry setting provides opportunities for enjoyment and requires the efforts of stewards if it is to remain unimpaired. Objectives associated with the setting, then, directly address the contents or character of the backcountry.

- **Within three (3) years, reconstruct all existing drainages and install all necessary new drainages on all trails maintained for horse riding.**

  The greatest need for the Park's trail system is stabilization to arrest any continued decline. Drainage provides the foundation for a stable system. By initially focusing on trails maintained for horse riding, one addresses the majority of the system (65%, 517 miles). In addition, compared with hiking, horse riding is the activity with the greatest potential to impair the system. By offsetting some of the activity's effects, the system's present decline is more likely to slow.

- **Within five (5) years, reconstruct all existing drainages and install necessary new drainages on all trails maintained only for hiking.**

  Again, the greatest need is to stabilize the system and drainages provide the basis for a sustainable trail system. Accomplishing this objective in conjunction with the previous one will ensure that the entire trail system is adequately drained and maintenance efforts, as opposed to reconstruction and installation, can take over completely.

- **Within three (3) years, initiate an integrated effort of rehabilitation and education towards the goal of containing visitors to trails in popular or sensitive locations.**

  By staying on trails in popular or environmentally sensitive locations, visitors help minimize their effects. Effective techniques will likely include low rubble scree walls, rehabilitation, and revegetation. Assistance from volunteers will benefit these efforts.

- **Within three (3) years, obliterate the first and last 1/4 mile of all "manways" and other non-maintained, informal trails in the Park.**

  "Manways" constitute an unofficial system of trails. They are not maintained, so, where erosion or other examples of poor trail conditions appear, the conditions represent unconserved Park resources and continued impairment. In addition, they are potentially hazardous. Visitors have become lost or injured as a result of inadvertently turning onto a manway. By obliterating the beginning and end of each manway, the likelihood of continued access is minimized and the remaining section should recover naturally. This objective assumes open, frank discussion about whether particular manways belong as part of the formal trail system.

- **Within five (5) years and every five (5) years after the initial effort, reconstruct, relocate, or close the 20 miles of the Park's trails that are in the worst physical condition.**

  One way to improve the ability to maintain a trail system is to stabilize its worst trails, improve their location, or close them. Many of the worst trails in the Park today are identified in Marion's (1994) work. Additionally, the final section of this document contains planned modifications to the system. That section also contains a review of the available information concerning many Park trails. The Park will re-visit implementation of this objective every five years.

- **Within three (3) years, implement a cooperative program between Park staff members and volunteers to minimize the presence of non-native plants at grassy balds and other sensitive locations.**

  Non-native plants can greatly alter the setting. Current programs operated by Park staff members to eliminate them can benefit from the assistance of volunteers. Because of the real and potential likelihood that horses contribute to the presence of non-native plants, horse riders are an especially appropriate group to provide assistance.

- **Within three (3) years, install appropriate protective measures at any water source in the Park's backcountry where either horses or hikers are damaging either the water or adjacent soil or plants.**

  Clean water is important for hikers, horse riders, horses, and all the Park's native plants and animals. Protecting water sources helps conserves the Park for future generations and increases opportunities for enjoyment. Criteria for determining appropriateness is discussed throughout this document, but specific decisions depend upon the particular circumstances.

- **Within three (3) years, rehabilitate any and all backcountry vistas judged as appropriate for the stewardship objectives associated with conserving the Park's scenery and providing opportunities to visitors for its enjoyment.**

  The Park's scenery is one of its most characteristic contents. A program to rehabilitate and maintain the historic vistas once available in the Park will be established, provided consensus exists that such vistas are an appropriate component of the Park's backcountry. Insufficient discussion occurred during this project to offer any statement regarding the appropriateness of backcountry vistas. That discussion will occur and is an objective for Park stewardship.

Opportunity

Opportunities for enjoying the backcountry require a conserved setting and the efforts of stewards if current opportunities are to remain unimpaired for future visitors. Objectives associated with backcountry opportunities, then, ensure opportunities for knowledgeable, responsible enjoyment of the backcountry.

- **Every six (6) years, openly and publicly evaluate the trail system and the program of maintaining it to identify where problems exist and what options are available to address them.**

  The Park's backcountry trail system provides tremendous opportunities for enjoyment. A continual, regular effort is needed to assess the system and where opportunities for enjoyment could be further realized. This effort will be coordinated by the Backcountry Stewardship Coordinator and the Backcountry Use Committee.

- **Within two (2) years, openly and publicly evaluate the need for all present campsites and shelters, the need for any additional designated camping areas, and any concerns associated with either existing or potential locations for staying overnight in the backcountry.**

  Like the trail system, the network of camping areas and shelters also offers opportunities for enjoyment. Following Marion's (forthcoming) assessment of campsite conditions, an open and public evaluation of all present campsites and shelters will occur. That evaluation will include discussion about the appropriateness of each camping area and shelter and whether any new camping opportunities should be established. It will also identify any concerns associated with existing or potential camping areas and propose actions to resolve problems.

- **Within three (3) years, provide backcountry visitors with a renovated backcountry campsite and shelter reservation system that (a) serves identifiable purposes, (b) is sufficiently staffed with Park employees and volunteers to serve those purposes, (c) is accessible to visitors, and (d) is simple to operate.**

  Park staff members operate a backcountry campsite and shelter reservation system that has evolved over several decades. Although it is an essential component of the current backcountry management effort, this project did not attempt to produce specific actions related to the reservation system because of the its complexity. This objective reflects the four concerns most relevant to the system.

- **Within three (3) years, establish an interpretive program throughout the Park, oriented toward the backcountry, and with the purpose of educating program participants about backcountry components and activities.**

  The Park's Interpretation and Visitor Services Division has recently initiated an effort to provide even more current services to Park visitors. This objective relates to the backcountry component of their effort.

- **Within three (3) years, establish an integrated and participatory means of coordinating, evaluating, and distributing educational and interpretive information pertaining to trails, shelters, and campsites.**

  The Park's Interpretation and Visitor Services Division has initiated an effort to provide visitors with opportunities to learn more about the Park. The backcountry offers a setting for groups or individuals to learn. The Visitor Services Division offers a means of coordinating educational and interpretive information across all Park Divisions. Any effort to coordinate educational and interpretive information related to the Park's backcountry would benefit from a participatory program of evaluation. Concerns include contents, effectiveness, and distribution avenues. Examples of distribution means include maps, brochures, and displays.

Stewardship

A backcountry setting and the opportunities it provides for enjoyment require stewardship if current opportunities are to remain unimpaired for future visitors. Objectives associated with backcountry stewardship, then, ensure that the backcountry setting is conserved and opportunities for its enjoyment are provided.

- **Within six (6) months, establish priorities for each objective contained in this document and, within one (1) year, designate an individual or group as responsible for realizing that objective.**

  Objectives are most likely fulfilled when one individual or group is assigned responsibility for its completion. Park staff members will determine the Division, Branch, group, or person who will be responsible for each objective.

- **Within six (6) months, establish the means to effectively coordinate and administer the needs and complexity of current and planned inter-Divisional backcountry management efforts in an open and participatory manner.**

  Integration of existing and proposed programs requires coordination and facilitation. Several means for addressing this need are available, including realignment of the current committee structure and creation of a Backcountry Stewardship Coordinator position to complement the new Volunteer Project Coordinator position. Establishing a Backcountry Stewardship Coordinator position as a member of the Superintendent's immediate staff is the preferred means for accomplishing this objective. Coordination and integration of current programs and their anticipated future growth is the most pressing stewardship need. That need will be addressed carefully and without delay.

- **Within one (1) year, clearly state Park policy regarding backcountry vistas and guidelines for tools, stream bridges, and vehicles in the backcountry.**

  Currently, some Park policies are unclear or loosely defined. Some confusion has occurred as a result. Clearly stating policies and guidelines about backcountry management will more explicitly define its direction.

- **Within two (2) years, produce an extensively revised, technically explicit, and current manual for trail work in the Park.**

  No single Park document exists that contains outlines of NEPA compliance information along with trail lay-out and design, construction, and maintenance guidelines. The materials will be compiled into a single reference manual reflecting Park policy.

- **Within one (1) year, select and apply an open, participatory decision framework applicable to consideration, selection, and assessment of actions to address the backcountry's needs based upon indicators and standards.**

  Several frameworks are available to facilitate comprehensive and comprehensible decisions about a backcountry. Examples include LAC and VERP, discussed earlier in this document. A framework would objectively articulate changes in backcountry conditions and would benefit decision processes and purposes.

- **Within one (1) year, begin implementing a monitoring program-- completed within three (3) years-- to provide objective, replicable, and applicable information to those participating in decisions affecting the Park's backcountry.**

  The advantages and structure of a well designed program to monitor change and anticipate future conditions are described in previous sections of this document. Although one year is insufficient time to design and implement a monitoring effort, a year is sufficient to establish monitoring objectives applicable to the backcountry, assess whether gaps exist in current monitoring efforts, confirm logistical and staffing support, and review data collection methods along with potential indicators. Such an effort will have immediate and long-term advantages to the Park and those who care for it.

- **Within one (1) year, begin compiling *prescriptive maintenance worklogs* for each Park trail based upon its initial priority among all trails.**

  A prescriptive maintenance worklog provides detailed a description of the existing and needed work along a trail (Appendix D). From the description, alternatives for repairing or relocating a route can be compared against redesignating or closing it. This information is crucial.

- **Within one (1) year, provide training to all Great Smoky Mountains National Park Trail Crew members and selected volunteer trail workers in the most current techniques of backcountry and wilderness trail layout and design, construction, reconstruction, and maintenance.**

  Backcountry stewardship begins with trails because trails provide access and opportunities for enjoying the backcountry setting. The Comprehensive and Integrated Backcountry and Trails Program requires the participation of a skilled, knowledgeable group of professional and volunteer trail workers. Training is at the core of this program and it will remain an ongoing need.

- **Within three (3) years, establish a comprehensive program that integrates a training program (begun with completion of the previous objective), professional Trail Crews (National Park Service and cooperative organizations), and volunteer trail workers (indirectly and directly supervised) and has the purpose of reconstructing, constructing, and maintaining the Park's official system of backcountry trails, campsites, and shelters.**

  The preliminary outline of an Integrated and Comprehensive Backcountry and Trails Program is found earlier in this document. It is the means for accomplishing the most immediate work needed along the Park's trails.

- **Within three (3) years, establish a system of basecamps located outside the backcountry for the purpose of providing shelter and supplies to 500-800 volunteers each year, and to crews of cooperating organizations, all working on trails or other backcountry projects in the Park.**

  To fully realize the potential for an expanded volunteer program requires more infrastructure than currently exists in the Park. Basecamps, described earlier, provide an essential component of the needed infrastructure. They will provide a staging area, tool cache, and rustic accomodations.

- **Within three (3) years, establish a well-trained, volunteer-staffed Backcountry Host program to provide informational and educational presence in the backcountry.**

  When members of the Park's Ranger Activities Division established the current Adopt-A-Trail program, they intended the program to provide an informational and educational presence in the backcountry, among other responsibilities. The idea was to have volunteers serve as hosts should a backcountry visitor need or desire friendly assistance. The current Adopt-A-Trail program does not provide an opportunity for individuals who might be more attracted by that original idea than by basic trail maintenance. A Backcountry Host program would restore that opportunity by separating the function from the Adopt-A-Trail maintenance program. More detailed discussion of this and the following objective is found earlier in this document.

- **Within three (3) years, establish a well-trained, volunteer-staffed Adopt-A-Campsite program to maintain the backcountry campsites and shelters.**

  Campsite maintenance is currently overlooked and, in some areas, the Adopt-A-Trail program is overwhelmed by enthusiastic people willing to volunteer their efforts to care for the Park. An Adopt-A-Campsite program would complement the Adopt-A-Trail program and the recommended Backcountry Host program by focusing on campsites and providing another opportunity for people to assist the Park.

- **Every three (3) years, complete a cycle of reviewing, evaluating, and maintaining the system of backcountry trail signs.**

  Backcountry trail signs are a component of the trail system and camping area network. This objective is currently in effect and will continue.

- **Within one (1) year, following open and reasonable discussion, decide whether a second seasonal window in the fall is appropriate for using chainsaws and other motorized equipment in the backcountry.**

  The current spring chainsaw window allows some windfallen trees to remain long enough that by-pass trails form, causing erosion and compaction of soil and damage to vegetation outside the intended trail tread. Discussion should occur about the appropriateness of a second chainsaw window in the fall.

- **Within one (1) year, establish a schedule and priorities for completing modifications to the existing system.**

  Modifications to the Park's backcountry trail system are described in the remaining portion of this document. Park staff members will establish a schedule for implementing the actions. Some actions depend on successful completion of others and the schedule should reflect that interdependence.

Modifications to the Existing Trail System

Accomplishing the objectives requires specific actions. Each action reflects at least one of three reasons. One reason is to reduce the demand for maintenance by redesignating the activities for which a trail is maintained. Another reason is to improve opportunities for enjoyment, as might be achieved by reopening or redesignating a trail as part of the formal trail system. And, lastly, one reason is to repair or maintain a trail, campsite, or shelter.

Each action is the result of extensive discussion. Horse riders, hikers, Park employees, and Conservation Organizations offered their ideas, expressed their concerns, and suggested options. Appendix C of this document contains a listing of the organizations and groups who were approached or who chose to participate in this project. The people who participated in these discussions reviewed Marion's (1994) assessment of trail conditions, suggested where other problems likely exist, and shared understandings about the trail system and what affects its quality. In addition, they explored ideas found in the most current literature about trails and backcountry recreation. Potential means for addressing concerns about the Park's trails and backcountry were discussed and the actions that follow are the result of those talks.

For most of the actions, specific options are not yet selected, Park staff members will complete prescriptive maintenance worklogs for each trail section affected by an action. Information from the worklogs will allow selection of a specific alternative. Once a specific action is proposed, the applicable NEPA compliance work will begin. In many cases, a Categorical Exclusion will apply, but, in some cases, more involved work is likely necessary. The Park may modify specific actions from the descriptions that follow if NEPA compliance work reveals an unexpected need.

Reducing Maintenance Demand

The simplest way to increase the capacity to maintain a system is to reduce the system's need for maintenance. Trails maintained for horse riding require more maintenance and, if a trail is inadequately prepared to withstand the effects of riding, the work necessary to reconstruct the trail can be great. If, in addition, a trail is not located where riders can enjoy it, then the benefits of investing the needed work to repair and maintain the trail for riding far outweigh the costs.

Two of the Park's trails that are currently maintained for horse riding will be redesignated and maintained as hiking-only trails. The effect of these changes is to free maintenance efforts and resources for the remainder of the Park's trail system.

- **Redesignate Brushy Mountain Trail as hiking-only.**

  The Brushy Mountain Trail ascends Mt. LeConte from the Porters Flat area of Greenbrier Cove. It is rarely ridden by horse riders, in part because access and parking are inappropriate for vehicles with trailers. Although the trail is adequate for hiking, it needs much additional work to become again a safe, enjoyable horse riding route. The effort required is better spent on more popular trails that are part of circuit or loop rides.

- **Redesignate Trillium Gap Trail as hiking-only.**

  Trillium Gap Trail ascends Brushy Mountain until it joins the Brushy Mountain Trail. Parking for the trailhead is along the Roaring Fork Motor Nature Trail and is limited for someone with a vehicle and trailer. In addition, the trail needs much trail work, especially to return it to conditions that will sustain horse riding. For these reasons, continuing to maintain the trail for horse riding diverts resources from trails that are more critical to the network of trails maintained for riding. Maintaining the trail for hiking-only will not divert resources.

Improving opportunities for enjoyment

By increasing opportunities for enjoying the backcountry, one can improve the system's quality. Careful consideration is necessary, however, so as not to unduly add to the existing maintenance demand. The existing system has problems and actions to improve opportunities must avoid adding new problems. Each of the following actions require that adequate steps are taken to offset any anticipated effects of implementing them. Those adequate steps constitute the conditional work upon which each proposal is based.

- **Redesignate trails proposed for incorporation into the Mountains-to-the-Sea Trail.**

  The route of the Mountains-to-the-Sea Trail traverses the width of North Carolina. It would enter the Park near Oconaluftee Visitor Center near the Blue Ridge Parkway and the Cherokee Indian Reservation. The route would then cross under Newfound Gap Road in an existing underpass and follow an existing woodsroad to join the Deeplow Gap Trail. It would then ascend towards Newton Bald and Thomas Divide, traverse to Sunkota Ridge and descend to Deep Creek Trail. It would finish by ascending to Fork Ridge Trail, climbing to join the Appalachian Trail, and traversing to Clingmans Dome. The redesignation would not affect any current trail designation or maintenance category. Some trail work is necessary to establish the route along the existing woodsroad near the Cherokee Indian Reservation.

- **Redesignate trails proposed for incorporation in the proposed Benton MacKaye Route.**

  The proposed Benton MacKaye Route parallels the Appalachian Trail below the ridge, offering an alternative low elevation route connecting either end of the AT in the Park. The proposal associated with the Route does not include any alteration of existing designation or maintenance category.

- **Connect Noland Divide Trail with the Appalachian Trail.**

  The upper end of Noland Divide Trail ends at the Clingmans Dome Road, approximately 200 yards from the AT. This gap will be bridged. The new section of trail will be designed and maintained for hiking-only because the AT, in that section, is hiking-only.

- **Install a connector trail between Ace Gap and Cane Creek Trail [conditional].**

No connection exists within the Park between Ace Gap, where Ace Gap Trail and Beard Cane Trail intersect, and Cane Creek Trail on the other side of Hatcher Mountain. This area is popular for horse riding and the trails are well designed, built, and maintained for riding. Currently, riders exit the Park and traverse private land to connect the two trails. However, work by Park Rangers, Park Trail Crew members, and the author of this document located a viable route within the Park boundary for resolving this situation. The route follows several old railroad grades along Hesse Creek, Johns Branch, and the lower portion of Johns Ridge before ascending along a short traverse of a steep slope to crest Johns Ridge. Much of the remaining portion of the route then follows an alignment laid out by Park Rangers that is expected to require only basic installation such as tread clearing and benching and corridor clearing. The final two to three tenths of a mile descending to Cane Creek Trail will follow the existing alignment of an abandoned woodsroad. The trail should be designed and constructed to accommodate year-round horse-riding [wide, well drained tread within a corridor free of brush]. The estimated distance of trail added to the Park's formal trail system is between four and five miles. Most of that distance would follow old railroad grades. The availability of personnel and funding to complete the needed work remains the primary condition for implementing this action.

- **Reopen the Greenbrier Pinnacle Trail [conditional].**

The Greenbrier Pinnacle Trail ascended the southwest slope of Greenbrier Pinnacle to reach the former site of a firetower. It is approximately 2.5 miles long. When open, it provided a hiking-only access trail with views and other attractions. It was closed to offset the addition of the Old Settlers Trail and the maintenance burden of its mileage, following previous interpretations of the Park General Management Plan's directive regarding trail mileage. Currently, the lower end of the trail is clearly visible and most maintenance needs are addressed by volunteers on an unofficial basis. Some short sections of the trail may need repair or reconstruction. Park employees will assess the trail for problems and the means for completing any needed work pursued. If the trail is deemed inappropriate for reopening, the lower end will be obliterated for one-quarter (1/4) mile to prevent continued access. If obliterated, Park staff members will annually monitor the trail to ensure it remains closed.

- **Establish a designated campsite at High Rocks [conditional].**

  High Rocks is the site of a former firetower above the Cold Spring Gap Trail on the North Carolina side of the Park. Water is available at a spring along the access trail. The site at High Rocks currently is a somewhat popular location for undesignated, illegal camping. It also is quite contained, so a designated campsite is unlikely to expand to an undesirable size. Because of the amount of riding in the area, Park staff members will assess the High Rocks trail for any needed work in anticipation of implementing the action. Three alternatives are present. First, if the trail can feasibly support horse riding, the campsite will include a hitchrack. Second, if any work determined as necessary to support increased horse riding outweighs the need for horse riding access, then Park will designate the campsite and access trail as hiking-only. And, third, if the trail is determined as unfeasible to repair or maintain, the Park will obliterate the trail and not implement this action.

- **Begin maintaining the upper 1.6 miles of the Miry Ridge trail for horse riding [conditional].**

  The upper portion of Miry Ridge trail, located between the Appalachian Trail and Lynn Camp Prong trail in the Tremont portion of the Park, **is** currently maintained only for hiking. If maintained for horse riding, it would offer a means to access the ridge from either Tremont or from Elkmont. Horse riders could then ride east to Silers Bald and descend Welch Ridge, if they desired. This would allow more access between Hazel Creek and Fomey Creek areas of North Carolina and the Elkmont and Tremont areas of Tennessee. Full implementation of this action requires immediate work to prepare upper Miry Ridge trail, the AT from Miry Ridge to Silers, and Welch Ridge trail for the additional effects of increased horse riding. Implementation of this action will not occur until the appropriate preparation is complete.

- **Reopen the Hyatt Ridge Trail [conditional].**

  The former Hyatt Ridge Trail ascended from the McGhee Spring campsite (#44) to the area of Tricomer Knob on the North Carolina side of the Park. It is approximately four (4) miles long. It provided more direct access to the ridge from the Raven Fork area. Because of existing conditions as the trail ascends the ridge (reportedly, exposed roots and alignment constraints), the Park will maintain the trail as a hiking-only trail. Assessment of the work needed to reopen the trail will occur before any final decision. If that assessment reveals that the work necessary to ensure a sustainable trail outweighs the advantages of having the trail as part of the Park's formal trail system, then the Park will not implement this action.

Repairing and maintaining trails, shelters, and campsites

The Park's formal trail system contains segments of trail with problems that demand immediate attention. By identifying the known problems associated with the trails, shelters, and campsites, the steps necessary to repair the problems and maintain the entire system can begin. The planned work addresses the most prevalent issues and concerns that people have about conditions found along the Park's backcountry trail system.

- **Begin a gradual effort to remove all metal culverts from the backcountry and replace each of them with an appropriate backcountry design, a short wooden bridge, or an open drainage dip, depending upon specific situations.**

  Metal culverts do not belong in the backcountry and the Park will begin removing them as time and resources allow. Problems with culverts include aesthetics and maintenance. Clearing closed culverts is difficult, yet a blocked culvert is easily washed out by high water. In addition, a severe storm can block and then rupture or wash out a culvert even if the culvert is clean before the storm. They will be replaced with an aesthetically appropriate culvert design modeled after Civilian Conservation Corps techniques, small wooden bridges, or an open drainage dip. Specific actions will depend upon local circumstances. This action will occur gradually as each trail section containing a metal culvert receives work.

- **Relocate the Panther Creek Trail.**

  Panther Creek trail ascends from Middle Prong trail to Jakes Gap in the Tremont area of the Park. It was not assessed during Marion's (1994) work, but reportedly has several sections in poor condition, especially as it ascends to Jakes Gap. Another route, however, might be possible along an abandoned railroad grade along Marks Creek to Bearpen Gap. At some point the route likely becomes an abandoned woodsroad or trail and ascends to Blanket Mountain. Park staff members will complete an assessment of both the existing route and the possible relocation. Comparison of the two routes will reveal whether reconstruction of the existing route is preferable over relocating it to the abandoned routes. Blanket Mountain at one time provided a scenic vista. The estimated distance closed is 2.2 miles. The estimated distance opened is 3.2 miles.

- **Relocate the section of Lakeshore Trail between the lower ends of Eagle Creek and Jenkins Ridge trails.**

  This is one of the worst designed sections of trial in the Park. It crosses a stream 15 times in less than a mile. By establishing a new route that mostly utilizes abandoned roads and trails to bypass the existing Pinnacle Creek section of the Lakeshore Trail, existing problems with alignment, safety, and water on the trail are likely avoided. If possible, the lower end of this new route will leave the existing route just upstream of the lowest bridge over Eagle Creek and ascend toward Flint Gap. Two alternatives present themselves at this point. The first is to ascend Pinnacle Ridge, probably with a completely new route. This alternative should be selected only if the route is extremely feasible. The second alternative is to descend Pinnacle Ridge toward Ramp Cove. From there an old roadbed connects with Possum Hollow and Proctor, where Proctor campsite (#86) is located. Entering this old road from the north, along Hickory Bottom Branch, is an old trail with switchbacks to ascend Pinnacle Ridge toward Soapstone Gap. Once the new route is properly cleared, and, as needed, drained and stabilized, close and rehabilitate that section of the Lakeshore Trail between Pinnacle Creek and the new upper junction with the proposed route (roughly at Pickens Gap). The entire length of the new alignment will be designed, constructed, and maintained for year-round horse-riding. The estimated distance to be closed is three miles. The estimated distance of trail opened is between four and five miles.

- **Relocate the Jenkins Ridge trail below Blockhouse Mountain [conditional].**

  The lower end of Jenkins Ridge is in poor condition. A potentially viable alternative, however, is present. An abandoned roadbed descends Forrester Ridge to Deep Gap where several other abandoned railroad grades or woodsroads begin. Depending upon ground conditions, the route will either descend east on abandoned roadbed to Bone Valley Trail or descend west on abandoned roadbed to Haw Gap Branch and then to Sugar Fork Branch section of the Lakeshore Trail. Park staff members will assess the amount of work needed to complete each of these options and decide whether any option is realistic. If so, when the new route is properly cleared, drained, and stabilized as needed, the section of Jenkins Ridge Trail from below Blockhouse Mountain to its junction with the Lakeshore Trail will be abandoned and obliterated. The estimated distance of trail to be opened is five miles, all on old roadbed. The estimated distance to be closed is also five miles.

- **Relocate the Mount Sterling Ridge Trail from Laurel Gap to Pretty Hollow Gap [conditional].**

  This four (4) mile long section of trail is in poor condition. Several alternatives will be considered, including relocating its entire length. An abandoned railroad grade skirts the southern shoulder of Mount Sterling Ridge for the entire length of this trail. Park staff members will assess the existing route to determine the scale of needed work and the abandoned railroad grade to compare with work required to repair the existing tread. If the existing tread is preferable, the trail should be reconstructed as soon as possible. If, however, the railroad grade is a viable alternative for a sustainable route, then work should begin to convert the grade into a trail. Once that work is completed, the existing route along Mount Sterling ridge should be obliterated and the new route opened.

- **Determine the most applicable means to improve the trails that are in the worst condition.**

  Park staff members will further investigate and decide the most reasonable alternative for completing currently necessary repairs to the backcountry trails. Park staff members will, depending upon the specific situation, either reconstruct, relocate, redesignate as hiking-only following repair, or close and rehabilitate the trails listed in Tables VII, VIII, IX, and X. The Park will adhere to a schedule of five years to initiate and complete either repair, relocation, or closure of those trails. Specific actions will be selected after prescriptive maintenance worklogs are applied to document alternatives and the work needs and costs associated with each one.

Table VII Appalachian Trail and AT shelters Most in Need of Major Work. Assume that Any Trail Not on List Requires Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Appalachian Trail	Russell Field to Spence Field	Entire section	Erosion and muddy quagmires are mostly the result of poor trail alignment. Relocate the trail with sufficient cross-slope to install needed drainage or install turnpiking to harden and elevate the existing tread.
	Spence Field to Cold Spring Knob	Spence Field and scattered other segments.	Spence Field needs a hitch rack to allow riders to hitch their horses outside the grassy area. The section east of Thunderhead needs relocation or reconstruction to offset the 30% grade. Many other segments need reconstruction, drainage, or short relocations.
	Clingmans Dome to Newfound Gap	Entire section	Drainage and other reconstruction work is needed.
	Newfound Gap to Charlies Bunion	Entire section	Drainage, drainage, drainage and occasional rocksteps to offset existing gullies. Some sections of rock cribbing are also needed.
Shelters	Tricorner Shelter	Spring area and hitchrack area	The spring requires work to provide a protected route to the source for people and horses. The hitchrack is located far enough from the shelter that horse riders often prefer to hitch their animals at the shelter. Installation of one or two tent platforms near the existing hitchrack is recommended to provide horse riders with a place to camp in tents near their animals.
	Pecks Corner Shelter	Spring area	Trail drains into spring. Relocate and properly construct access trail to prevent damage to water source. Install spring box.
	Icewater Spring Shelter	Spring area and shelter.	Install spring box. Remove bunks if the shelter is to remain closed for camping.
	Double Spring Shelter	Spring area	Install spring box and instruct visitors to dispose of human waste properly so as to protect water supply.
	Silers Bald Shelter	Spring area	Install spring box.
	Derrick Knob Shelter	Spring area	Relocate and properly construct access trail to prevent damage to water source.
	Spence Field Shelter	Spring area	Install spring box, including separate location for horses with a good access trail.
	Russell Field Shelter	Spring area	Install spring box. Relocate trail and install properly designed and constructed route to spring.

Table VII Cataloochee and Cosby Area Trails Most in Need of Major Work. Assume that Any Trail Not Listed Requires an Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Cataloochee	Caldwell Fork	3.3 miles between the trailhead and McKee Branch	**One of the worst sections of trail in the Park.** Most of this stretch requires major reconstruction, including rock cribbing, drainages, and turnpiking. An assessment of the needed work should compare the advantages of reconstructing the trail for horse riding or for hiking. If reconstruction for riding is unrealistic, redesignating the trail for hiking-only is recommended following reconstruction.
	Polls Gap	Scattered sections	Existing problems require assessment. Likely problems include gullies, tread widening, trail layout, and root exposure.
	Pretty Hollow Gap	From Little Cataloochee Trail to Pretty Hollow Gap	Trail aligned along drainage bottom. Assessment needed to determine alternatives for either relocation or reconstruction.
	Mount Sterling Ridge	Pretty Hollow Gap to Balsam Mountain Trail	Drainage and reconstruction. See recommendation for relocating trail.
	Long Bunk	Entire trail	Mud and root exposure. Park staff should assess this trail to determine whether relocation or reconstruction is warranted. This trail is an important riding trail and closure should be considered only if no other alternative is viable.
	Little Cataloochee	The 2.5 miles from Pretty Hollow Gap Trail	Muddy quagmires, excessive grade, eroded gullies, and multiple treads. Trail requires extensive work and possible relocation of some sections.
	Spruce Mountain	The mile between Balsam Mountain Road and Polls Gap Trail	Excessive grade. Relocation, as proposed by members of the Park trail crew, should be pursued.
Cosby	Low Gap	From Low Gap to Big Creek Trail	Existing problems require assessment. Likely needs are drainage and some reconstruction.
	Snake Den Ridge	Upper two miles below Inadu Knob	Drainage is needed to offset erosion and gullying. Effects of recent access by motorized vehicles should be repaired.
	Mount Cammerer	Entire trail	Effects of recent access by motorized vehicles must be addressed.
	Albright Grove Loop	Entire trail	The trail's alignment has led to root exposure in some localized areas. Relocating the trail for short stretches and installing an adequate trail bench (see Figure 4) is necessary. Near some of the old-growth trees, efforts to protect roots from damage should be considered.

Table IX Mt. LeConte, Clingmans Dome, Elkmont, Tremont, Noland Creek, and Oconaluftee Trails Most in Need of Major work. Assume that Any Trail Not on List Requires Assessment and Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Mt. LeConte	Rainbow Falls	From Cherokee Orchard Road to Rainbow Falls	Extensive erosion and shortcutting of switchbacks are problems. Reconstruction of trail, proper drainage, barriers, and rehabilitation of shortcuts are needed.
	Trillium Gap	From Roaring Fork Motor Nature Trail to Grotto Falls	Partial reconstruction and drainage is needed for existing trail route.
	Baskins Creek	Last one-quarter mile to Falls	An unofficial spur trail to the base of the falls should be brought into the system. It needs proper location and construction, including extensive rock steps, rock cribbing, and drainage. This is a hazardous situation.
	Grapeyard Ridge	From Roaring Fork Motor Nature Trail to Dudley Creek	Erosion, slumping, and root exposure are all problems. The trail should be reconstructed with adequate drainages. Several sections require proper benching of the trail to stabilize it and prevent slumping. A few, short relocations may be needed.
Clingmans Dome	Road Prong	Entire trail.	Drainage, trail layout, tread corridor clearing are problems. Fewer than 10 drainages exist along the 2.4 mile trail. Windfall should be removed from the corridor and drainage installed along the length of the trail.
Elkmont	Jakes Creek	Above the first 1.2 miles of trail	Excessive root exposure, wet soil, water running on trail, and erosion are all problems. Reconstruction and drainage is necessary.
Tremont	Panther Creek	Entire trail	Erosion, muddy soils, and steep grades are problems. See the proposal for relocating the trail.
	Lynn Camp Prong	Upper 1.5 miles	This trail should be assessed. Reported problems include steep grade and erosion.
Noland Creek	Noland Creek	From Mill Creek campsite (#64) to the Noland Divide Trail	Poor location is the problem. Proper drainage, reconstruction, and partial relocation are needed.
Oconaluftee	Enloe Creek	Entire trail	Wet soils and erosion are the problems. The trail needs drainage to eliminate water running along it.
	Hughes Ridge	Entire trail	The trail traverses private property within the Cherokee Indian Reservation. A final route for a proposed relocation should be established and installed or the trail should be closed.

Table X Cades Cove and Hazel Creek Trails Most in Need of Major Work. Assume that Any Trail Not on List Requires Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Cades Cove	Finley Cane	The one-half mile from Laurel Creek Road	Muddy quagmires and poor stream fords are problems. Turnpiking and drainage are needed.
	Turkey Pen Ridge	Entire trail	Trail is in remarkably good condition given the lack of drainage and an absence of tread hardening as it crosses streams. Drainage is needed for entire trail, every stream crossing requires stabilization, and turnpiking is needed in several locations at the lowest point of the trail.
	Russell Field	Entire trail	Drainage, reconstruction, proper tread benching, and turnpiking are needed immediately.
	Bote Mountain	Upper 1.7 miles	Huge gullies require drainage, staggered steps, and possible relocation. Assessment of possible routes should occur. No alternatives present themselves other than construction of new trail or major reconstruction. This is a major endeavor.
	Rich Mountain Loop	One mile as the trail climbs Cave's Ridge	Excessive grade and a lack of drainage are problems. Assessment of situation is needed. Likely actions include drainage and reconstruction of the tread's bench.
	Little Bottoms	Entire trail	This trail was never designed or constructed. Much of it simply happened. It should be properly constructed where the trail bench is absent and drainage installed along its length.
Hazel Creek	Jenkins Ridge	Below Blockhouse Gap	See proposal for relocation.
	Lakeshore Trail	Jenkins Ridge Trail to Eagle Creek	See proposal for relocation.
	Cold Spring Gap	The two miles above Hazel Creek Trail	Drainage, reconstruction, and at least partial relocation are all needed. This trail has maior problems.
	Jonas Creek	The mile above Forney Creek Trail	Poor location and a lack of drainage are problems. Reconstruction, drainage, and partial relocation should be considered. An assessment is needed.
	Forney Creek	Jonas Creek Trail to Whiteoak Branch	Poor location is the problem. Drainage, reconstruction, and partial relocation should be considered. An assessment is needed now.
	Forney Ridge	Andrews Bald to Clingmans Dome parking area.	Insufficient drainage, water running along the trail, and tread erosion are all problems. Extensive reconstruction is needed, including rock steps and water bars.

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Appendix A

EXPANDED DESCRIPTIONS OF EIGHT KNOWN NATIVE AMERICAN ROUTES PREDATING THE PARK'S ESTABLISHMENT

Cataloochee Indian Trail

Beginning with the eastern end of the Park, Cataloochee Indian Trail appears to have parallelled the Park boundary from northwest of Davenport Gap to near an area known as Mt. Sterling Post Office, near the current Big Creek Ranger station and where Big Creek exits the Park. In that section, a portion of the route may be within today's Park boundary, although it also may be within the current corridor of what is now Tennessee Route #32. A separate report by Wilbum (1940) indicates that between these points the route closely followed a stream then known as State Line Branch. From the vicinity of Mt. Sterling Post Office, the route followed what is now Laurel Creek toward Ivy Gap and then on to Mt. Sterling Gap. It then descended to Cataloochee Valley along the current road's alignment.

The Cataloochee Indian Trail is one of the best documented Native American routes in what is now the Park. It connected two major Native American trails outside the Park: the Rutherford War Trace along the French Broad and Big Pigeon River Valleys in North Carolina, and the Great Indian War Path along the Holston and Tennessee Rivers in Tennessee (Wilbum 1940a). Wilbum (1940a) refers to branch trails in the Cataloochee basin, including ones into Crying Creek and Indian Camp Creek, now known as Pretty Hollow Creek. Crying Creek no longer appears on maps under that name, although perhaps it became renamed Rough Fork or Caldwell Fork, two possible candidates.

The earliest reference Wilbum (1940a) found for the Cataloochee trail is dated 1799. John Strother, an early surveyor of the state line between North Carolina and Tennessee, described the trail even then as the Cataloochee Turnpike, a clear indication of the route's roll and dimensions. By that time, however, the trail may have been less traveled than it once had been because the Cherokees had largely abandoned many of their settlements. Several reasons may have contributed to that abandonment, including an Indian War of the 1760's, noted by Wilbum (1940a), and dislocation caused by the influx of European settlers.

The trail was adopted as a thoroughfare by settlers entering this area in larger numbers during the early 1800's (Wilbum 1940a). A treaty signed with the Cherokee and other tribes in 1791 began to open the area for settlement (Wilbum 1940a). Wilbum collected or compiled several maps showing deeds for land purchased by the middle 1790's. These maps currently are on file with the Park's Maintenance Division at Park Headquarters.

Balsam Mountain Indian Trail

Balsam Mountain Indian Trail extended from Ravensford, NC, to Cosby, TN, and may appear on a map of the Park completed by J.E. Thompson (1933). The route followed Raven Fork and Straight Fork creeks and then began ascending a shoulder of Balsam Mountain above Balsam

Corner Creek. It crossed Balsam Mountain near the head of Balsam Corner Creek. It probably then descended what is now Gunter Fork hiking trail, followed a short section of what is now Big Creek Trail, before ascending what is now Low Gap Trail and crossing into Tennessee. Likely, it then continued and descended along the current route of Low Gap Trail to the area of what is now Cosby campground and then exited the current Park boundary by following Cosby Creek, possibly with an alignment similar to that of the existing road.

Indian Gap Indian Trail

The Indian Gap Indian Trail is another well documented route (Wilbur-n 1940b). Like the Balsam Mountain Indian Trail, it also extended from the area around what is now Ravensford, NC, following the banks of the Oconaluftee River before ascending to the ridge near what is now called Luftee Gap. It then followed the ridge west for a short distance to Indian Gap before descending what is now called Road Prong Trail to the West Prong of the Little Pigeon River and on to the current vicinity of Gatlinburg where it exited the Park. An area along Road Prong is still known as Indian Grave Flats, although the incident that led to the naming occurred during the Civil War. Much of this route was adapted by settlers and converted to a roadway. It became a major trade route across the mountains and connected Sevierville, TN, and Cherokee, NC (NHA 1994).

Tuckaleechee and Southeastern Trail and Its Branches

A major trail entered what is now the Park from the area of Tuckaleechee Cove, now the home of Townsend, TN (Wilburn 1940b). The trail was called the Tuckaleechee and Southeastern Trail and served as a branch of the Great Indian War Path. It followed the Little River to Laurel Creek and ascended toward what is now Cades Cove. Several branches of the trail ascended to the ridge and then into what is now North Carolina. One of those branches went up Bote Mountain to what is now Spence Field before descending to Hazel Creek valley where a Native American settlement existed. This route is not well documented. Another branch passed through Ekaneetlee Gap descended the ridge to the Twentymile drainage. And, a third branch passed through the Cove toward today's Rabbit Creek, Happy Valley, and Chilhowee, TN.

The Ekaneetlee Gap branch has two descriptions associated with it. Wilburn and other's (1938) document called this route Ekaneetlee Indian Trail. Their description begins at the confluence of the Cheoah River and the Little Tennessee River in North Carolina. From there, the route followed the Little Tennessee River upstream to its confluence with Eagle Creek, an area now submerged by Fontana Lake. It then followed Eagle Creek upstream to Ekaneetlee Creek and ascended to Ekaneetlee Gap before descending to Forge Creek in Tennessee, probably traversing to Lonesome Brook and then following Ekaneetlee Brook to Forge Creek. It then descended along Forge Creek following what is now the lower section of Gregory Ridge Trail and Parsons Branch Road to Abrahms Creek. Evidently, there it joined numerous other routes and trails, some going to settled areas and others exiting what is now the Park.

The second and later description of the Ekaneetlee Gap branch has it ascending Twentymile drainage (Wilbur-n 1940b). From there, it followed the ridge to Ekaneetlee Gap before descending along much the same previously described route from that gap to Cades Cove.

Wilbum and others (1938) conjecture about two other routes that would have allowed Native Americans and others to avoid the gorge where the Little Tennessee River passes through the Smokies. One route might have crossed near what is now Deals Gap; the other through what is now Dalton Gap. The Dalton Gap route might have followed what are now abandoned roads and trails between Campsite #95 on the Wolf Ridge Trail in North Carolina and where Dalton Gap Branch crosses Tennessee highway #129 near the Parsons Branch Road intersection.

APPENDIX B

GREAT SMOKY MOUNTAINS NATIONAL PARK COMPENDIUM EXCERPTS

Compendium of Designations, Closures, Request Requirements and Other Restrictions imposed under the discretionary authority of the Superintendent[2]

In accordance with regulations and the delegated authority provided in Title 36, Code of Federal Regulations, Chapter 1, Parts 1 through 7, authorized by Title 16, United States Code, Section 3, the following regulatory provisions are established for the proper management, protection, government and public use of Great Smoky Mountains National Park under the jurisdiction of the National Park Service.

Unless otherwise stated, these regulatory provisions apply in addition to the requirements contained in 36 CFR, Chapter 1 and Section 7.14 Special Regulations.

Written determinations which explain the reasoning behind the Superintendent's use of discretionary authority are required by Section 1.5(c) and appear in this document *in italic print.*

[2] **Locations where sections were** deleted **are shown by a line of period dots across the page. Deleted sections address issues not related to backcountry visitors or their activities. Enclosed sections refer only to backcountry visitors, trail or campsite activities, or non-concession horse riding. italicized comments are from the original. All text is from the original edition signed July, 1994.**

Summary of changes[3]

The following items have been modified, added or deleted since the last approval:

1. The format of the text has been revised. Regulatory language is in standard text while the rationale for a specific action follows in italics.

2. Some explanatory language has been modified without affecting the regulatory intent. Specific changes are not listed.

2. Under Section 1.5, Closures and Public Use Limits, new language restricts visitation to the Mountain Farm Museum to daylight hours only. The manway descending the north side of the Chimney Tops has also been closed to public use.

3. Under section 2.10, Backcountry Camping, the definition of an Appalachian Trail thru-hiker is changed to read "whose trips begins and ends a minimum of fifty miles...". This change conforms to the Backcountry Management Plan and to the historical park definition.

4. Under section 2.10, Food Storage, regulatory language duplicating that in the CFR was omitted.

5. Appendix A, Closed and Excluded Waters: the waters of Mingus Creek and Lands Creek were added to correct a previous omission.

6. Appendix B, Designated Foot Trails: Trail names or location descriptions of the following trails were corrected to reflect current status or past errors:

Abrams Falls Trail
Albright Grove Loop Trail
Appalachian Trail: Sassafras Gap to Fontana Dam
Baskins Creek Trail
Baxter Creek Trail
Flat Creek Trail
Little Brier Gap
Little River Trail
Miry Ridge Trail
Rainbow Falls Trail
Ramsay Cascades Trail
Rough Creek Trail
Scott Mountain Trail
Spruce Mountain Trail
Three Forks Trail
Twentymile Loop Trail

7. Appendix C and Appendix D have been added to include maps defining areas listed in Section 2.51 and 2.52.

[3] Items related to changes numbered 5 and 7 are not enclosed in this abbreviated version.

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[4] The official Compendium contains other sections not relevant to backcountry trails, camping, or non-concession horseback riding. Pagination reflects the current document, not the original Compendium.

. . . . . .

Section 1.6 PERMITS

(a) Pursuant to the provisions of 36 CFR 1.6(f) the following is a compilation of the activities for which a permit is required. . . .

. . . . . .

Backcountry Camping Permit 2.10(a)

. . . . . .

Stall Fee Permits for overnight stays in developed horse camps will be issued by making reservations through Great Smoky Mountains National Park's Backcountry Reservations Office located'in the headquarters building in Gatlinburg, TN.

(b) Backcountry permits will be available at the following locations:

Visitor Centers
- Sugarlands
- Oconaluftee

Ranger Stations
- Abrams Creek
- Cades Cove
- Greenbrier
- Big Creek
- Cataloochee
- Twentymile

Campgrounds
- Elkmont
- Smokemont
- Abrams Creek
- Deep Creek
- Cosby
- Look Rock

Appalachian Trail
- Hot Springs, NC (USFS)
- Fontana Dam, NC (TVA), Near the TVA's hikers shelter
- Fontana Boat Dock, NC (TVA), Near the restrooms

. . . . . .

Section 2.10 CAMPING AND FOOD STORAGE

(a) Camping is prohibited in areas being restored or revegetated and so posted, pursuant to 36 CFR 1.7(a).

Restoration efforts are compromised by camping activities.

Camping in any historic structure or building is prohibited.

Historic structures are fragile and need protection from any activity that could adversely impact the structure or degrade the historic scene. . . .

. . . . . .

DEVELOPED HORSE CAMPS:

Reservations through the Backcountry Reservations Office, located in the headquarters building in Gatlinburg, TN, are required for the use of developed horse camps. . . .

. . . . . .

Length of stay shall not exceed seven (7) consecutive nights.

Horses must be restrained or under physical control at all times. Horses shall not be tied to trees. A stall or hitch rack MUST be used.

BACKCOUNTRY CAMPING:

A backcountry permit is required for all overnight stays in the backcountry.

The permit must be in the camper's possession while in the backcountry and must be exhibited upon the demand of an authorized person.

Backcountry permits and the permit system aid the park in distributing and monitoring use and in locating lost/overdue persons.

Persons may not stay more than three (3) nights in a row at any backcountry campsite or more than one (1) night in a row at any backcountry designated shelter.

Groups camping in the Park backcountry are limited to a maximum of eight (8) persons per group and ten (10) riding or pack animals per group.

Reservations obtained from the Backcountry Reservations Office are required for backcountry shelters and campsites which are designated as "rationed". Rationed sites are limited to a specific number of persons and/or horses that may occupy a given site on a given night. The rationed campsites and shelters and their capacities are listed below:

RATIONED BACKCOUNTRY CAMPSITES AND SHELTERS

10	Ledbetter Ridge	(8, 8H)
13	Sheep Pen Gap	(15, 8H)
23	Camp Rock	(12)
24	Rough Creek	(15)
29	Otter Creek	(10)
36	Upr. Walnut Bottoms	(20, 20H)
37	Lwr. Walnut Bottoms	(20)
38	Mount Sterling	(12)
47	Enloe Creek	(8)
50	Lwr. Chasteen Creek	(15, 15H)
55	Pole Road	(15, 15H)
57	Bryson Place	(20, 12H)
61	Bald Creek	(12, 6H)

71	CCC Camp	(12, 12H)
83	Bone Valley	(20, 10H)

SHELTERS

Davenport Gap	(12, 12H)
Cosby Knob	(12, 12H)
Tricomer Knob	(12, 12H)
Pecks Comer	(12, 12H)
Icewater Spring	(12)
Mount Collins	(12)
Double Spring Gap	(12)
Silers Bald	(12, 12H)
Derrick Knob	(12)
Spence Field	(12, 12H)
Russell Field	(14, 14H)
Mollies Ridge	(12, 12H)
Birch Spring Gap	(12, 12H)
Mt. LeConte	(12)
Kephart	(14, 14H)
Laurel Gap	(14, 14H)
Rich Mountain'	(8, 8H)
Scott Gap	(8, 8H)

Reservations are required because of the high demand for the limited space available.

The use of tents at shelters is prohibited except by persons qualifying as thru-hikers on the Appalachian Trail (by definition an Appalachian thru-hiker is a backpacker who is using the Appalachian Trail exclusively while in the Park and whose trip begins and ends a minimum of fifty miles outside the Park). Thru-hikers may pitch tents outside shelters only when all bunks are otherwise occupied.

It is unrealistic to expect thru-hikers to obtain advance reservations when they do not know when they will be entering the Park.

Camping in the backcountry is permitted only at established backcountry sites, except as authorized by a cross-country permit. Cross-country permits must be issued by a Great Smoky Mountains National Park ranger and may not be issued under the self-registration system. Cross-country camping (at other than designated sites) is permitted under the following conditions:

a. The maximum party size is six persons and use of horses or other stock is prohibited.

[5] **Rich Mountain** and **Scott Gap shelters have been removed since this Compendium was last updated. Designated campsites are likely to replace the shelters in the future.**

b. The campsite must be at least one-half mile from any designated trail, one mile from any designated road and 100 feet from the nearest surface water.

c. Camping in spruce-fir, beech gaps or on grassy or heath balds is prohibited.

d. The duration of stay at each location cannot exceed one night and the same location cannot be used a second time on the same trip.

e. Wood fires are prohibited.

f. Campers are required to obliterate all traces of human presence upon leaving a cross-country camp.

g. Camping locations for each night should be as closely pinpointed as possible using natural landmarks or map coordinates, and trips are expected to follow the designated itinerary as closely as possible.

Cross-country hiking is a special use and requires special equipment, training and/or experience. These regulations are an attempt to permit this special use, while minimizing the potential impact on natural resources.

(b)(3) Camping within 100 feet of a flowing stream, river or body of water is permitted only at designated front and backcountry campsites.

Camping within 100 ft. of water normally increases erosion and sanitation problems in water sources.

FOOD STORAGE:

(d) Food storage requirements apply to all areas within the Park boundary.

In locations where wires, poles, ropes or food storage containers are provided for storage of food and garbage, such facilities must be used at night and when the camp is unattended.

Food scents attract animals. Animals which gain access to human food sources tend to return to those sources and may cause property damage or injury. Subsequent behavior problems often necessitate the removal or destruction of an animal. . . .

. . . . . .

Section 2.13 *FIRES*

(a)(1) The kindling of a fire in the fireplace of any historic building or structure is prohibited.

In frontcountry campgrounds and picnic areas fires must be kindled in provided grates, grills or within existing fire rings.

The use of portable stoves, including charcoal burners, is prohibited in frontcountry areas except in picnic areas and campgrounds.

In backcountry areas fires must be kindled within existing and established fire rings located at the designated backcountry campsites.

At backcountry shelters fires are permitted only in the fireplace inside the shelter and at the central fire ring in front of the shelter.

(c) The Superintendent may close all or part of the Park to fires, except stoves, when the conditions meet the guidelines identified in the "Wildland Fire Management Step-Up Plan for Great Smoky Mountains National Park" as staffing class four (4) or five (5). That plan is hereby adopted and made part of these orders. Closure notices will be posted at Trailheads, campgrounds, visitor centers and through media notification.

The use of open fires in the Park is regulated so as to protect structures and natural resources. During extreme weather conditions open-pit fires may be restricted to preclude the accidental ignition of wildfires.

Section 2.14 SANITATION AND REFUSE

In non-developed areas more than a quarter of a mile from restroom facilities, human body waste must be buried four (4) to six (6) inches deep in organic soil in an area not frequented by the public, not visible from trails, campsites or developed areas, and at least 100 feet from any water source.

During the winter when organic soil is not exposed, solid human body waste must be buried 100 yards from any campsite or established travel route to a depth of 12 inches in snow whenever possible.

These regulations minimize the contamination of water supplies, minimize the presence of unsanitary conditions and preserve site aesthetics.

Section 2.15 PETS

(a)(l) Dogs (except guide, search and hearing ear dogs), cats, and other pets, are prohibited on any Park land or trail except in those locations identified below:

All park roads, including those seasonally closed for public vehicular use, parking areas, established picnic areas, and frontcountry campgrounds including group and frontcountry horse campsites, as well as the two-mile trail from Park Headquarters to Gatlinburg and the two-mile trail between Cherokee and the Oconaluftee Visitor Center. Pets must be on a leash not to exceed 6 feet in length. . . .

. . . . . .

(a)(5) Pet excrement must be immediately collected by the pet handler and disposed of in the nearest trash receptacle.

These regulations are not intended to restrict pets from the Park but rather to enhance the natural experience of all visitors. Pets are natural predators and their scent alone will scare wild animals into hiding places. . . .

. . . . . .

Section 2.16 **HORSES AND PACK ANIMALS**

(a) Horses, mules, burros, and llamas are designated as pack animals [as opposed to pets or some other category].

(b) The use of saddle and pack animals on park trails is permitted except in the following areas:

Nature Trails
Handicapped Access Trails
Paved Trails
Designated foot trails as listed in Appendix B

Deep Creek Trail is closed to horse use from the Deep Creek Trailhead to the Indian Creek/Deep Creek Junction.

The following Smokemont riding stable trails, marked CONCESSION HORSES/HIKERS ONLY, are closed to private horse use during the open season.

1. Bradley Fork Trail from the Bradley Fork Road south to Becks Branch Trail.

2. Hughes Ridge Trail between the Bradley Fork Trail (Smokemont Church area) and the New Smokemont Bypass Trail.

. . . . . .

(g) The tying of horses and pack animals is not permitted within 100 feet of established backcountry campsites, fire rings, shelter, or sleeping areas in the backcountry, or within 100 feet from any stream or water source.

Horses are not permitted within one hundred feet of frontcountry campsites.

At designated backcountry sites where stock are permitted, the number of animals in any one party SHALL NOT EXCEED 10 ANIMALS.

In an area without hitch posts or stalls, pack animals MUST be tied on a cross-tie system. If picket stakes for the cross-tie system are not available, a tree of no less than eight (8) inches in diameter should be utilized. Animals that remain "camped" in an area longer than 12 hours on a cross-tie system should be rotated to a new picket site and any manure at the old site scattered no less than 100 feet from any campsite area or water source.

In backcountry areas with hitch racks or stalls, any manure shall be scattered no less than 100 feet from any campsite area before departing the area.

Stock are hereby restricted from stopping, standing, or travelling across or adjacent to any water spring.

Stock are restricted from water springs to prevent contamination. Springs do not normally have the water volume necessary to cleanse themselves. It is recommended that pack animals be watered with the use of a container.

In developed horse camps, all manure shall be moved from the stall and hitch rack areas to a designated collection area.

At trailheads, any manure spilled from the trailering unit or fresh excrement MUST be replaced in the trailering unit or scattered in the woods at least 100 feet from the trailhead and any existing water source. . . .

. . . . . .

In the backcountry the use of loose hay or grain containing viable seeds is prohibited. Stock users are required to carry supplemental feed such as pellets or rolled grains on all trips. . . .

. . . . . .

Section **4.30 BICYCLE**[6]

(a) The following routes are designated for non-motorized bicycle use.

Park Headquarters

The 2-mile trail between the Park headquarters building and Gatlinburg.

Oconaluftee

The trail between the Oconaluftee Visitor Center and the town of Cherokee.

Deep Creek Area

[6] **CFR, volume 36, section 4.30, states that bicycles are prohibited except on park** roads, **parking areas, or areas** designated as **appropriate, unless the Superintendent exerts discretionary authority to prohibit bicycles in a location where riding is judged inappropriate.**

That portion of the graveled road now existing from the trailhead to the end of the gravel:

1. Indian Creek Trail
2. Deep Creek Trail

Foothills Parkway-West

Uncompleted sections of the Foothills Parkway-West that are not yet open to motor vehicle traffic may be used by bicyclists; except that, when construction work is underway, access gates will be closed and all public entry will be prohibited to ensure public safety.

Non-motorized bicycles may travel year-round on the following seasonally closed roads:

Balsam Mountain Road
Clingmans Dome Road
Forge Creek Road
Heintooga-Roundbottom Road
Little Greenbrier Road
Parson Branch Road
Rich Mountain Road
Upper Tremont Road

Designated Foot Trails (Closed to Horse Use)

Trail Name	Location: From - To
ABRAMS FALLS TRAIL	Abrams Falls Parking Area - Hannah Mtn. Trail
ALBRIGHT GROVE LOOP TR.	Loop off Maddron Bald Trail
ALUM CAVE TRAIL	Newfound Gap Road - Rainbow Falls Trail near Mt. LeConte
APPALACHIAN TRAIL	Miry Ridge Trail - Eagle Creek Trail
APPALACHIAN TRAIL	Pecks Comer - False Gap
APPALACHIAN TRAIL	False Gap - Icewater Spring
APPALACHIAN TRAIL	Icewater Spring - Newfound Gap
APPALACHIAN TRAIL	Newfound Gap - Clingmans Dome
APPALACHIAN TRAIL	Clingmans Dome - Silers Bald
APPALACHIAN TRAIL	Sassafras Gap - Fontana Dam
BASKINS CREEK TRAIL	Trill Gap Trail - Roaring Fork Motor Nature Trail
BAXTER CREEK TRAIL	Big Creek Picnic Area - Mt. Sterling Tower
BOOGERMAN TRAIL	Loop from Caldwell Fork Trail
BOULEVARD TRAIL, THE	Mt. LeConte - Appalachian Trail near Mt. Kephart
BULL HEAD TRAIL	Old Sugar Trail - Rainbow Falls Trail near Mt. LeConte
CHESNUT BRANCH TRAIL	Big Creek Road - Appalachian Trail
CHESTNUT TOP TRAIL	Schoolhouse Gap Trail - Townsend Wye
CHIMNEY TOPS TRAIL	Newfound Gap Road - Chimney Tops
CLINGMANS DOME BYPASS TR.	Fomey Ridge Trail - Appalachian Trail
COVE MOUNTAIN TRAIL	Park Headquarters - Cove Mountain Tower
CUCUMBER GAP TRAIL	Little River Trail - Jakes Creek Trail
CURRY MT TRAIL	Little River Road - Meigs Mountain Trail
DEEP CREEK TRAIL	Campsite 55 - Newfound Gap Road
EAGLE CREEK TRAIL	Lakeshr. Trail - Appalachian Trail at Spence Field
FLAT CREEK TRAIL	Heintooga Ridge Road - Heintooga Picnic Area
FORK RIDGE TRAIL	Clingmans Dome Road - Deep Creek Trail
FORNEY CREEK TRAIL	Jonas Creek Trail Junction - Fomey Ridge Trail
FORNEY RIDGE TRAIL	Clingmans Dome Park Area - Sprhse Branch Trail
GABES MT TRAIL	Maddron Bald Trail - Cosby Picnic Area
GOSHEN PRONG - #25	Goshen Prong Trail - #25
GOSHEN PRONG TRAIL	Little River Tr.-Appalach. Tr. at Double Spr. Gap
GRAPEYARD RIDGE TRAIL	Greenbrier Road - Big Dud Trail
GREENBRIER RIDGE TRAIL	Middle Prong Tr.-Appalachian Trail at Sams Gap
GREGORY RIDGE TRAIL	Forge Creek Road - Greg Bald Trail at Rich Gap
GUNTHER FORK TRAIL	Camel Gap Trail - Balsam Mountain Trail
HAZEL CREEK TRAIL	Proctor Creek - Welch Ridge Trail
HDQTRS.-GATLINBURG TRAIL	Sugarlands Vis. Center - Boundary at Gatlinburg

[7] **Appendix B of the Compendium that comprises the current report's Appendix B.**

HUSKEY GAP TRAIL	Newfound Gap Road - Little River Trail
KANATI FORK TRAIL	Newfound Gap Road - Thomas Divide Trail
LAUREL FALLS TRAIL	Fighting Creek Gap - Cove Mountain Trail
LITTLE BOTTOMS TRAIL	Cooper Road Trail - Hatcher Mountain Trail
LITTLE BRIER GAP	Little Greenbrier Schoolhouse-L. Greenbrier Trail
LITTLE GREENBRIER TRAIL	Wear Cove Gap Road - Laurel Falls Trail
LITTLE RIVER TRAIL	Barricade - #30
MADDRON BALD TRAIL	Barricade at Boundary - Snake Den Ridge Trail
MEIGS CREEK TRAIL	Laurel Creek Road at Sinks - Meigs Mtn. Trail
METCALF BOTTOMS TRAIL	Metcalf Bottoms Picnic Area-L. Greenbrier School
MIRY RIDGE TRAIL	Buckeye Gap - Lynn Camp Prong Trail
OCONALUFTEE RIVER TRAIL	Oconaluftee Visitor Center - Park Boundary at Cherokee
OLD SETTLERS TRAIL	Ramsay Cascades Road - Maddron Bald Trail
PORTERS CREEK TRAIL	Barricade - Vic. of #31 on Porters Creek
RAINBOW FALLS TRAIL	Rainbow Falls Parking Area at Cherokee Orchard Mt. LeConte
RAMSAY CASCADES TRAIL	Barricade - Ramsay Cascades
ROAD PRONG TRAIL	Chimney Tops Trail - Indian Gap
ROUGH CREEK TRAIL	Little River Trail - Sugarland Mountain Trail
ROUNDTOP TRAIL	Wear Cove Gap Road - Townsend Wye
SCOTT MOUNTAIN TRAIL	Indian Grave Gap Trail - Schoolhouse Gap Trail
SMOKEMONT LOOP TRAIL	Smokemont Campground - Bradley Fork Trail
SPRUCE MOUNTAIN TRAIL	Balsam Mountain Road - Campsite 42
SUGARLAND MOUNTAIN TR.	Fighting Crk. Gap-Appalachian Tr. at Mt. Collins
SWEAT HEIFER CREEK TRAIL	Kephart Prong Trail - Appalachian Trail near Mt. Kephart
THOMAS DIVIDE TRAIL	Newfound Gap Road- Junction w/ Sunkota Ridge Trail
TWENTYMILE LOOP TRAIL	Wolf Ridge Trail - Long Hungry Ridge Trail

Appendix C

ORGANIZATIONS WHO WERE APPROACHED OR WHO PARTICIPATED DURING THE COURSE OF THIS PROJECT

Federal Agencies

National Park Service, Denver Service Center
———, Kings Canyon National Park
———, Washington Legislative Office
United States Forest Service, Alaska Regional Office
———, Mt. Hood National Forest
———, Northwest Regional Office
——— Technology and Development Program

National Organizations

American Hiking Society
Appalachian Mountain Club, Trails Program
Appalachian Trail Conference
Backcountry Horseman of America
California Conservation Corps
National Outdoor Leadership School
National Parks and Conservation Association, Southeast Regional Office
——— Washington Office
Student Conservation Association
The Wilderness Society, Southeast Regional Office
The Trail Riders

Local Organizations

Asheville Citizen-Times
Backcountry Horsemen of North Carolina
Big Creek Trail Riders
Blue Ridge Trail Riders
Cades Cove Riding Stables, Ince
Carolina Mountain Club
Cataloochee Ranch
Deep Creek Riding Stables, Inc.
Euchella Sport Lodge
Foothill Striders
Friends of Great Smoky Mountains National Park
Gatlinburg Hiking Club
Governor of North Carolina, Western Office
Knoxville News Sentinel
LeConte Lodge, Inc.
Natural History Association, Great Smoky Mountains National Park
Haywood Trail Riders
Izaak Walton League
Nantahala Outdoor Center
Natahala Hiking Club
North Carolina Dept. of Nat. Res. and Community Devel., Div. of Parks and Recr., Asheville Office
North Carolina National Park, Parkway, and Forest Commission
Sierra Club, East Tennessee
———, North Carolina
Smokemont Riding Stables, Inc.
Smoky Mountain Stables, Inc.
Smoky Mountain Field School
Smoky Mountain Hiking Club
Smoky Mountain Trail Riders
Tennesse-Great Smoky Mountain Park Commission
Tennessee Citizens for Wilderness Planning
Tennessee Department of Environment and Conservation
The Happy Hiker
Trout Unlimited, Little River Chapter
———, Tennessee Council
Waynesville Mountaineer
Western Carolina Spotted Horse Club

Appendix D

ARTICLE BY WILLIAMS AND MARION (1992) DESCRIBING AND COMPARING PRESCRIPTIVE WORKLOGS AND OTHER TRAIL ASSESSMENT TECHNIQUES

TRAIL INVENTORY AND ASSESSMENT APPROACHES APPLIED TO TRAIL SYSTEM PLANNING AT DELAWARE WATER GAP NATIONAL RECREATION AREA

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Trail system planning and management require accurate assessments of existing trail resources and their condition. A standardized and efficient process for surveying, inventorying, and assessing trail systems was developed and applied in the Delaware Water Gap National Recreation Area. Two approaches employed were (1) a Trail System Inventory, and (2) Prescriptive Work LOPS. These complementary approaches provide resource managers with valuable information regarding the location and length of individual trails, their current condition and needed maintenance work, and material and labor estimates necessary to conduct such work.

This paper describes two trail inventory and assessment approaches developed and applied at Delaware Water Gap National Recreation Area (DWGNRA) in support of a comprehensive trail planning effort. The trail surveys and final report were developed by the Appalachian Mountain Club (AMC) Trails Program under cooperative agreement with the National Park Service (NPS)[1]. Here, we review the criteria used to select the specific trail survey approaches, discuss our application of these approaches, and critique the capabilities and limitations of the approaches. We believe the standardized, yet flexible, techniques applied in DWGNRA offer significant advancement over earlier, less structured approaches.

Trail System Planning in DWGNRA

The objective of natural resource management planning is to translate legislation, regulations, and policies into objectives, programs, and specific actions (Hendee and von Koch 1990). The trail system planning strategy for DWGNRA mirrored this process by translating DWGNRA General Management Plan (GMP) goals into specific trail resource recreation alternatives for visitors. To meet the needs of resource visitors and resource managers, the strategy for DWGNRA included:
(1) identification of recreation interests,
(2) identification of management objectives,
(3) documentation of trail resources, and
(4) prescriptions for correcting resource problems in light of recreation interest and management concerns. To be effective, this plan had to be flexible by design in order to address both current and future trail resource needs.

Approaches to trail system planning are selected according to management objectives, often derived with cooperative involvement of interested and involved individuals and organizations. The process adopted here is marked by the cooperation of an external organization in analyzing the suitability of trails to address recreation demands and concerns. The results of this effort are intended to feed a public review process.

Project Background

DWGNRA is managed by the NPS and is located in the states of Pennsylvania and New Jersey. Established along a 35 mile stretch of the Delaware River by an Act of Congress in 1965 as part of the Tocks Island hydroelectric project, DWGNRA today embraces some 54,000 acres of the nearly 70,000 acres originally circumscribed. Congress, as part of the Tocks Island Dam legislation, directed the Army Corp of Engineers to assemble a detailed set of maps for the area within the congressionally mandated boundaries. These cartographic documents provided a rich resource for this project.

The 1987 DWGNRA GMP called for the enhancement of day and overnight hiking opportunities, to be accomplished with the provision of an expanded trails network. The GMP specifically obligated DWGNRA to work with trail clubs and organizations in planning for expanding and maintaining the trail system. The AMC, though headquartered in Boston, met the NPS needs as a conservation and recreation organization with an organizational chapter located in the DWGNRA region. In 1975, the AMC had performed a study under cooperative agreement with DWGNRA (Appalachian Mountain Club). More significantly, in 1988 the AMC had completed a park-wide trail

study for Acadia National Park in Maine*. In 1989 DWGNRA invited the AMC to complete a similar' study of their trails.

Primary Goals of the Project

DWGNRA faced a situation common to many parks and forests: how to upgrade an existing, partially informal trail system in an organized manner when both the current conditions and viable options for improving the system are incompletely documented. DWGNRA intended to offer a trail system with a diversity of dispersed recreation opportunities, but required information to direct the necessary efforts in a cost-effective manner.

The primary goals of this project, then, were to:

1. Emphasize the protection of the existing and proposed trail system resources by identifying deficiencies, alternative engineering solutions, and visitor management actions.

2. Produce a report for DWGNRA containing documentation of the trail system's current status, options for future alignment, and estimated costs required to realize potential alignments. This report was intended to provide a preliminary set of recommendations for the comprehensive trail planning process.

3. Incorporate the objectives of the DWGNRA GMP wherever possible, especially those to: (a) provide a quality trail system that emphasizes a minimal disruption of natural processes while servicing a broad range of **visitors,** and (b) employ existing dirt roads, trails, and woods roads to the greatest advantage.

Selection of Inventory and Assessment Approaches

The cooperative agreement between DWGNRA and the AMC addressed the need to document existing conditions through a comprehensive trail resource inventory and assessment. The purpose for the report was to fuel a public review period, to provide a starting point for comments by managers and interested members of the public. To achieve these ends, two state-of-the-knowledge techniques for trail inventory and assessment were applied: (1) a *Trail System Inventory* and *(2) Prescriptive Trail Work Log* **assessments.**

Four techniques were considered (Table 1). Each approach has its own unique capabilities. Of the techniques applied in DWGNRA, a *Trail System Inventory* approach provides a broad description of the system as a whole, including the location, classification, and general features of individual trails. *The Prescriptive Work Log* approach, in

Table I Four trail inventory and assessment techniques.

Techniaue	Purpose
Trail (System) Inventory	identify and catalog the trail system's physical resources including surface type, location, or access opportunities. Often incorporates non-physical classifications such as ownership, type of use, or maintenance level.
Prescriptive Trail work logs	Identify trail tread deficiencies and prescribe tread engineering solutions. Adaptable to resource and visitor management purposes. Provides basis for cost and staff estimates and recommendations.
Research level Measurements	Studies designed to understand processes such as relationships between visitation and resource degradation.
Monitoring Level Measurements	Monitoring resource conditions over time. Oriented toward measuring parameters documenting resource impacts rather than resource maintenance and management.

contrast, catalogs specific features of a trail. Groups of trails may then be reviewed according to their features or deficiencies (e.g.: drainage needed in a local area, district, park, or forest). Originally, prescriptive work logs served trail maintenance purposes. The location of existing trail engineering features were catalogued along with any work needed to maintain those features. A modem prescriptive work log, however, fulfills management, as well as maintenance, objectives. Contents of prescriptive work logs completed in DWGNRA consist of observations oriented toward maintenance and management of the trail resource, oftentimes coupled with references to selected visitor management and recreation features (e.g.: viewsheds, camping potential, general parking availability). Such techniques can be modified according to a manager's need to obtain information for a variety of purposes, including maintenance, visitor interpretation, natural resource protection, or any combination. The information gathered by each of the two techniques selected for application in DWGNRA, then, was intended to complement the information gathered by the other.

Monitoring and Work Log Approaches Compared

Of the four approaches outlined in Table 1, heaviest debate focused on whether to apply monitoring or prescriptive work log techniques to support the anticipated report's recommendations. Monitoring is done to measure physical changes to the environment resulting from an influential factor, typically recreational use. For example, soil loss occurring over a period of time may be measured. While monitoring might provide objective assessments of trail resource conditions, such measurements do not provide the information necessary to estimate the cost for repairing the effects or mitigating the cause of resource degradation. Yet, estimating these costs was an important management objective for the project. Further, monitoring is not intended to prescribe recommendations for addressing concerns about the resource or visitors, a primary goal of the cooperative agreement.

For this project, a monitoring effort would have yielded a description of the changes occurring as a result of recreation. A prescriptive work log approach, however, would yield a description of the recommended solutions to such physical changes. One final factor was considered: trail maintenance recommendations will vary according to the type and amount of existing or anticipated recreational use. In many ways, trail work is discretionary by its very nature; those who work on trails must make judgements concerning how best to remedy a perceived problem. The need for flexibility in describing trail maintenance recommendations became the crucial criteria for selecting an approach. Because prescriptive work logs originally were devised to document recommendations based on direct field observations, they are most easily adapted to provide information necessary for estimating costs.

Trail System Inventory: Methodology

Three objectives of equal priority guided the trail system inventory. First, the twenty-five year old Army Corps of Engineers maps required ground verification of all trails and roads features. Second, an inventory of the basic features of the trail system was to be completed. And, third, the cartographic data would be prepared for transfer to DWGNRA's Geographic Information System (GIS). Using the Corps' maps (1:400 scale) as a baseline, two surveyors were directed to hike all roads and trails appearing on the maps, confirm the existence and location of these features, and accurately locate any roads or trails not appearing on the maps. While hiking the system, the inventoried roads and trails were categorized according to NPS management classifications, access, ownership, surface, average width, and maintenance level. Scenic features, water courses, major maintenance needs, and vehicle barriers also were noted on the maps.

Trail System Inventory: Applications

The trail system inventory painted a broad overview of the entire system of roads and trails found in DWGNRA. From this baseline information, a preliminary trail system was selected during a consultation period involving NPS and AMC staff. This period of *intermediate evaluation* was built into the field schedule of the project. The prescriptive work log technique for assessing trails was applied to the trails comprising this preliminary system.

The GIS applications of the inventory data are perhaps the most beneficial. Access to high quality maps during the trail planning review process will encourage constructive criticism of the preliminary trail system's layout. Not all roads and trails inventoried in DWGNRA were selected for the proposed system. Only those that appealed to the perceived visitation demands and the indicated management objectives were selected. However, access to an accurate set of trail resource maps will

better communicate the AMC's rationale for recommending the particular system found in their report. Also, computer generated maps will likely facilitate interpretive efforts, maintenance efforts, resource protection efforts, and resource management efforts, as well as search and rescue, and fire fighting operations.

A well formulated trail system inventory should remain applicable for many years. However, a new inventory of specific trails or areas, possibly with new parameters, may be necessary following the onset of natural disasters (extensive flooding or heavy snow-melt), introduction of a new form of recreation (mountain bike or horse use), or inauguration of new management directives (managementzoning).

Prescriptive Work Logs: Methodology

Various forms of prescriptive work logs have been applied by agencies and organizations in diffuse regions of the country. Hooper (1988) describes a trail log format employed by the NPS, though this particular approach is considered to be a physical inventory separate from what Hooper refers to as a condition/ corrective survey. Prescriptive work logs have traditionally blended a detailed physical inventory with a series of corrective prescriptions intended to remedy any trail tread and alignment deficiencies observed along a trail. The AMC Trails Program has applied such assessments extensively for some fifteen to twenty years. Proudman and Rajala (198 1) describe several methods for conducting prescriptive work logs. Recent incorporation of the capabilities of personal computer technology to store, analyze, and present information has made the prescriptive work log format even more useful than in the past.

For a prescriptive work log to be a reasonable estimate of a trail's condition, the individual conducting the survey must be accomplished in trail construction and design. Prescriptive work logs completed in the DWGNRA were compiled by an individual proficient with a wide range of trail work techniques and the many options for mitigating trail resource damage. In general, prescriptions for trail work actions should be the minimal necessary to stabilize the trail tread, should emphasize protection of natural resources, and should exhibit a clear understanding of the trail's role within the locally available recreational opportunities. Further, those who are compiling the surveys should be given clear understanding and directions regarding the intentions for the trail.

In DWGNRA, a format for prescriptive work logs was selected that relied upon pocket dictation device to record comments. These comments were organized by verbal reference to distances indicated by a five foot circumference trail-measuring wheel pushed along each trail. The wheel's counter displayed the distance from a starting point within six (6) inches by tallying five foot intervals to the nearest tenth of an interval. The location of permanent reference features such as stream crossings or conspicuous rocks was noted to facilitate accurate future location of sites requiring work.

The dictation notes were later transcribed and formatted on a computer word-processor. A standard format has evolved at the AMC (Example 1). The work logs can then be printed and placed in a ring-binder for simple access. A well-documented prescriptive work log done in the Northeast will remain a good gauge of a trail's condition for roughly five to ten years, depending on the amount of recreation use, the form of that recreation, and any severe weather.

The dictation method of recording prescriptive work logs has advantages and disadvantages. Occasional errors in handling the tape recordings do occur, and clear enunciation of concise comments is imperative. Furthermore, the dictation tapes must be transcribed, introducing another potential source of error. However, compared to the alternative of recording comments on paper forms, dictation devices have several advantages. The devices are more efficient in the field since they require only one hand to operate, as compared to taking notes on a clipboard. Further, notes on paper are more time-consuming to write and there is a tendency to be too brief. If a prescriptive work log is to be used as a document in a trail work labor contract, or is to be used by a field crew who is unfamiliar with an area, detailed descriptions of work locations are very important. Finally, dictation devices work well in plastic bags under wet conditions, allowing assessment of trail drainage problems at times when those problems are most obvious.

Prescriptive Work Logs: Applications

By following standardized procedures for recording comments, managers and their staff can assemble information in a format that facilitates field efforts and trail work planning. Managers concerned with allocating budgets and staff, and staff concerned with completing field projects, benefit from the information in prescriptive work logs, originally

developed for specifically these purposes. In DWGNRA prescriptive work logs facilitated planning efforts by providing information about the proposed trail system's strengths and limitations. Prescriptive work log trail maintenance assessment figures for each trail were entered into a computer database and printed in a catalog format (Example 2). A database also permits managers to calculate labor and materials necessary to complete the estimated work needed on a trail. Data from the prescriptive work logs completed in DWGNRA can effectively summarize the trail maintenance work required for a single trail or any selected grouping of trails. Additionally, prescriptive work logs are commonly used as a field guide for trail work contractors and cooperators.

Discussion

Trail inventories and prescriptive trail work logs offer managers a standardized, yet flexible, method for inventorying and assessing individual trails or entire trail systems. A consistent methodology for compiling information about trails enhances the capacity of an agency or other organization to manage those trail resources. This paper illustrates the application of two separate but complementary trail surveys which provided information vital to the DWGNIU comprehensive trail system planning process. The trail survey information formed the basis for AMC recommendations regarding the proposed DWGNRA trails system, including the type, extent, and cost estimates of the trail work required to fully establish the proposed system.

Trail surveys provide objective information about trail resource conditions and the capabilities of the trail resource to sustain various forms of recreation. Such information should be integrated with expressed public needs and views when formulating a final trail system plan. It is recommended that the results provided by trail surveys be presented to the public as background information supporting public involvement and review. Such input is viewed as critical to the design and implementation of a broadly accepted network of trails appealing to recreationists of all interests, whether hikers, walkers, horse-riders, or bicyclers.

Literature Cited

Appalachian Mountain Club. 1975. A proposal for dispersed recreation in the Delaware Water Gap National Recreation Area. Boston, MA: Appalachian Mountain Club. 62 p.

Project Title (if appropriate)

Trail: ADAM'S CREEK TRAIL
file name: "ADAMCRK.LOG"
pages: 12
Area: West of Rt. 209, north of Dingman's.
Date: Aug. 26, 1989
Synopsis: Containing a summary of the work log's highlights. Appropriate comments include trailhead information (signs, parking, access, etc.), safety concerns, natural features, basic geology (helpful for work crews), and major issues or problems associated with the trail.

1=5ft	Comments	Work
006	[EX: information that a work crew would use to orient themselves or to find a work site, suggestions for installing the work, or dimensions of existing trail work.]	6' Water Bar, Right; install 20' ditch parallel to tread [in gully adjacent to road].
012	**ref.** trail traverses section of old road w/stone wall **Left;** terrain drops off down to creek, **Right;** no work needed.	
173	**ref.** remains of old jeep road joins from Left; 2 large red pines on ground	Install **5 Rock Steps** to harden 3 foot deep gully.

Example 1 Format of an AMC Prescriptive Work Log.

Cole, David N. 1983. Assessing and monitoring backcountry trail conditions. Research Paper INT-303. Ogden, UT: U.S. Department of Agriculture, Forest Service, Inter-mountain Research Station. 10 p.

Hendee, John C.; von Koch, R. 1990. "Wilderness management planning." in: Wilderness management. John C. Hendee, George H. Stankey, and Robert C. Lucas., eds. Golden, CO: North American Press: 195-213.

Hooper, Lennon 1988. NPS trails management handbook. Denver, CO: U.S. Department of the Interior, National Park Service, Denver Service Center. GPO, 1988-576-279/85200. 53 p.

Proudman, Robert D.; Rajala, R.R. 1981. Trail Building and Maintenance, 2nd Edition. Boston, MA: Appalachian Mountain Club. 286 p.

Footnotes

1/ Williams, Peter B.; Marion, J.L.; Rajala, R.R. 1992. A comprehensive trail inventory and preliminary recommendations for development and maintenance of a trail system in Delaware Water Gap National Recreation Area. Gorham, NH: Appalachian Mountain Club, Trails Program. 93 p. [unpublished].

2/ Williams, Peter B.; Rajala, R.R.; Martin, B.H. 1988. Acadia National Park trail system assessment. Gorham, NH: Appalachian Mountain Club, Trails Program. 69 p. [unpublished].

Trail name: **Adam's Creek** **Filename:** *adamcrk.log*
Length: 0.93
stage to Incorporate into Trail System: 2
Local Park Area: Adams **Creek**

General Characteristics		Maintenance Figures			Estimated Days of Labor	
		Item	Totai Feet	Units	Low	High
Difficulty:	**moderate**	**Rocksteps**	**n/a**	**43**	10.75	143
Existing **Use:**	**hiking**	**Log Steps**	**n/a**	**0**	**0.00**	**0.00**
Level of Use:	**moderate**	**Step-stones**	**n/a**	**32**	**6.40**	**8.00**
Recommended Use:	**hiking**	Ditching	**6**	1	**0.12**	**0.15**
Expected Level of Maintenance:	moderate	Wood Water **Bar**	16	**2**	0.40	**0.53**
Sensitive Areas?:	**Yes**	**Rock** Water Bar	0	0	**0.00**	**0.00**
Potential Safety Concerns?:	**Yes**	Cribbing	**75**	1	**3.75**	**7.50**
		stream **Bridge**	0	0	0.00	**0.00**
		Bog Bridge	0	0	**0.00**	**0.00**
		Sidehilling	0	**n/a**	**0.00**	**0.00**
		'Estimates of **Total** Labor **Required:**			21.42	**30.51**

Comment:
Adam's Creek has several stream crossings. These will be difficult to bridge because of width. The streams are shallow, except in flood. **SS** or **nothing should** be sufficient Beyond the upper **falls** is a **mill.** A number of options **are** present for **connecting the current trail with** the **mill area.** Additional **field** trips **will** be **necessary** to determine **the preferred route. It is recommended that the south bank be used for accessing the mill. The north is steep and has** more **obstacles.** Management decisions **concerning** *use,* **type** of **use, local** loop hikes, etc. should be made prior to the **installation** of this route.

Example 2 Catalog Entry for a Prescriptive Maintenance Worklog.

A Strategic Plan for Managing Backcountry Recreation

In Great Smoky mountains National Park

GREAT SMOKY MOUNTAINS NATIONAL PARK
107 PARK HEADQUARTERS ROAD
GATLINBURG, TENNESSEE 37738

'September 1995

A STRATEGIC PLAN FOR MANAGING BACKCOUNTRY RECREATION IN GREAT SMOKY MOUNTAINS NATIONAL PARK

GREAT SMOKY MOUNTAINS NATIONAL PARK
107 PARK HEADQUARTERS ROAD
GATLINBURG, TENNESSEE 37738

September 1995

EXECUTIVE SUMMARY

For several years, many individuals have been concerned about the conditions of trails and backcountry in Great Smoky Mountains National Park, the most heavily visited national park in the United States. People who work for the Park or who enjoy its many wonders have been and remain profoundly worried about the effects of so many people pursuing activities from hiking to horse riding, from camping to day-visits. This document describes future actions that the National Park Service will take to improve the Park's trails and backcountry.

The Park and its trails are of international caliber and a source of local and national pride. Several trails follow Native American routes that date from before Europeans first encountered the region, many others evolved from paths, woodsroads, or railroad grades established by early settlers. In addition, a remarkable period of trail building occurred during the Park's earliest years, thanks to the efforts of the Civilian Conservation Corps (CCC). That effort converted many of the routes that predate the Park into a system of recreational trails providing access to the Park's interior. Techniques applied by CCC workers in the Park were documented and applied throughout the nation during other CCC era projects. Today, just over 800 miles of trails comprise the Park's formal trail system, along with 18 shelters, 83 designated backcountry camping areas, and five vehicle-accessible horse camps.

Unfortunately, the condition of the Park's trails and backcountry is deteriorating. Reasons for the declining condition are complex, but they are clearly related to the type and amount of activities occurring, the behavior of those who visit the backcountry, and the lack of sufficient means to maintain the trails or repair problems. Specific problems were documented during recent assessments of trails and camping areas (Marion 1994 and forthcoming). A faculty member of Virginia Tech's Department of Forestry, Dr. Jeffrey L. Marion, completed the assessments at the Park's request. The Park sought the assessments because it needed objective information about conditions along the Park's trails and at its backcountry camping areas. This work was completed under a cooperative agreement with the National Park Service. The assessments document that the trails suffer from extensive amounts of soil erosion, wet or muddy soil, water running freely along trail treads, and a lack of effective drainages. And, they document that many campsites are large, barren of vegetation, and close to other campsites. These conditions will continue and deteriorate unless changes are made.

The project that culminated with this document began in September, 1994. The National Park Service sought the assistance of a Research Associate from Virginia Tech's Department of Forestry, Mr. Peter B. Williams, to identify options for improving the situation found along backcountry trails and at backcountry camping areas, again under a cooperative agreement. The project applied methods that emphasized facilitated discussion between Park staff members, local

horse riders, and local hikers. In addition, national conservation, hiking, and horse riding organizations were contacted, along with Park concessionaires who operate horse riding stables. The purpose of these discussions was to expand the effort's understanding of the current situation by exposing these individuals and groups to the known situation and asking them for their ideas about other related issues or concerns. Examples of the information gathered during this effort most often pertained to the Park's backcountry management structure, project funding, trail construction and maintenance, volunteerism, and interactions between visitors who hike and those who ride horses.

In September, 1995, Virginia Tech submitted its report containing recommendations for the National Park Service's consideration. Following their review, the current document was produced. It contains actions that the National Park Service believes will improve the situation along the Park's trails and at camping areas without compromising opportunities for enjoyment.

Several actions detailed in this document are considered most essential:

- To improve administration of the backcountry and to increase public access to relevent Park decisions, the Park will create a **Backcountry Stewardship Coordinator** position.

- To better maintain and repair backcountry trails and camping areas, the Park will establish and implement an **Integrated and Comprehensive Backcountry and Trails Program** beginning with a continued increase in cooperative trail projects involving the Park's trail crew and volunteers. Eventually, the program will include ***expanded professional trail crew efforts,*** expanded programs for supervised and unsupervised ***volunteer work,*** ***Backcountry Hosts,*** expansion of the Park's current ***Adopt-A-Trail*** program, and an ***Adopt-A-Campsite*** program.

- To remain aware of conditions along backcountry trails and at camping areas, the Park will begin a long-term **Monitoring Program** that builds upon the work of Virginia Tech.

- To promote more responsible enjoyment of the backcountry, the Park will expand upon existing **Information and Education** materials that emphasize Leave-No-Trace ideals.

- To ensure a consistent direction in the Park's backcountry efforts, the Park will adhere to a **Vision Statement, Priorities, Goals, and Objectives** for backcountry management.

- To improve the trails and camping areas, the Park will take **specific actions** that include ***reconstruction, relocation, redesignation,*** or ***eventual closure*** of trails in the worst conditions, following the timeline established in this document.

Successful implementation of the ambitious actions described in this document requires much hard work by those who care about and for the Park. Many people must be involved because more drastic steps are necessary if the actions fail. It can be done, but it will take time, patience, and enthusiasm. Although the work that went into this project and document was intensive, the really major work has yet to be done.

Many people and organizations assisted this project. Appreciation is extended to the National Park Service Mid-Atlantic and Southeast Regional Offices and the Friends of Great Smoky Mountains National Park for providing funding. Additional assistance in the form of photocopying was provided by the North Carolina Department of Natural Resources and Community Development, Division of Parks and Recreation, Asheville office. Many of the most original ideas, however, were provided by the employees of Great Smoky Mountains National Park and members of numerous -local riding and hiking organizations.

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INTRODUCTION

This document describes future actions that the National Park Service will take to improve the trails and backcountry of Great Smoky Mountains National Park. For the document's purposes, backcountry is defined as *largely natural, undeveloped, remote, and often protected areas or wildlands where people visit, but do not remain, and where their activities do not impair the free-play of natural processes and do not require motorized means of transportation.*

The efforts that led to this document began because of a troublingly unbalanced equation: a fixed, perhaps even shrinking set of available resources is insufficient to address overwhelming problems along the Park's trails and in its backcountry. Those efforts also began with a simple question: **how can we change that equation in a way that might work?**

Reaching an answer to that question required understanding the existing and potential resources along with the scale and scope of the problems so as to select workable options. If we are to have any realistic hope of balancing the troubling equation, each option chosen must either expand the resources or reduce the problems.

Changing the equation needed the ideas of many people ranging from those who work for the National Park Service to those who simply care about national parks and backcountry recreation. To bring as many of these people together as possible and to spark a great willingness to share ideas, the effort that led to this document applied a strategic planning approach together with collaborative means. Such an approach allowed those who participated to focus on three sets of guiding questions (Figure 1). In addition to having guided discussion, these questions serve as this document's structure.

I) **What is the current situation?**
what are the physical, biological, and **social conditions? what are the National Park Service's responsibilities and capabilities? What are the issues and concerns of those who enjoy or help care for the Park?**

II) **'What is the current. direction?**
Is the current situation acceptable? Why? Why not? To whom? If nothing changes, what **likely will result? Where do we seem headed?**

III) **How do we go Where we want?**
Where do we want to -go? Are we headed there? what resources are available to take us **there? can** those **resources be** expanded?

Figure 1 Three Strategic Questions.

Compared with many National Park Service planning efforts, the effort that led to this document was non-traditional because it gathered some of the most essential information throughout the planning process, as opposed to before it. Some of the information gathered

included general responses of interested individuals and organizations to the very process itself and specific ideas for fulfilling Park administration mandates. Although easily overlooked, there is a distinct difference between a recommendation and the guidelines that such a recommendation must follow. When participants in a planning process are willing to learn about and work within Park administration guidelines, then they can contribute many ideas that might be overlooked by others, especially ideas and information about how a possible recommendation might affect them. By bringing more people together who are willing to understand and respect existing guidelines, a broader selection of options becomes available.

Many Park employees offered their ideas about what might or might not work, as did many other people who hike, ride horses, or otherwise care about the Park's character and contents. Together, each of these individuals sought to understand current backcountry conditions in the Park, which of those conditions is a problem, to whom it is a problem, and why it is a problem. Then, they offered ideas for workable solutions. They did not negotiate a compromise from preliminary positions. Instead and more constructively, they learned from each other and suggested ways to address various interests and concerns in a manner that would benefit all those throughout the nation who care about the Park. As a result, they changed that original equation by suggesting ways of expanding the resources available to repair or avoid backcountry problems. They discussed how to promote greater consideration toward and care of the backcountry, in part through educational brochures and informational contacts. They also suggested ways volunteers might help repair or maintain the trails-- seasonal trail maintenance, integration of volunteer efforts with current or expanded NPS programs, and more. And, they offered ideas for how the Park's efforts might expand to facilitate more volunteerism, tackle the Park's most technically demanding trail work, and provide the most suitable information to backcountry visitors.

Whether the actions will mitigate existing and future problems remains to be seen. Ideally, the increase in resources together with a decrease in problems will balance the equation and lead to improved, sustainable conditions in the backcountry. That is our goal; that is our direction.

The Project's Process

This document is the result of a cooperative process between the National Park Service, Virginia Tech, and many people who ride horses, hike, or otherwise care about Great Smoky Mountains National Park and its trails. Throughout this process, the National Park Service has retained all decision authority, as required. The extensive, initial phases of this project and its participatory approach was not intended to make decisions, but to offer Park management a set of recommendations that many people, including Park staff members, agree should be workable. The only viable way to gauge whether an idea is workable without actually implementing an action is to ask people for their thoughts.

Following the initial phase, Peter Williams, a consultant from Virginia Tech who facilitated that phase, compiled a draft report. That report presented the issues and concerns related to the Park's backcountry and trails, along with the ideas and recommendations offered by many individuals for addressing those issues and concerns and improving the Park's trails. The National Park Service reviewed that report and adapted it to become this document.

Of those people participating in this project, no one has consented to its final suggestions or offered any commitment other than broad support for the project's general, participatory approach. Also, no one claimed to speak for or represent anyone else unless that participant was an officer of a club or organization and was authorized to speak for its members. Meetings during this project occurred at the request of an individual or organization. Every meeting's purpose was identical: provide or gather information about 1) the current situation and its apparent trends, 2) the significance of that situation or its trends, and 3) what might be done to ensure that the Park's character and contents remain for future generations. By reviewing existing scientifically gathered information, learning about NPS policies and mandates, and then sharing ideas, participants came to understand more about the situation and about perspectives other than their own. They also became better prepared to offer constructive suggestions.

The participation that occurred during this effort would not substitute for the strictest requirements of the National Environmental Policy Act (NEPA) (U.S. *Code*, volume 42, section 4321 and following). Still, the participation has been essential because it allowed the effort that led to this document to identify more completely the issues and concerns related to the Park's backcountry and trails. It also has expanded the number of ideas available for addressing those issues. Early and continuous participation was imperative for workable recommendations because it allowed people to understand the project's intentions, attracted their ideas, and avoided much of the occasionally reflexive opposition that an effort such as this can attract. This project would not have worked 'without the understanding, ideas, and general support that is received.

The Document's Structure

This document begins by reviewing the current situation. First and foremost, it discusses existing mandates that the National Park Service and its employees must follow. Actions described in this document must stay within the confines of those mandates if they are to be workable. The review then explains what is known about the Park's trails and backcountry camping areas. It also presents issues and concerns raised by those who participated in this project. Workable recommendations must address the Park's situation, including the concerns of those who care about it.

The second section evaluates the current situation's direction. There, one will find discussion about the effects of various activities, how those effects differ, likely trends in those effects, and what ideas are available to address them. That section anticipates, with the best information available, future backcountry conditions in the Park.

The document's third section contains its recommendations. Together, these proposals provide an answer to the third question: how do we go where we want? One must look at that section as a whole. A single proposal, taken out of context, may seem disturbing at first. By looking at all the recommendations together, however, one should see that they provide a means to improve the trail system's condition while also increasing the Park's capacity to provide visitors with opportunities for its enjoyment.

In that third section, one finds materials delineating the vision behind this document's recommendations and, when possible, specific and measurable items recommended for gauging

success. The document's heart also is in that third portion: recommended modifications to the system and to how the system is maintained and managed.

Assumptions about Implementing the Recommendations

Recommendations require one understand the reasoning behind them, the importance of success, and the consequences of failure. Congress has given the National Park Service a challenging mandate for administering national parks. The American people's expectations, represented in that mandate, are high and the National Park Service must comply with their wishes. Later sections of this document discuss the mandate in greater depth. At this point, however, it is important to note that, because of limitations on the fiscal resources provided by Congress, fulfillment of that mandate is no longer possible without major changes. Those changes can be drastic, like regulating types or amounts of activities, or they can be constructive, like providing more opportunities for individuals and organizations to help fix the problems.

This document does not assume the National Park Service should provide every means for fulfilling the recommendations. Unless many more people, especially those who enjoy the Park's trails and backcountry, are willing to help, the National Park Service must return to the original equation, the one with less participation and assistance from outside groups. If that point is reached, Park employees will be forced to make painfully difficult decisions so that they can fulfill their Congressional mandate and comply with the wishes of the American people.

Likewise, Park employees must fulfill their part of our joint responsibility for successful implementation. We must not expect other organizations or individuals to accept anything less. The Park unquestionably needs assistance from those who enjoy it. Without help, tough decisions must be made. Nevertheless, if the National Park Service wants the assistance of partnerships, we must also treat as partners those who are willing to join our stewardship efforts.

The overriding goal for this project is that its recommendations be workable. Because of the willingness of many people to offer their time and thoughts, the proposals that follow are workable and possible, provided each person, group, and organization who cares about the Park is willing to continue or begin offering ideas and assistance. There are, however, no guarantees, only challenges. Everyone who helped in this effort must continue to work together to see that it ultimately succeeds. We must jointly increase the number of people involved in repair and maintenance, and educate as many people as possible to leave no trace of their visit. More than anything else, the Park will benefit from visitors who act responsibly towards it and other visitors, and who act as stewards for future visitors. The children and grandchildren of today's visitors need people who are willing to support and participate in efforts to care for the Park's trails, shelters, and campsites.

HISTORIC ORIGINS OF THE CURRENT TRAIL SYSTEM

An understanding of the Park's current backcountry situation is often helped by understanding the history of its trail system. Great Smoky Mountains National Park's current system of trails is extensive and, in many ways, it is one of the Park's most distinctive features. The system has evolved over many years and, in some cases, perhaps even centuries. What follows is a brief description of that evolution. The description likely will raise as many questions as it answers. It should not be considered comprehensive. Although such a description can help place the current trail system into an historical context, the absence of material that is both existing and concise presents an awkward situation because an extensive research effort needed to examine the trail system's history is beyond the capacity of this project. It is hoped that the following material provides a start for a more focused effort to uncover the trail system's historic origins.

Earliest Routes

Much of the region's history prior to the last 300 years is undocumented, even within Cherokee mythology or oral history (Mooney 1982). This makes it difficult to determine the earliest beginnings of the current trail system.

Anecdotal evidence suggests that original portions of these routes may have been made by American bison. Certainly, there were significant herds in this area, as mentioned in numerous journals and correspondence from that period (Ramsey 1967). It is possible that great herds moving across the mountains followed the same route year after year. Over generations the herds, seeking to avoid the narrow gorges that rivers cut through the mountains, would have found the best routes for them to cross the difficult terrain of the Smokies. Their routes might have appeared as moderately wide trails with intermediate grades similar to those of wagon roads. Native Americans could have followed these same routes to hunt, access the mountainous interior of the Smokies, or trade with other tribes.

By the late 1760's, when Daniel Boone and other early settlers of European descent first pushed west of the Appalachians, the region apparently had few human settlements, although their journals suggest a previous and dense population (Ramsey 1967). Evidently, the Choctaws, Chickasaws, and Cherokees, to the south, and member tribes of the Miami Confederacy, to the north, had reached an agreement that the region north of the Little Tennessee river and south of the Ohio river would serve for hunting and warfare, but not for settlement. If correct, these writers were describing an area approximately that of contemporary Tennessee and Kentucky. One journal author from that period wrote,

> That part of these two states embraced between the boundaries mentioned [Tennessee and Kentucky], was one great park, where the skill of the uncivilized hunter was practiced, and a central theater, upon which the desperate conflicts of savage warriors and bloody rivals were perpetuated (Ramsey 1967, p.74).

A two-hundred-and-thirty-year-old description of this region as ***one great park*** is no less than remarkable.

Native American Trails and Routes

When the Park was established in 1934, at least eight major routes known to have been used by Native Americans existed (Wilbum, Grossman, and Stupka 1938; Wilbum 1940a, 1940b). Several of the trails or routes are unconfirmed and others may have existed as well. By the time of the Park's establishment, European settlers had converted most portions of these routes to roads. Other sections had become abandoned.

Today, several sections of the Park's formal trail system lie in the same location as these routes. In other places, either existing paved roads or abandoned woods-roads are now found. Names applied by Wilbum and others (1938) and by Wilbum (1940b) are, from east to west, Cataloochee Indian Trail, Balsam Mountain Indian Trail, Indian Gap Indian Trail, Bote Mountain Indian Trail, Tuckaleechee and Southeastern Indian Trail, and Ekaneetlee Indian Trail. They provide no names for the trails they believe may have existed through Dalton Gap and Deals Gap in the western end of the Park.

Appendix A of this document contains expanded descriptions of each route. Research for this effort uncovered no reference to names applied by Cherokee or other tribes, so Wilbum's nomenclature is used.

Settlement and Timber Era

From the 1830's until the 1930's, human activity within what is now the Park expanded greatly as European settlers pushed into the area from the east and west. They were drawn by what they saw first as a bounty of land and then as a harvest of timber, as well as the beauty of remoteness. Shadows of this era remain along with more obvious remnants. Examples include scattered remains of former homesites and the often still tended cemeteries throughout the Park that serve as a reminder of this era to the living descendants of those who experienced it.

Today, the Park's road and trail system retains many of the routes that first appeared during this era. Roads ran into nearly all the major watersheds and trails ran from there (Thompson 1933). Several of the earlier trails and routes were adapted to new purposes. For example, Cataloochee Indian Trail became Cataloochee Road (Wilbum 1940a) and Bote Mountain Indian Trail became Bote Mountain Road, constructed with the assistance of Cherokee tribe members (NHA 1994). Indian Gap Indian Trail became a toll road and served as a primary route across the mountains (Wilbum 1940b).

Most routes from this era served practical purposes. Very few served a recreational need because the greater needs were utilitarian. Routes connected homes or communities, facilitated trading, or allowed access to timber. This project's research could not determine how many trails served for recreation or when trails with such a purpose were first constructed. Evidently, however, several trails to waterfalls or summits predate the Park's establishment, as shown on maps from the period (Thompson 1933).

Because of the large number-of trails, roads, and railroads constructed during this period, detailed documentation of specific routes will not occur in this document. Instead, most significant for the purposes of this project are those roads, railroads, or trails no longer a part of the trail system. Some of those might be reopened, yet, to replace sections of trail that are now in damaged condition. Many of the routes are spurs, meaning that they do not connect with another route. Enlisting some of these routes as part of a reconfigured trail system may require new sections of trail. Specific discussion of these routes is found in the section dealing with recommended modifications to the trail system, rather than here in the history section.

Civilian Conservation Corps and the National Park Service

In 1926, the U.S. Congress endorsed a Great Smoky Mountains National Park (Runte 1987). The Congress authorized the Secretary of the Interior to accept as much as 704,000 acres from either the States of Tennessee or North Carolina or from private donors. The estimated cost was $1 0,000,000.

The effort to establish what became Great Smoky Mountains National Park first began in 1894 with a petition by the North Carolina Press Association requesting Congress for a national park in their state. By 1899, the Appalachian National Park Association had organized in Asheville, NC, for the purpose of pursuing establishment of a national park in the region, possibly in North Carolina, Tennessee, or Virginia. Unlike many parks established about the same time in portions of the western U.S., such an effort in the eastern U.S. meant repurchasing lands from private owners, something Congress was unwilling to pursue itself. Congress authorized the process of establishing the Park in 1926. Citizens of North Carolina and Tennessee rose to the occasion. Support was broad and even school children donated lunch money. Their donations, together with those of religious institutions, business leagues, and many individuals from well beyond the state lines, eventually raised one half of the needed amount. John D. Rockefeller, Jr., contributed the remaining $5,000,000 dollars in memory of his late wife. In 1934, the Park was formally established by an Act of Congress, although National Park Service operations there had begun earlier.

Coinciding with the Park's establishment, the Civilian Conservation Corps began its short, yet productive life in 1933. That spring, the Park's first CCC camps opened just six weeks after President Roosevelt signed the Federal Unemployment Relief Act establishing the Emergency Conservation Work program of which the CCC was the central part. By the beginning of World War II, the program's life was nearly complete. It became an independent agency in 1937 and, by 1941, Congress acted to de-authorize the program as war preparations became paramount.

The trail system of Great Smoky Mountains National Park took on national status during the CCC period. Although much of the system constructed during this period made extensive use of old roadbeds, railroad grades, and existing footpaths, much new work was also completed. Many of the Park's famed roads and trails were first constructed or were converted from existing routes, including most of its Appalachian Trail (AT) section. Quite significantly, a Park employee, Guy B. Arthur, one of the nation's premier trail builders, produced a manual, Construction of Trails (USDI 1937), that became the standard guide for CCC efforts throughout the country. The methods he described became widely applied wherever CCC trails were built. Many of the trails he' or others designed for the Park during this period still remain in remarkably good condition after 60 years.

No history of the CCC's diverse effort in the Park focuses on the trail system. Although not compiled, many of the materials seem available; yet, no one has documented the system's progression. Fortunately, the 1937 CCC manual Construction of Trails is available, so techniques for the original trail construction are documented. Also, the Park's Maintenance Division maintains many of the original drawings for the actual trail construction projects, including bridges, fords, and rock walls.

Recent Times

Since the CCC effort, no comparable amount of trail construction has occurred in the Park. An NPS Master Plan effort in 1964 proposed more construction, but other components of the plan called for construction of additional roads and new facilities. Those components drew opposition that eventually led to rejection of the plan.

More important than a reduction in new trail construction has been a trend throughout the Park's history toward increasing numbers of annual visitors. Although the accuracy of individual figures may vary, their trend is no less revealing: over 2.5 million people by 1955; 4 million by 1960; 6 million by 1965; 8 million by 1975 (USDI 1981a). Currently, annual visitation is thought between 8 and 11 million people, with a sizable portion of that number reflecting people who enter the Park multiple times during the year. Whatever the actual number, no other park in the National Park system is likely visited more than half as often. Several surveys, however, support the widely held opinion that most people who visit the Park spend little or no time away from roadways or visitor centers (ARMS 1975, Peine and Renfro 1988). More recent information about visitation patterns is unavailable.

As the number of visitors has increased, Park staff members have become increasingly alarmed at the real and potential effects of greater and greater numbers of people. Three approaches are available to offset those effects: restrictions on visitors or their activities; maintenance, repair, or rehabilitation of locations where those effects occur; and informing or educating visitors about how they can leave no trace of their passage. Park staff members have applied examples of each approach to address concerns about the backcountry. Although Park efforts have included maintenance and rehabilitation of trails and campsites, as well as information and education of visitors, their primary tool has often been regulation.

One reason for the emphasis upon regulation has been the Park staff members' application of a *carrying capacity* model for understanding and responding to backcountry recreation. The model was introduced in the early 1960's (Wagar 1964). Unfortunately, some people are easily mislead by the model if unfamiliar with the specific ideas behind it. For some, it suggests, erroneously, that a preordained figure can be deduced by scientific study or agency experts. Likewise, some people assume it also means that limiting visitor numbers will resolve any wildland recreation issue. Applied to maintenance, a capacity-oriented perspective might suggest wrongly that reducing trail mileage will increase the capacity to maintain a trail system. In both cases, these assumptions ignore the importance of behavior, ignore the differences between how various activities affect a setting, and ignore the key role of trail design and construction or campsite location. How and where an activity occurs is at least as important as whether it occurs. When focusing upon the number of visitors, one's options for responding to perceived problems tend to remain limited to those options that reduce the number of visitors or the mileage of trails. Alternatives to these ideas will appear throughout this document.

In part, funding restrictions have also played a role in the reliance upon regulation. As a general indication, trail crew staffing for 1995 is 21 people, including 11 permanent positions and 10 seasonals. This is in contrast to the 1973 trail crew with 52 positions, of which 50 were seasonal and 2 were permanent foreman positions. Park staff members attribute the change in staffing to several reasons, including Park budgets that have been flat or reduced in the face of inflation, recent changes in NPS hiring practices, local Park budgeting priorities, and staffing decisions by the Park's Maintenance Division. In addition, reaching backcountry visitors to provide informative materials can be difficult because many of them prefer to avoid visitor centers and other locations traditionally used to distribute materials. The exact reasoning for relying more on regulation than maintenance or information is complex and the previous description is likely inadequate.

Concerns that visitors negatively affect the Park and other visitors had reached a point by 1972 that a draft Backcountry Management Plan, produced as part of a Park-wide planning effort, proposed closing the Appalachian Trail (AT) to horse riding and, in selected areas, limiting the number of overnight visitors to the number of bunks available at shelters. Areas that would have been affected by those proposed restrictions on overnight stays included the AT's entire length in the Park and the summit of Mt. LeConte. Prior to 1972, over one-third (35%) of the AT's section in the Park had been previously closed to horse riding. Maintenance demands and concerns about trail conditions led to the 1972 proposal to close remaining sections. That proposed action was never implemented. The closure would have effectively eliminated much of the trail mileage available for high-elevation riding in the Park. Horse riding enthusiasts successfully pursued a compromise. It led to the current situation whereby 50% of the AT in the Park remains open for riding. Of the closed section, no major reconstruction effort occurred to repair the problem sections and, today, they remain among the trail sections most in need of repair (Marion 1994).

Park staff members responded to concerns about crowding at backcountry overnight areas by establishing a backcountry reservation system and a backcountry registration system. Several

versions of these systems have been tried since the first one in 1972. The present system requires backcountry campers to acquire, at no cost, a *backcountry use permit* through a self-registration process whereby campers complete their own permit. Two backcountry permit stations are staffed and volunteers can provide visitors to those stations with assistance completing the form. In addition, campers are required to stay in designated campsites and some of those sites are rationed, meaning that Park staff members have placed a limit on the number of campers and horses. Although the regulations allow some exceptions, this policy of requiring visitors to camp only at designated sites is intended to concentrate the effects of camping and dilute the effects outside those designated areas.

The most recent concerns continue to echo those of the last several decades. In general, the concerns parallel the equation described at the beginning of this document: trails and other backcountry areas need help, backcountry campsites and shelters are too often fouled by manure or human waste, there are not enough resources available to provide the needed help, and something has to give. This is the difficult point where efforts began that led to this document.

THE TRAILS AND BACKCOUNTRY OF GREAT SMOKY MOUNTAINS NATIONAL PARK

Located along the mountainous State border between Tennessee and North Carolina, the 514,885 acres of Great Smoky Mountains National Park include 477,670 acres recommended for inclusion into the National Wilderness Preservation System. The Park is administered by the National Park Service, an agency of the United States Federal government's Department of Interior.

The Park is one of the most topographically, biologically, and climatically diverse areas known (GSMNP 1990, USDI 198 la and 1981 b, USDI 1982). Its lowest point, at the mouth of Abrams Creek in Tennessee, is 840 feet above sea level; its highest point is 6,642 feet, atop Clingmans Dome. This difference of over 5,800 feet makes it possible to gain a vertical mile within the Park's boundaries. Because of its remarkable diversity, the Park is an International Biosphere Reserve and a World Heritage Site, two special titles accorded by the United Nations in recognition of the Park's biological diversity and the National Park Service's leadership in preserving it.

Areas that qualify as backcountry comprise more than 95% of the Park. As such, most of the Park's diversity is there, too, including more tree species (more than 100) than in all of northern Europe, more than 1,600 species of plants (approximately 400 are rare by some measure or another), and greatly diverse and largely unknown species of amphibians, insects, and other animals. There are more salamander species (more than 20) than in any other comparably sized part of the world. Freshwater fish, including native Brook Trout, are plentiful in the Park's many miles of brooks and streams, attracting many anglers. Many bird species either reside in the Park or find it an important part of their migratory route. Additional native Park animals include more than ten endangered or threatened species and seven species that have been reintroduced following their elimination from the local area.

At least eight different types of forest exist in the Park, each one noted for its particular mixture of tree species. The composition of several of these types, however, is threatened by damage occurring either to Frasier fir (*Abies fraseri*), flowering dogwood (*Cornus florida*), or red spruce (*Picea rubens*). Air pollution, non-native fungi, and pests each contribute harm. The Park's large number of plant varieties includes approximately 375 non-native species, called exotic species. At least 25 of these species pose significant threats because of the non-native plant's ability to invade areas, out-compete native plants, and, therefore, unnaturally change natural, historic, or cultural scenes.

Geology, topography, and soils play a crucial role in supporting the Park's natural diversity (USDI 1982). The primary geologic formations are members of the Ocoee series, a group of sedimentary rocks 600,000,000 to l,OOO,OOO,OOO years old. Formations range from intensely

metamorphosed rocks of the Park's southeast to less altered rocks of its northwest. The Park's geology provides parent material for its six soil types. Park soils generally become more rocky, thin, and susceptible to erosion as elevation increases, although highly organic soils, commonly found along drainage bottoms, are also susceptible to disturbance. The most dominant soil type by area is also associated with steep slopes and a notable potential for erosion. Notwithstanding the potential for erosion, many areas of the Park contain soil that is permeable or otherwise erosion resistant, as shown by the area's severe topography despite its age.

Climactic diversity and rainfall distinguishes the Park as much as anything else. Travelling from the Park's lowlands to its highlands is ecologically comparable to a journey from North Georgia to Maine, an equivalent distance of nearly 3,000 miles, yet all within the Park. Annual precipitation is 80 inches in some areas, more than enough to qualify as a temperate rainforest. That the soil's potential for erosion is often offset is demonstrated by the Park's topographic prominence despite such rainfall. One of the reasons the soils are more stable than one might expect is likely the protecting influence of lush vegetation. The careful balance struck between topography, soil, and vegetation, however, can be upset if a disturbance occurs.

Some of the Park's features are the result of human activities. Numerous shadows of former structures exist, including old homesteads, stone walls, fence posts, and abandoned roadbeds or railroad grades. Although restored or representative examples of buildings are accessible by road, many of the faintest remnants are seen only in the backcountry. For many people, the Park's special historic and cultural qualities are amplified by the presence of cemeteries that predate the Park's establishment.

The Park's natural and cultural wonders attract people. According to the best estimates available, the Park is visited between 8 and 10 million times each year and its backcountry is visited between 500,000 and 700,000 times each year (Table I). Popular backcountry activities in the Park include hiking, horse riding, and camping. The best figures available suggest that approximately 95,000 backcountry camper-nights (one person, one night), 80,000 horse riding trips (one person, one day), and 42 1,000 day-hikes (one person, any portion of a day regardless of time spent or mileage covered) occur each year. The horse riding figures do not include any concessionaire operations because separate networks of trails are maintained by concessionaires for their riders. Park visitation figures suggest that, during the 15 years from 1979 to 1993, the total number of Park visitors is up (~15%) and, comparatively, backcountry camping is up about the same, private horse riding is up twice as much (~30%), total backcountry visitation is up about three times as much (~45%), and day-hiking is up nearly four times as much (-60%).

To offer opportunities for people to enjoy the Park, the National Park Service maintains an extensive system of trails, campsites, and shelters. Currently, that system includes 802 miles of trails, 83 backcountry camping areas, and 18 backcountry shelters. Yet, as numerous scientific studies all show, every *visit, regardless of activity, to any backcountry, regardless of location, changes that backcountry to some degree for some length of time,* notwithstanding that some activities inherently contribute changes that are more significant and last longer than others (Hammitt and Cole 1987).

Table I Fifteen Years of Visits to Great Smoky Mountains National Park categorized According to Activities.

Visitation Category	Year[1]		Percentage Change from 1979 to 1993 [2]
	1979	1993	
Backcountry			
Camping	81,000	95,000	+17%
Horse Riding	62,000	80,000	+29%
Day-Hiking	269,000	421,000	+57%
Total (Backcountry) [3]	412,000	597,000	+45%
Park Total (millions)	8.0	9.3	+16%

Management actions are necessary if the Park is to provide opportunities for backcountry recreation today without compromising the capability of providing future generations of visitors with similar or better opportunities. Each such action focuses on either visitors or the environment. For example, a regulation may either prohibit or require visitors to do something. Alternatively, visitors' environmental effects may be offset at least to some degree by maintaining trails, campsites, and shelters and by repairing problems as they appear.

Picturing the Current Situation

The current situation is complex. One way to approach it is with a simplified picture that starts with a system of trails, shelters, and campsites. That system is a component of a larger, mostly natural setting-- a national park. The setting has contents and physical presence, and character and emotional meaning. One purpose of a national park, as we will soon see, is to provide future visitors with opportunities for enjoyment that are comparable to those opportunities available to current visitors. To realize this purpose, a national park requires the care of stewards. The picture, then, is of a predominately natural setting with a system of trails and camping areas

providing **opportunities** for visitors to enjoy the setting and needing **the** care of **stewards if the** system is to provide similar future opportunities (Figure 2).

To understand the current situation's complexity, one might begin by identifying directives that guide Park management because those directives should reveal the Park's purpose (Rainey 1991). Often, directives are legislative mandates, and the National Park Service is legally bound to comply with them. The legal nature of these directives means that they provide this project with boundaries it must not exceed.

The next step is to describe the system's condition. Such a description appears in the following section and begins with the physical trail conditions (Marion 1994) followed by those of campsites, shelters, and horse camps. Many parts make up the Park's trails and backcountry. Because of various scientific studies, we understand much about some of those parts. Other parts, however, have not been studied in detail, although some studies in similar protected areas generalize safely to the Park's current situation. Throughout this effort, we must rely upon the best information available, recognizing that we will never know everything about the current situation because it is so complex and ever-changing.

The current situation is affected by the people who come to the Park and how they act when they are there (Hammitt and Cole 1987). So, we also need to know about current visitors-- why they visit the Park and what they do there. Some effects of people, if not dealt with, can conflict with the Park's purpose. Park employees, sometimes with the help of others, can offset those effects with either administrative actions, such as regulations directed towards people, efforts to

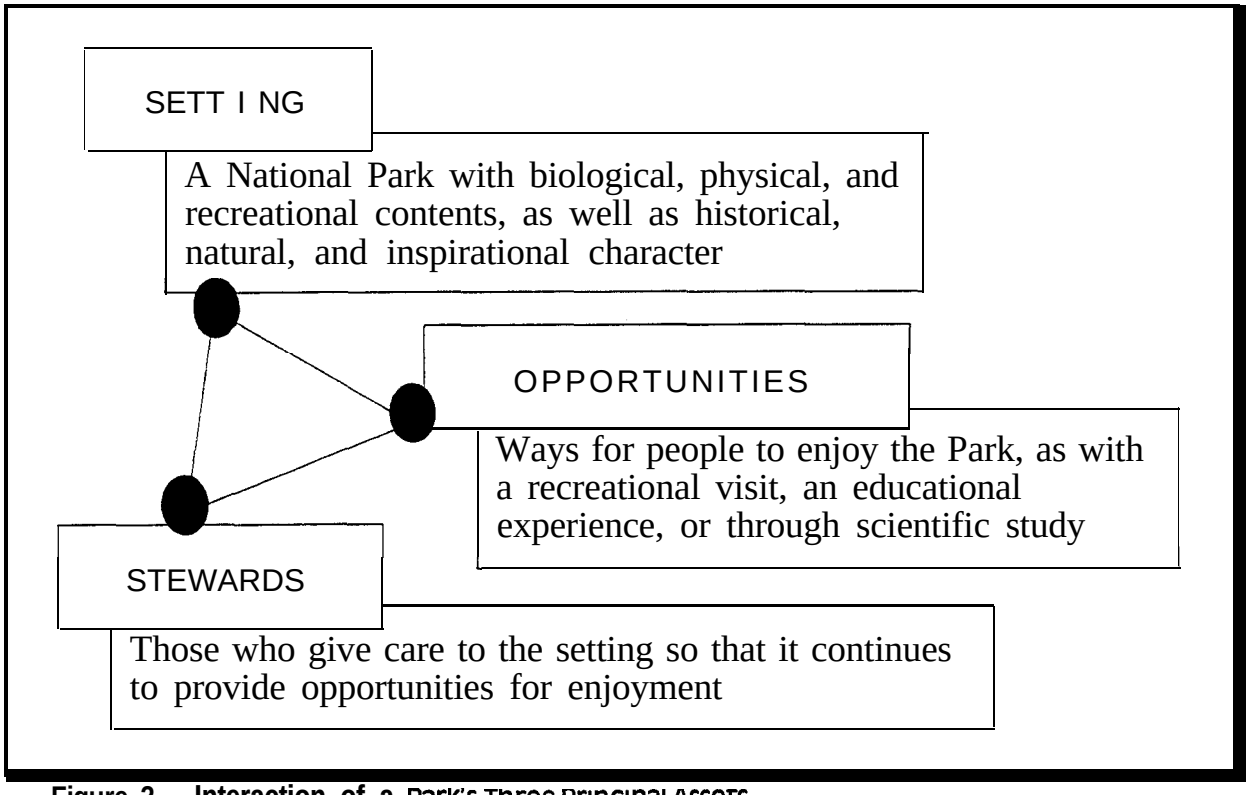

Figure 2 Interaction of a Park's Three Principal Assets.

inform visitors, or maintenance directed towards trails or other backcountry features. To understand the situation, we need to know about the current capability to maintain that system, existing informational and educational efforts, and current regulations. Together, this information portrays the current situation and places it within a context.

Understanding the current situation is important because not all individuals react alike. Two people, for example, might interpret a situation differently, especially if each is pursuing a different activity. Part of the current situation is what people think about it and what they say is important to them about it. Perhaps most importantly, we must start by understanding National Park Service responsibilities and capabilities, for these are the boundaries within which we must operate to find workable solutions.

Mandates Guiding Park Actions

Every national park is unique and represents a complex set of values and resources. Although the content and character of each park is special, each park also is administered according to guidelines that are quite similar. Those guidelines consist of Congressional legislation, National Park Service policies, and local park policies (Figure 3). Guidelines tend to become more specific as one moves from Congressional Acts to local park policies. Accordingly, some guidelines are the same for every park, while some are unique to each park. Mandates, however, become superior as one moves from local policies to legislation. A local park policy must not compromise a superior mandate.

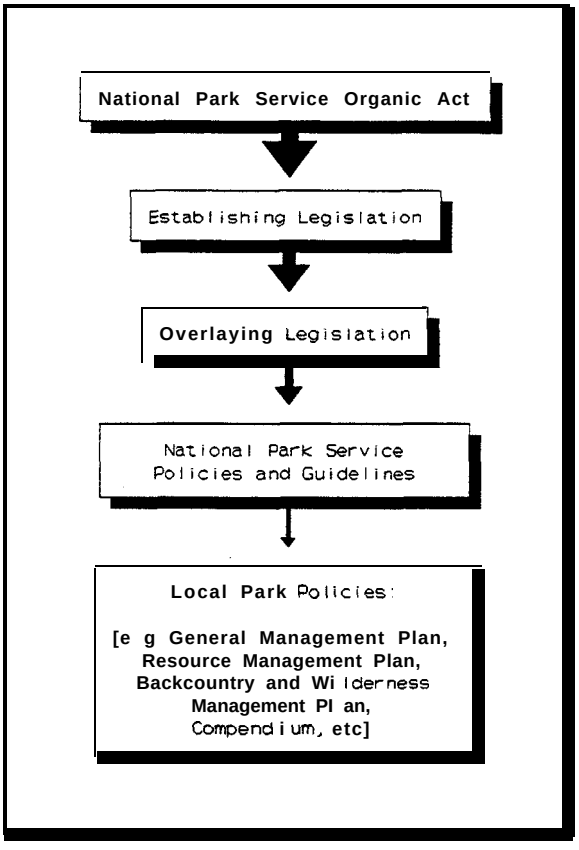

Figure 3 Sources of Park Administration Mandates.

This review reveals the inherent flexibility of NPS mandates and underscores the role of judgment in determining whether current conditions exceed mandated ones. NPS mandates provide guidelines helpful to Park stewards. NPS employees and others should recognize, however, the flexibility inherent in policy. When a recommendation, decision, or action is within the guidelines and strives to support the agency's mandate, it is appropriate, even if a more strict or narrow interpretation of policy suggests otherwise. Operating outside the guidelines, however, oversteps the mandates and, therefore, is inappropriate and not workable.

National Park Service Legislation

National parks, such as Great Smoky Mountains National Park, are administered by the National Park Service, an agency of the United States Department of Interior. The US Congress established the agency on August 25, 1916. The Congress also enacts legislation that guides the National Park Service's management of individual national parks.

The agency's primary legislation is *the National Park Service Organic Act* (U.S. *Code,* volume 16, section 1 and la- 1). That Act provides the National Park Service with it's fundamental direction by defining both the agency's purpose and the fundamental reason for all national parks. The National Park Service is the United States Federal government's premier agency dedicated both to conservation and enjoyment. The agency's purpose is:

> to promote and regulate the use of the Federal areas known as National Parks . . . by such means and measures as conform to the fundamental purpose of the said Parks . . . which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the eniovment of future generations. . . .
>
> These areas derive increased national dignity and recognition of their superb environmental quality. . . . The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public values and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established. (U.S. *Code,* volume 16, sections 1 and la-l with emphasis added)

Congress establishes a national park, therefore, to conserve an area's contents and character for future generations while providing current visitors with opportunities for enjoyment that do not detract from that content or character. The job of the National Park Service is to promote national parks and regulate today's visitors to ensure that tomorrow's visitors have similar opportunities or, if an area has been or is impaired, better opportunities. Clearly, Congress believes environmental quality is a paramount measure of a park's capability to provide for future enjoyment and it instructs National Park Service employees to conserve environmental quality.

For those who visit a national park, enjoyment often means recreation. Recreation, however, can change a park. At times and in some places, change to a park's contents or character may be enough for some people to consider it impairment. To fulfill their conservation mandate, a park's staff members must decide whether recreation has led to such impairment that the agency's purpose has been compromised. In the past, National Park Service employees often made many of those decisions without gathering sufficient information from people outside the agency. Unfortunately, such an approach can lead to a lack of support for decisions because, among many other reasons, some people may believe the decisions are based upon inappropriately limited information.

Today, decisions about impairment are often made in a participatory and collaborative manner, incorporating the interests and opinions of many individuals and organizations outside the agency.

Participants may be visitors, local residents, or concessionaires. Employees or members of conservation organizations can also be helpful participants, as can those of recreation organizations. In addition, a park's staff members, representing every park operations division, should participate because they offer a broad range of ideas and will be responsible for implementing many of the recommendations they and the public ultimately decide are acceptable. This approach to management is prescribed in Management Policies of the National Park Service (USDI 1988), a point discussed shortly in more detail.

In line with the contemporary approach to crafting proposals and making decisions, if those participating agree that impairment has occurred, then they must recommend a response that, while sensitive to diverse visitor interests, protects a park's character and contents. After all, those contents and characteristics are the preeminent reasons Congress establishes national parks, as clarified in *U.S.* Code, volume 16, section la-l. Without the features, there could be no opportunity to enjoy them either today or in the future. The primary mandate provided by the National Park Service's Organic Act, therefore, is to conserve a park's character and contents in public trust for future generations while, wherever possible, providing opportunities for contemporary visitors to enjoy that same character and contents.

Park Legislation

Congress creates each national park with what is referred to *as establishing legislation.* Compared with the Organic Act, this type of legislation more specifically defines the reason for Congress's decision to protect a particular area. For Great Smoky Mountains National Park, the legislation is found in several Acts including an authorizing Act of 1926, an establishing Act of 1934, and an Exclusive Jurisdiction Act of 1942.

With its authorizing Act, Congress formally allowed the process of creating Great Smoky Mountains National Park to begin, although discussions about such a park had occurred in North Carolina since at least 1894 (Runte 1987). The authorizing legislation set a minimum area for the potential park of 150,000 acres and a maximum of 704,000 acres. It also states that the area is meant "for the benefit and enjoyment of the people" and that the Park's administration "shall be exercised . . . by the National Park Service, subject to the provisions of the [Organic] Act of August 25, 1916" *(Statutes at Large,* 1934, volume 48, section 964). Congress acted to make the acquired area part of the National Park System on June 15, 1934, by accepting approximately 400,000 acres from the States of North Carolina and Tennessee, assisted by a generous $5,000,000 donation from John D. Rockefeller, Jr. Although neither the authorizing Act nor establishing Act delineates the Park's purpose much beyond the Organic Act, it does reconfirm the Organic Act's importance-- the Park is held in public trust for future generations.

The Exclusive Jurisdiction Act of 1942 *(Statutes at Large,* volume 56, section 258) provides the Park's most specific Congressional mandate. With this Act, Congress accepted jurisdiction from the States of Tennessee and North Carolina for lands within the Park. Congress also defined the scope of operations within the Park by declaring an exceptional need

> for the preservation from injury or spoliation of all . . . natural curiosities, or wonderful objects therein . . . [including] any damage, injury, or spoliation to or upon any . . . sign, . . . tree, wood, underwood, . . . plants, land, springs . . . or other matter or thing growing or being thereon, or situated therein (U.S. *Code*, volume 16, section 403)

Taken together, the establishing legislation and other related legislation more specifically confirms the importance of protecting the Park's character and contents, especially natural contents. Congress clearly intends National Park Service employees to provide opportunities for enjoying the Park, but realizing those opportunities today must not cost future generations their opportunities to enjoy the Park's character and contents. Both provision and protection should occur; yet, when in doubt, the Park's foremost purpose is to serve as a reservoir of natural and wonderful objects for future generations.

Overlay Legislation

In addition to National Park Service legislation, national parks are often affected by special legislation called *overlay legislation.* This type of legislation gets its name because it over-lays an area, guiding decisions about how that area is managed. Some overlay legislation guides the process of reaching a decision; other overlay legislation guides a decision's form.

Examples of overlay legislation guiding the form of this project's recommendations include *the Wilderness Act* of 1964 (P.L. 88-577) and the *National Trails System Act (Statutes at Large,* volume 82, section 919, also referenced as P.L. 95-625). These two Acts define the form appropriate for many recommendations or actions in the Park. Examples of overlay legislation that guided the method for reaching this project's recommendations include *the National Environmental Policy Act* of 1969 (U.S. *Code,* volume 42, section 4901 and following, also referenced as P.L. 91-190) and *the Federal Advisory Committee Act* (P.L. 92-463). These Acts specify the means appropriate for soliciting information and ideas that balance the interests of the many Park constituencies.

The Wilderness Act

To a great extent, the Wilderness Act guides the form of most administrative decisions affecting the Park's backcountry. As many as 477,670 acres of the Park have been proposed for Wilderness designation (93% of the Park's total area of 514,885 acres). The area proposed is divided evenly between North Carolina and Tennessee. Although Congress has not acted to establish Wilderness in the Park, the Wilderness Act remains important because it specifies that only Congress may designate an area as a component of the National Wilderness Preservation System.

Since 1966, several authorization bills have been sent to Congress that would have formally established Federal Wilderness in the Park, most recently in 1987. Passage of any Wilderness proposal, however, would not change how affected areas of the Park are managed because, for the nearly 30 years since 1966 when portions of the Park were first formally proposed as Wilderness,

Park employees have been required to administer those areas according to Wilderness Act directives. In addition, directives of the Wilderness Act generally parallel those of the National Park Service's Organic Act, so most administrative directives would remain consistent regardless of whether the Wilderness Act or the Organic Act provides the source.

Because only Congress can formally designate Wilderness, NPS employees or volunteers may not usurp Congressional authority by doing anything that would compromise the area's status as Wilderness. They must comply with Wilderness Act directives from the moment an area is proposed and until Congress acts to make the area part of the National Wilderness Preservation System or to release it for other purposes.

Implications of Wilderness designation can be confusing. Some people believe the Wilderness Act requires actions that it does not and others believe it prohibits options it does not. The purpose of Wilderness, as stated in the Act, is

> To establish a National Wilderness Preservation System for the permanent good of the whole people . . . to secure for the American people of current and future generations the benefits of an enduring resource of wilderness (P.L. 88-577, emphasis added).

The National Wilderness Preservation System, therefore, is for people and its components are to be administered

> in such a manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness (P.L. 88-577, Section 2(c), emphasis added)

The Act implicitly distinguishes between an area's public purposes and administrative actions necessary to realize those purposes. The Wilderness Act does not contradict a Superintendent's discretionary authority to administer a park. As the Act states it,

> except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motor boats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area (P.L. 88-577, Section 4(c), emphasis added, parentheses in original).

The Act makes clear that mechanized or motorized equipment is inappropriate for public purposes, like recreation, education, or scientific study that is not serving administrative purposes. Such equipment, however, is occasionally appropriate for administration of a Wilderness area, provided that the result meets the Act's requirements for such an effort (Stankey 1990). More specifically, efforts necessitating the equipment must protect or rehabilitate the area's character and contents as Wilderness for enjoyment or study by future generations.

Accordingly, an inappropriate administrative decision under the Wilderness Act is one that compromises an area's character or contents, as when efficiency or economics are the sole rationale for an action. Maintaining a trail with vehicles, for example, such that the trail's width, design, or character is altered to accommodate the vehicle, as opposed to the trail remaining only what is necessary for simple recreation, is inappropriate.

This standard is quite similar to that of the NPS Organic Act, already applicable in all national park backcountry areas. The standard is a form of *the minimum-tool principle.* When applying the principle, one should consider each available tool, how each tool is likely to affect an area, and the advantages gained by the tool. A tool, in this sense, might be an implement, a mechanism, or a machine, but it might also be a regulation, a sign, an informational brochure, or a map.

Selecting the minimum tool requires judgement. If one judges that a particular tool is the minimum necessary to rehabilitate or protect a Wilderness area's character or content and that one can offset any effects that might alter the area's character or content, then the tool is appropriate even if it is mechanized or motorized. If, however, one judges that the tool or its effects compromise a Wilderness area's character or contents, then the tool is inappropriate even if it is neither powered nor mechanized. The same reasoning applies in NPS administered backcountry, regardless of Wilderness status. Borrowing from the previous example, maintaining trails with vehicles such that the trail becomes altered to accommodate the vehicle is inappropriate in the Park's backcountry regardless of Wilderness status, but one may find justification for such equipment during a particular project, depending upon the specific situation and whether one is willing to complete the work required to offset any of the equipment's effects that alter the backcountry's contents or character.

In a national park, administrative discretion for such decisions resides with the Superintendent. In Great Smoky Mountains National Park, the current chainsaw-window, available for Park trail maintenance each spring, is an example of such discretion. Additionally, a distinction is often made between occasional reconstruction efforts and routine maintenance. According to both the Wilderness Act and the Organic Act, anyone working in the Park's backcountry should not use mechanized equipment as a matter of routine when alternatives are available, even if those alternatives seem to require greater effort. Nevertheless, major reconstruction projects that, upon completion, leave an area with characteristics closer to those envisioned in the Wilderness Act and the **NPS** Organic Act appropriately could involve mechanized or motorized equipment.

The National Trails System Act

The National Trails System Act (P.L. 95-625) guides the form of administrative decisions affecting the Appalachian Trail (AT). Extending over 2,000 miles from Maine to Georgia, the AT runs along the Park's ridge-crest for just over 70 miles from Fontana Dam to Davenport Gap. The Act establishes that "the Appalachian Trail shall be administered primarily as a footpath (emphasis added)," but it does not establish hiking as the exclusive activity. The accuracy of this interpretation is clarified in additional documents associated with AT management. The Act calls for submission of a Comprehensive Plan for managing the trail. Regarding horse riding, the 1981

plan, re-authorized in 1987, states "riding is limited to those sections of the Trail which have traditionally accommodated horse use" with the understanding that the AT's "natural and cultural resources or social values" must not be degraded (AT Project Office 1987). Such is the case for 35 miles of the AT open to horse riding in the Park.

Several principles guide all AT management. First and foremost is cooperative management. Volunteers, as opposed to state or Federal agencies, shoulder most of the trail's maintenance and management in cooperation with those agencies and other interested groups. Second, wherever possible, the trail is managed as a simple footpath with diverse appearance reflecting local character. Third, diverse character and activities are welcome, with special emphasis placed on areas retaining primeval appearance. And, fourth, travellers along the AT are held responsible for themselves and their actions, with as little regimentation as possible and education as the primary means to ensure compliance (AT Project Office 1987).

National Environmental Policy Act

As the National Park Service decides upon a course of action, its methods are determined largely by *the National Environmental Policy Act* (NEPA, P.L. 91-190). This Act is complex and lengthy. Congress intended it to ensure protection of natural, social, and economic environments by, in part, establishing and legislating a structure for members of the public to participate in a Federal agency's decision processes when a significant action is proposed that might disturb any of those environments (Hoogland 1990). A significant action is not defined as just one that involves potential or proposed environmental disturbance. The definition also encompasses actions that include the adoption of rules, regulations, or changes in policy (Bergman and Mackentham 1992).

Technically, many options for improving the Park's backcountry would not trigger a full and often lengthy NEPA process because they would qualify as a categorical exclusion (CE), meaning that they do not have a significant, new effect on the environment (Bergman and Mackentbam 1992). Examples of actions categorically excluded from requiring a NEPA process include alternatives outlined prior to selecting a specific action, routine maintenance and repairs of trails, minor trail relocation or conversion of former woodsroads or railroad grades to trails, minor changes in amounts or types of visitor activities, or designation of trailside camping areas (USDI 1985). In addition, no action described in this document exceeds the existing Environmental Impact Statement (EIS) of the Park's General Management Plan (USDI 1982). For these reasons, a public review process as prescribed by the NEPA is unnecessary for the actions described in this document.

Nevertheless, the sometimes antagonistic opinions about Park trails and backcountry activities suggest that public review of this document is important and should be followed. Review by itself, however, is not an adequate substitute for constructive participation. Unlike review, participation attracts valuable ideas and support, but only if it occurs early and throughout a process, as occurred during the project that led to this document.

Federal Advisory Committee Act

Methods guiding appropriate participation in a National Park Service decision process are also specified in the *Federal Advisory Committee Act* (FACA, P.L. 92-463). In some ways, FACA may be more relevant to this project than NEPA. Congress's purpose for the Act is to ensure adequate and appropriate non-Federal and public participation in Federal decision processes. Prior to the Act, no legal avenue existed to challenge exclusive, special access that sometimes was available to particular groups or individuals. A strict interpretation suggests that only a very formal sequence of participation is available, including posting of all meetings in the *Federal Register*, exacting minutes of every meeting, and many other complicated and often cumbersome procedures.

FACA, however, does not apply to several particular forms of advisory meetings, according to current Judicial interpretations (Northwest Forest Resource Council v. Espy, et al. [D.D.C. 19941). For example, the Act does not apply to any meeting intended to obtain advice, as opposed to consent. It also does not apply to any meeting initiated by a non-Federal group to express the group's views. And, it does not apply to any meeting occurring for the purpose of exchanging facts or information, as opposed to making decisions without public review or participation. As described earlier, each meeting that occurred as part of the participatory project that led to this document met one or more of these three tests.

Other overlay legislation

In addition to those Acts reviewed, other Acts guide this project, including the Archeological Resources Protection Act of 1979, the Historic Sites Act of 1935, and the National Historic Preservation Act of 1969. Those interested in the specifics of these Acts may find Mantell's Managing National Park Service Resources: A handbook on legal duties, opportunities, and tools (1990) a helpful resource. In addition, the Park's General Management Plan (USDI 1981a) supplies an exhaustive listing of applicable legislation. It is available in many libraries.

National Park Service Policies

In addition to legislation, parks are managed according to National Park Service policies and local park policies. NPS policies are compiled in Management Policies (USDI 1988). As with legislation, NPS policies either guide a process's methods or the form of its products, regardless of whether a product is a recommendation or an action. NPS employees are required to follow National Park Service policies so as to carry out their Congressional mandates consistently and professionally (USDI 1988).

Policies guiding a decision process

Planning projects, such as this one, must apply processes that are appropriate according to NPS policies. Most relevant to this effort is policy related to public participation. According to Management Policies,

> positive actions will be taken to identify and involve the public as individuals and through public interest groups and organizations at the earliest possible stages in the planning process and before planning decisions have been made. . . Opportunities for public participation may include public workshops and meetings, informal work sessions on particular issues, and public review and comment on draft documents (USDI 1988, chapter 2).

Other policies regarding planning processes relate to types of projects that are more typical than this one, such as a General Management Plan or Resource Management Plan. This project is non-traditional because it gathered certain critical information during the planning process, as opposed to prior to the process, and some of the information gathered includes responses of interested individuals and organizations to the very process itself and specific ideas about fulfilling Park administration mandates.

Policies guiding a decision's form

This document addresses recreational activities that affect the backcountry, its trails, and its visitors and that are attributed to people, their activities, or efforts to manage them. Additionally, the Park contains areas proposed for inclusion within the National Wilderness Preservation System. Several sections of Management Policies contain specific guidelines for decisions about Wilderness areas, visitors and their activities, and backcountry trails, campsites, and shelters.

Trail Maintenance. According to NPS policy, a trail is a component of a park's *access and circulation system*, as distinguished from *visitor facilities* or *maintenance facilities.* Guidelines concerning trails state that

> all trails will be carefully located, designed, and managed to allow for a satisfying park experience and to protect resources. . . . Backcountry trails will offer visitors a primitive outdoor experience and will be unsurfaced and modest in character, except where a more durable surface is needed. Artificiality in the form of nonnative materials should be avoided on backcountry trails. . . . Equestrian trails and related support facilities, such as feed boxes and hitch rails, may be provided where consistent with park objectives and where site conditions are suitable (USDI 1988, Chapter 9, emphasis added).

The purpose of a backcountry trail, according to Management Policies, is to provide opportunities for a primitive experience without infringing upon that experience by way of artificial or otherwise incompatible construction or maintenance techniques.

A contradiction exists in these excerpts, however, because an exception is made for trail locations where a more durable surface is needed, yet the sentence related to equestrian trails suggests that suitable, perhaps preexisting, site conditions are necessary. A strict interpretation of the policy for equestrian trails might suggest that, in contrast with other trails, no exception is appropriate for modest modifications to that site. Such an interpretation is contradictory. Modest modifications are appropriate for any trail, where modest is understood as minimally influencing a park's character, contents, and natural processes.

Visitor Regulation. As stated in the agency's Organic Act, management of backcountry visitors through regulation is a central duty of the NPS. The objective for managing visitors, according to NPS policy, is to protect park resources while providing opportunities for safe, public enjoyment and minimizing conflicts between visitors. Several means are available for fulfilling this objective, including

> general or special regulations; permit or reservation systems; and local restrictions, public use limits, closure, and designations implemented under the discretionary authority of the superintendent. Any restrictions . . . will be limited to the minimum necessary to protect park resources and values and promote visitor safety and enjoyment. . . . (An) activity may be restricted or prohibited when, in the judgement of the superintendent, its occurrence, continuation, or expansion would result in the derogation of the values or purposes for which the park was established (USDI 1988, Chapter 8, emphasis added).

The discussion of visitors that is found in Management Policies emphasizes regulatory options and overlooks the importance of integrating regulatory actions to manage visitor activities with maintenance actions or informational actions. For example, a maintenance action might include trail work that manages the effects of trail activities. Likewise, an informational action might include distributing a pamphlet that provides instructions to visitors about how a person can minimize his or her effects. In addition to regulations, maintenance of the Park's resources can contribute to protecting both the setting and the opportunities it offers, just as informational materials can promote among visitors the understanding they need to leave no traces of their presence. These tools-- regulation, maintenance, and information-- must work together.

Wilderness Management. NPS policy for managing designated or proposed Wilderness clarifies the directives of Congress found in the Wilderness Act, but it adds no new directives. The purpose of areas designated or proposed as Wilderness is to preserve the character and contents for future generations. The only difference between managing an area as Wilderness and managing one as NPS backcountry, according to NPS policy, is that more care must be taken when selecting a tool because the acceptable standard for choosing a mechanized or motorized tool is more strict for a Wilderness area. Mechanized and motorized equipment is not prohibited. As Management Policies states it,

> If some compromise of wilderness resources or character is unavoidable, only those actions that have localized, short-term adverse impacts will be acceptable (USDI 1988, Chapter 6).

As under the Act itself, discretionary authority for mechanized or mechanical tools resides with the Superintendent.

Appropriate Activities. *The Code of Federal Regulations* (CFR), volume 36, legally defines activities that are appropriate in the Park's backcountry. Although regulatory, these restrictions also supply a mandate that must be followed. A Superintendent may further restrict activities that are otherwise allowable according to the CFR when a determination is made that

> such an action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities *(Code of Federal Regulations,* volume 36, section 1.5).

According to the CFR, hiking, horse riding, and camping are relevant to this document and appropriate in the backcountry, with the understanding that such activities must not compromise the Park's character and contents for future generations. The CFR establishes several mandates associated with horses.

> The use of horses or pack animals [is prohibited] outside of trails, routes or areas designated for their use . . . [and] the use of horses or pack animals are prohibited [on the Appalachian Trail], except in locations designated for their use *(Code of Federal Regulations,* volume 36, sections 2.16.b and 7.100, respectively).

Bicycle riding in the backcountry is inappropriate, according to specific language within the CFR. The Superintendent, under the CFR, may allow bicycle riding only when provided

> written determination that such use is consistent with the protection of a park area's natural, scenic, and aesthetic values, safety considerations and management objectives and will not disturb wildlife or park resources *(Code of Federal Regulations,* volume 36, section 4.30).

Because such a determination does not exist, this document does not address the activity of riding bicycles in the backcountry. In addition, bicycles are mechanized means of recreation and, therefore, are inappropriate in the Park's backcountry, especially in light of Wilderness proposals.

Within a park, the Superintendent may further restrict an activity that is otherwise allowable if the effects of that activity compromise the park's purposes and overwhelm the capacity to offset those effects. Such decisions are examples of a Superintendent's *discretionary authority* to decide the appropriateness of an activity, although exercising such discretion may require *special regulations* or *public notification.* The judiciary defers to a Superintendent's administrative discretion, as recent court decisions show *(Sierra Club v. Andrus 487* F. Supp. 443 [1980], *Bicycle Trails Council of Marin v. Babbitt* [1994]).

When strong evidence establishes that an activity is inconsistent with protecting park values or ensuring visitor safety, or the activity threatens other management objectives, a Superintendent may determine that it is inappropriate and prohibit it. If an activity has occurred for any length of time, yet is changing a park beyond the available means to offset those changes, then the Superintendent has the responsibility, authority, and discretion to restrict that activity or, if necessary, prohibit it, especially if all available avenues for improving a situation are exhausted.

Local Park Policies

Local park policies further refine the instructions given to park employees and, by extension, the effort that led to this document. The primary component of a park's policies is its General Management Plan (GMP). A GMP is a formal document required for each park and it defines a park's management direction. A GMP is not complete until it has been reviewed by the public and its contents are determined to represent general consensus. Included in a GMP are all proposed new changes in a park's facilities, trails, and roads. Other planning documents elaborate on the GMP's general directives. Those documents include a Resource Management Plan (RMP) and a Backcountry Management Plan (BMP).

General Management Plan

Guidelines found in the Park's GMP (USDI 1981) include the Park's purpose, appropriate management practices, broad goals, and direction for managing its trails. According to the GMP, the Park's purpose is

> to preserve these exceptionally diverse resources and to provide for public benefit from and enjoyment of them in ways that will leave the resources-- and the natural processes of which they are components-- essentially unaltered.

This purpose conforms to that of the Organic Act and establishing legislation, and it is nearly identical with that of the Wilderness Act. To comply with this purpose, the GMP directs that efforts to care for the Park

> be undertaken to restore and/or *[sic]* continue the park's environment in the condition that would have prevailed without interference by nonnative plants and animals and by modem technological man.

In addition, efforts to manage visitors must promote the goal of providing opportunities that increase appreciation of the Park's natural, cultural, and aesthetic values. Appropriate backcountry activities are defined broadly to include walking, fishing, horseback riding, and other activities, presumably including hiking and camping and not bicycle riding.

The GMP offers some directives that are relevant to any consideration of the Park's trail system, including its backcountry campsites and shelters. The GMP states,

> facilities for horseback riding will be kept at approximately the 1975-1976 level; overall impacts from the use of horses will be contained by shifting use from fragile or degraded areas to areas more capable of absorbing the impacts (such as former roadways) and by improving control of the effects of stock on vegetation. . . . Proposed changes in existing development will result in a net increase in hiking trails. Horseback riding facilities are to be kept at approximately the 1975-76 level.

Neither the National Park Service's Management Policies (USDI 1988), the GMP, nor this document considers a trail as a facility, as in *visitor facility* or *management facility.* Roads and

> such an action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities *(Code of Federal Regulations,* volume 36, section 1.5).

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This document does not consider mileage as a relevant, primary reason for any action. The objective is to improve the system, not expand or contract it. Any change in mileage, whether an increase or decrease, is incidental to this objective.

Resource Management Plan

A park's RMP is a formal document compiled by park staff members and approved by the Superintendent. It defines specific, non-routine actions proposed to protect and preserve a park's natural and cultural resources, and it provides justification for allocating funds to those various projects. The Park's RMP (GSMNP 1995) contains, among other components, a listing, explanation, and relative priority for projects judged by Park staff members as needed to address their primary concerns. The listing is updated annually, most recently in March, 1995. Among the current items are two pertinent to the scope of this document. One pertains to improving the backcountry and trail system, and the other one addresses monitoring visitation patterns and economic impacts.

This project fulfills the need to plan for Improving the Backcountry Trail System (Project Statement GRSM-N-043). The *problem statement* in the RMP illustrates the concern that increases in hiking, horse riding, and backcountry camping during the last several decades have led to demonstrable problems. Many of these problems have been quantified by scientific assessments of trails and campsites. Often, these and other problems are indicated in verbal and written complaints or limited visitor surveys. The objective for this project, as defined in the RMP, is to produce a comprehensive strategy for mitigating the problems.

A second Project Statement, entitled Monitor Visitor Use Patterns and Determine Economic Impacts (RMP Project Statement GRSM-N-164), also relates to issues and concerns addressed through this effort. Its application would support this project's efforts. Studies of visitation patterns and concerns have been conducted in the Park several times since 1956. A well-designed, repeatable effort to understand backcountry visitors, however, has not. This lack of information about backcountry visitation is not restricted to the Park. Roggenbuck and others (1994) point out that relatively little information is available from any source about differences between frontcountry visitors, backcountty day visitors, and backcountry overnight visitors. If provided such information, those people making decisions about the Park's backcountry and its visitors would better understand visitors' needs and concerns. Better understanding would reduce the possibility that some decisions, although intended to protect resources for future generations, lead to unnecessary loss of opportunities for current visitors. This is not suggesting that protection of resources should be compromised to answer the preferences of current visitors. Rather, better understanding helps identify current preferences that are compatible with the mandate of providing for future generations. Information necessary for that understanding is continually needed.

Backcountry Management Plan

Details of the Park's backcountry efforts are found in its BMP (GSMNP 1993). Although some of the material reiterates mandates found in previously reviewed materials, such as legislation or other planning documents, the BMP also contains specific policies about visitor management, trails maintenance, trail signs, backcountry structures, patrol and reporting practices; day-visitors, and information and education. It also addresses research related to recreational activities.

Guidance relevant to this project involves campsites, shelters, trails, and backcountry visitors. For the trail system, the BMP establishes that major rehabilitation projects greatly affecting areas outside the existing trail corridor require a disturbance assessment performed by staff members of the Park's Resource Management and Science Division and approved by the Superintendent. Projects that do not significantly affect areas outside the corridor are categorically excluded from this requirement, as are short relocations. New trails, however, require formal procedures concluding with the Superintendent's determination. Closure of trails, whether temporary or permanent, must follow standard procedures, including final acceptance and authorization by the Superintendent. The same is true for campsites and shelters.

Following the BMP, construction materials must consist of native materials, such as trees, soil, and rocks, whose removal is neither concentrated nor blatant. Finished work is to blend into the setting without seeming artificial or requiring non-natural materials such as cement, concrete, or dimensional, chemically treated, or preserved lumber, although exceptions can occur when no alternatives exist. Scenic vistas are appropriate at selected locations and maintained as necessary.

Motorized equipment is not appropriate without a written proposal approved by the Superintendent, although the option of a seasonal window-- an extended length of time-- is available to provide periods of blanket authorization for work requiring chainsaws. Primary justifications acceptable for motorized vehicles are new trail construction, major reconstruction, or trail relocation. Convenience, such as commuting to a work site, is not an appropriate or acceptable justification. Routine maintenance-- other than seasonal clearing of wind-felled trees-- also is not appropriate justification.

Education of visitors is a primary component of backcountry management and emphasized in the BMP. A visitor who has learned to leave no trace of their visit helps reduce demand on limited Park maintenance resources. Education efforts also help better match visitor expectations with the actual Park.

Monitoring of visitors, their satisfaction, and their effects is another important direction of the BMP. Programs to provide this need are discussed. Specific projects are described in the RMP, examined earlier.

Compendium

A park's Compendium lists all restrictions established under a Superintendent's discretionary authority to further restrict activities in light of a park's particular situation. Because these restrictions pertain to a specific park or park area, they are more specific than those found in either the *Code of Federal Regulations,* volume 36, or in legislation. The Park's Compendium

(GSMNP 1994) is updated annually where needed, most recently in July, 1994, and is available to the public upon request. Arrangement of its contents follows that of the CFR and includes explanations. Excerpts from the Park's Compendium that are related to backcountry 'trails, camping, and non-concession horse riding are found in Appendix B of this document.

The Park's Compendium does not provide mandates comparable to legislated mandates. Instead, it contains regulations based on interpretation of those mandates. Although relevant to this project, restrictions of the Compendium do not necessarily limit alternatives because the Superintendent retains the option to revise them if provided sufficient and convincing justification.

Current Backcountry Conditions

Evaluating whether the Park fulfills its mandates requires an assessment of current conditions. Such an assessment should illustrate where either problems or opportunities exist. The more one knows about the location and scope of problems or opportunities, the better one is prepared to consider alternatives for mitigating problems or realizing opportunities. Current conditions fall into the three categories of setting, opportunities, and stewards (see figure 1). Setting includes trail, campsite, and shelter conditions. Opportunities are provided by the system's design and reflected by the responses of visitors to others. Examples of stewards include NPS programs, cooperative non-NPS programs, volunteer organizations, and others. Stewardship programs include informational and educational materials, trail maintenance and construction activities, and administrational efforts.

Setting

Understanding the backcountry setting means understanding current conditions of trails, campsites, and shelters. The setting is perceived separately by each visitor, so statements about results should not place values on the conditions. Such a statement is seen more properly as a response to *opportunities* and often is an issue or a concern. It is appropriate, however, to identify where conditions seem furthest from those intended for the Park and what trail characteristics are associated with those conditions. Knowing the scope of a problem helps one consider alternative responses.

Trails

The character and contents of the Park's backcountry setting are amplified and, in some ways, distinguished by its trails. Trails provide virtually the only access to the backcountry's many natural or cultural features and they have a remarkable history of their own. The Park's trail system consists of 802 miles of formal trail, including 412 miles in North Carolina and 390 miles in Tennessee (see Table II). In addition, a system of *Quiet Walkways* exist. The walkways extend for short distances from various locations along major Park roads. They are intended to entice people out of their cars and to offer a peek into the woods without requiring the preparation or time of an extended trip. Walkways generally are comprised of paths informally established

Table II Components of Great Smoky Mountains National Park Trail System and Their Mileage.

Trails	Park-- North Carolina	Park-- Tennessee	Park System-- Total
Maintained for Horse Riding and Hiking (State %) [1]	320 (78%)	197 (51%)	517
-- Percentage of Park System	(40%)	(25%)	(65%)
Maintained only for Hiking (State %) [2]	92 (22%)	193 (49%)	285
-- Percentage of Park Svstem	(11%)	(24%)	(35%)
Formal System Total Mileage	412	390	802
- Percentage of Park Svstem	(51%)	(49%)	(100%)
Appalachian Trail (AT) Maintained for Horse Riding and Hiking (AT %)			35 (50%)
-- Percentage of Park System			(4%)
Total Appalachian Trail Mileage (within Park)			71
- Percentage of Park Svstem			(9%)
Quiet Walkways	unknown	unknown	unknown

[1] Horse riding is restricted to trails maintained for the activity.
[2] All trails are available for hiking, but some are intended and maintained only for hiking.

Sources: Marion 1994, GSMNP Trail Map & Brochure (1994), GSMNP files.

over time by visitors, as opposed to trails designed and constructed with an intentional layout or destination. Walkways are a component of the Park's trail system although the paths do not extend into what is commonly considered backcountry and the paths do not have a set trail alignment. Because they are mostly informal, their precise mileage is unknown.

Hiking and horse riding are popular activities on Park trails. Currently, 517 miles of the total system are maintained for horse riding (64% of the Park total), including 320 miles in North Carolina (78% of the NC total) and 197 miles in Tennessee (51% of the TN total). All remaining

trail miles are maintained only for hiking, although hiking is not restricted to those trails. Hiking-only trails usually are narrower and neither designed nor maintained for the heavier combination of horse and rider.

Although types of activities are important, Park trails are also greatly affected by the large number of people who visit the Park and enjoy its trails. Data collected by Van Cleave and others (1990, 1993a, 1993b) during 1988, 1989, and 1990 illustrate the situation (Table III). Information provided in those reports shows great variety in the numbers of people on different trails, and on the same trail during different months. Generally, data show the number of visitors is highest during July and August, and is high again during October when the fall foliage colors appear. The spring wildflower season-- generally from March through May, depending upon location and year-- is another popular time to visit the Park, but data are limited to compare this period to other periods. During the spring wildflower season, soils are typically more wet than during most other times, and both soils and plants are quite sensitive to damage.

Limited information is available about the relative amounts of different activities. On many horse/hiking trails, the rough proportions are expected to parallel those seen in Table I. These figures suggest that, over the course of a year, about 16% of visits are on horseback. On some horse/hiking trails or at particular times of year, the proportion likely is different. For example, many horse riders avoid riding during August when yellow-jackets are common-- a stung horse is dangerous on a trail-- and the heat is hardest on the animals. On the other hand, popular riding times are during the spring wildflower season and the fall foliage season. During these periods, the percentage of people riding horses as opposed to hiking may be higher, at least on some trails, as limited data suggests (Van Cleave 1990, 1993a, 1993b). Generally, however, the most frequently travelled trails shown in Table III are restricted to hiking.

Background. A trail's design, construction, and maintenance must be appropriate for the type and amount of activities anticipated (Hammitt and Cole 1987, Proudman and Rajala 1981). A properly designed and maintained trail supports the type and amount of expected activities without compromising an area's purpose. At the same time, however, an activity that exceeds a trail's design capacity or a trail program's maintenance capacity leads to decaying trail conditions. Selected basic trail features are diagramed in Figure 4.

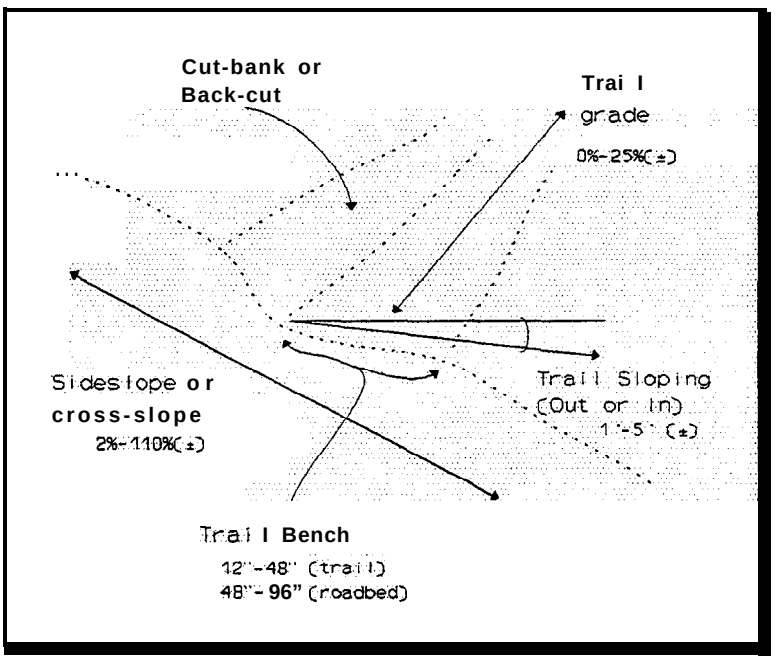

Figure 4 Diagram of a Trail Cross-Section Showing Selected Tread Features.

Table III Known Visitation Amounts for Selected Park Trails.

Trail	Average number of people per day	
	Trailhead	Terminus or Past Primary Destination'
Alum Cave [2]	375	142
Appalachian Trail to Charlies Bunion [2]	553	76
Chimneys [2]	707	255
Ramsey Cascades [2]	179	83
Albrights Grove [2]	16	13
laurel Falls [2]	1487	32
Trillium Gap [3]	1384	50
Rainbow Falls [3]	266	27
Bote Mountain [4]	20	unknown
Anthony Creek [4]	76'	12"
Rich Mountain [4]	31	9
Gregory Bald Trail [4***]	24	17
Rough Fork [4]	117	13
Caldwell Fork [4]	42	unknown
Bradley Fork [4]	191	unknown
Palmer creek [4]	13	9

1 As applied here, terminus refers to the less popular end of the trail. Traffic on some trails falls off dramatically beyond some primary destination that occurs prior to the terminus.
2 Data from summer, 1988, assessed with mat-counters.
3 Data from summer, 1989, assessed with mat-counters.
a Data from summer, 1992, assessed with mat-counters.
' Beyond existing horse camp.
.* On Russell Field trail just above junction with Anthony Creek Trail, not at junction with Bote Mountain Trail.
*** Excluding June data which are exceptionally high because of spring wildflowers (50+ people per day).

Source: Van Cleave 1990, 1993ab.

A trail's tread-width is related to its **alignment** across the slope. Proper alignment depends upon the terrain that the trail must cross and it affects construction and maintenance costs (Figure 5). Tread-width is an even more important determinant of cost in the Park's steep, mountainous terrain than in areas with less steep slopes. This increased importance is because a wider tread, compared with a more narrow tread, requires much more excavation on a steep slope. More excavation complicates trail construction because of the effort necessary to construct a stable back-cut, diagramed in Figure 4. In some locations, stabilizing a back-cut requires a *retaining wall*, often constructed from rocks. Alternatively, establishing a necessary tread-width in some locations may require what is referred to *as cribbing* to build up a section of trail, again often using rocks. All this makes the construction cost more.

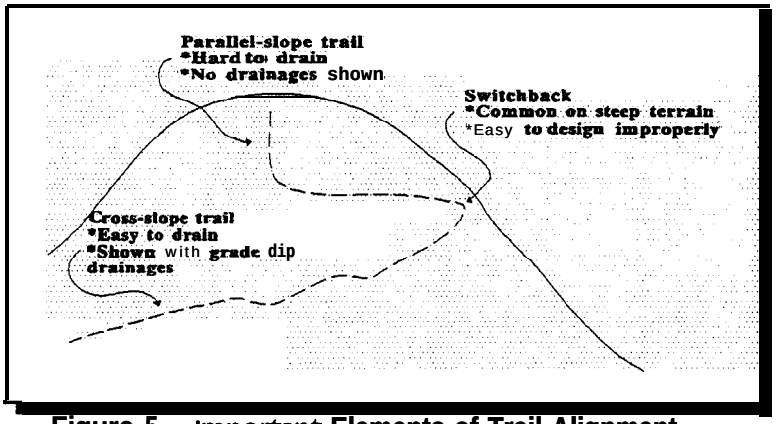

Figure 5 Important Elements of Trail Alignment.

Although a trail's alignment determines the amount of excavation and construction necessary to install a desired tread-width and, therefore, influences construction costs for the trail, alignment also makes its tread either durable and easy to maintain or unstable and difficult to drain. A trail that ascends nearly parallel to the slope will have a grade that approaches or equals the terrain's slope. A parallel-slope alignment allows a maximum rate of ascent, but it produces a trail with minimum cross-slope. Although the trail will gain elevation quickly, require less length to complete the ascent, and need less excavation to install the desired tread-width during the climb, the lack of cross-slope means water can only run directly down a trail, regardless of drainage installation. A trail that traverses a slope and has a moderate grade, however, is easy to drain because the cross-slope is sufficient. This is especially true when the trail's tread is properly pitched away from the face of the slope at a slight angle-- a technique called *outsloping*. Although traversing a slope requires greater trail length and more excavation to establish a stable trail bench, the result is a durable, sustainable trail.

Proper trail alignment on steep terrain also often requires installation of *switchbacks*. A switchback allows a trail with a mostly constant grade to ascend a steep slope without going completely around a mountain. Although a switchback is often necessary, switchbacks are difficult to design and construct well. A poorly designed or constructed switchback is prone to people cutting between the upper and lower segments of trail and to water eroding the turn or the segment of trail below the switchback. One of the most important, yet difficult considerations when one designs or constructs a switchback is outsloping. As a trail's tread approaches a switchback from above, the outsloping must be rolled in towards *the* slope to become *insloping*. This change in the tread's pitch allows it to carry water along the edge of the trail that is into the slope. Water on the trail will then drain off at the outside of the switchback where the trail turns

and begins travelling in the opposite direction across the slope. By draining the water at the trail's switchback comer, one keeps it from draining onto the trail segment below the switchback. When the trail exits the switchback's lower end, the tread is outsloped again.

Draining a trail tread is perhaps the most important design, construction, or maintenance action one can take. A trail unavoidably diverts water from naturally flowing either along the ground surface or in the portion of the soil that is exposed when the trail is cut into the slope. In addition, a trail's grade causes water that enters the trail either to flow along it or, if the trail is flat, to stand as a puddle. Flowing water erodes soil; standing water can become mud. Drainage, however, diverts water off a trail and back to a more natural flow along the ground surface. Unless one properly drains a trail and then maintains those drainages, erosion and mud will occur regardless of the type or amount of activities occurring on the trail.

Several techniques for draining a trail are common. When designing a trail, one can layout *grade dips.* For example, a trail ascending with a 10% grade can descend at 3% for 10-20 feet and then return to a 10% ascending grade. The slight descent will cause water to divert off the trail at the low point between the two grades. Alternatively, one can retrofit drainages by installing them after a trail's bench is completed or as problems appear over time. Examples of these drainage techniques include collection drainages to keep water from entering a trail and diversion drainages to divert water off of a trail. A *lateral drainage ditch* along the side of a trail, a *"Y-shaped drainage"* above a trail, and a *"T-shaped drainage" are* examples of collection drainages. Diversion drainages extend across the trail's tread and divert water to the trail's low side. Examples include *drainage dips, wood water-bars,* and *rock water-bars.* In each case, the drainage extends outside both the high-side and low-side of a trail, often with a rock or pile of rocks to keep people and water from going around the drainage. By extending outside the tread, the drainage is most likely to catch and divert any water flowing down the trail.

Drainages require a minimum amount of cross-slope because flat ground allows water to form puddles instead of draining. Wherever possible, a trail location should allow for drainage and should occur on no less than a slight slope. If a trail must cross flat terrain, then the tread often requires elevation. Several tread-elevation techniques are available, including *stepping-stones* or *bog-bridges* for hiking trails, *boardwalks* or *puncheon* for horse/hiker trails, or *turnpiking.* Stepping-stones are moderate sized rocks placed a short stride apart. Bog-bridges are longer logs that are elevated on short logs. The longer logs serve as a tread. Boardwalks and puncheon are also elevated above the ground, but they are constructed with dimensional lumber and designed to support horse riding. Tumpiking refers to an elevated section of rock, gravel, and soil constructed across a flat area and designed to support hiking or horse riding.

Two types of backcountry trails are maintained in the Park: trails maintained for both horse riding and hiking and those maintained solely for hiking. All Park trails are available for hiking, but horse riding is restricted to those trails that are intended to support horse riding. There are two reasons for this constraint. First, a horse's height, weight, gait, and shoes lead to design implications that increase the amount of work necessary to design, build, and maintain trail. Secondly, a trail designed to accommodate horses has some necessary attributes that may restrict opportunities for certain experiences. For example, some hikers prefer a trail that is more

narrow and simple than is possible for most trails designed and maintained for horse riding. In the Park, a horse/hiking trail-- although available for hiking-- is constructed and maintained for the effects of horse riding and the general needs of horse riders for a wider and taller trail corridor and a more substantially constructed trail tread. A hiking-only trail, however, is typically designed and maintained for the different, often lesser effects of hiking and the different needs of hikers for a less substantial trail corridor and tread. NPS regulations prohibit horse riding on Park hiking trails.

Different design requirements of the two types of trail can lead to different costs. A horse/hiking trail costs more to design, build, maintain, or reconstruct than a hiking-only trail. Part of the cost difference is due to the wider trail bench on horse riding trails; another part is dependent upon the local soil and terrain that the trail must cross. The width of a trail's bench varies on horse/hiking trails and some sections can be as narrow as any other trail. Generally, when designing a sustainable trail in a popular area like the Park, a horse/hiking trail requires a width between 24" and 48", compared to a hiking-only trail that requires a 12"-30" tread. When a former roadbed or railroad grade serves as a trail, however, the width tends to depend less on the intended activity and more on the former one. Another consideration is the number of people on a section of trail because that number also greatly affects tread width, regardless of whether hiking or horse riding occurs.

Terrain, soil, and the type and amount of anticipated activities are the most important considerations of trail design. In sections with especially difficult circumstances, such as wet soil and steep slopes, constructing or repairing the trail to support horses can cost at least 10 times more than if only hiking is expected. In other places, where soil is dry and the terrain not steep, or where large numbers of hikers are anticipated, the difference may be much less. For example, a section of trail with wet and organic soils commonly will turn to mud regardless of whether horse riding or hiking occurs, but constructing the trail to prevent mud will cost more when the design requirements include horse riding, as opposed to just hiking. A comparison of the activities' effects is found in a later, separate section of this document. Generally, designing and constructing a horse/hiking trail is more complicated compared to a hiking trail because the horse/hiking trail must accommodate a horse's greater weight, the capacity for horseshoes to cut through material, and the wider and more uniform gait of horses. Exceptionally popular sections of hiking trails, however, are also more complicated and several Park trails fall into this category.

The Park's preeminent trail, for many people, is the *Appalachian Trail (AT),* running for 71 miles from Fontana Dam to Davenport Gap, mostly along ridges that can provide spectacular views and respite from summer heat below. Five distinct segments totaling 35 miles of the AT in the Park are maintained for both horse riding and hiking (50% of the AT's total mileage in the Park). The AT section between Newfound Gap and east to Icewater Springs shelter is among the most popular in the Park and is restricted to hiking only. During 1989, as many 670 people per day hiked some distance from the trailhead, although less than a third of these people went much more than one-half mile (Table III).

Numerous miles of unofficial or abandoned trails also exist. An extended shortcut or an abandoned trail that is still passable is called a ***manway*** by local residents and Park staff members.

Manways comprise a portion of the unofficial trail system and some are quite gullied. Several visitors have injured themselves while travelling these routes. Unofficial routes also include many miles of old roads and railroad grades that remain from the nineteenth and early twentieth centuries.

Trail assessments provide information about either a trail's location, condition, or maintenance needed (Williams and Marion 1992, Appendix D). A *rapid assessment* can identify location and inventory signs or trail features. A *trail assessment,* compiled by trained workers, provides more detailed information about conditions along a trail or trail system. A *prescriptive maintenance worklog,* compiled by experienced trail workers, can catalog existing conditions and maintenance actions necessary to repair any problems. The advantages of a worklog is that it describes the work needed, the availability of natural materials for accomplishing the work, and the condition of existing work. With such information, trail crew scheduling can occur along with budgeting or contracting.

Marion (1994) provides the most recent, detailed assessment of Park trail conditions. His assessment applied *trail assessment* techniques and does not include any Quiet Walkways. Little specific information is compiled about the current condition of walkways. Field work for the assessment occurred in 1993. Marion's (1994) report of findings includes a complete description of his team's survey methods. His work follows earlier assessments completed by Bratton and others (1978a, 1978b, 1978c, 1979), Whittaker (1978) and Renfro (1985). Comparison between Marion's (1994) findings and previous studies, whether in the Park or elsewhere, are difficult because few standardized procedures have been adopted. Marion (1994) discusses this issue and several others related to comparisons across time. These questions are relevant to all trail assessment efforts, especially those that are part of a monitoring effort.

Conditions. Marion's (1994) effort assessed 72 trails totaling 328 miles (41%) of the Park's 802 mile system. Of the trails selected, most (67%) are maintained for horse riding. This percentage nearly matches that of horse trails for the whole Park (Table II). Trails were selected by Park staff members to encompass those generally believed in the worst condition, although a diverse set of trail conditions and locations are represented.

Extrapolating from the conditions of one group of trails to those of an entire trail system requires a study designed around assessing trails selected in a statistically appropriate manner. Some forms of statistically valid selection emphasize random selection and other forms apply structured selection. At least two methods of random selection exist. The more traditional method is defined by drawing or picking items randomly from a pool of possible choices. Another method, however, is defined by whether one is willing to exchange any item selected with any other choice in the pool of alternatives (Shavelson and Webb 1991). Although Marion (1994) assessed trails that were picked without a random drawing, the willingness Marion and Park staff members to exchange any trail selected with virtually any other suggests that some extrapolation to the complete trail system is appropriate. In addition, although Park staff members believed the selected trails would represent the worst trails in the Park, results show that many sections of the selected trails are in good condition. For this reason, Marion's (1994) results are

quite representative of the entire Park trail system and, again, some degree of extrapolation is entirely appropriate.

The current document assumes that Marion's (1994) assessment of 41% of the Park's trails produced figures that account for SO%-60% of the trail system's total, but also recognizes that the actual figure is not precisely known. The low end of the presumed range is a 50% figure because that is about 10% above 41% and should compensate for selecting trails believed to be in poor condition. Another 10% is added to reach the range's high end of 60%, 20% above 41%, in case 10% does not sufficiently compensate to the selection procedures.

Results from Marion's (1994) work show localized occurrences of significant soil erosion and wet soils (Table IV) and great variety in the density per mile and effectiveness of trail maintenance items such as drainages (Table V). A localized occurrence of particular condition is typical for any trail because terrain, soil type, and the presence of water varies along its length, as can the type or amount of activities.

A common measure of a trail problem is its total distance, but this can be deceptive. A large problem in the middle of a long section of trail can affect both the real and perceived quality of the entire section even when, for the entire trail, the cumulative distance of that particular type of problem is not great. At times and for some people, a section of trail may seem enough of a problem that it reduces opportunities outside its immediate vicinity and detracts greatly from the entire trail's quality. Opinion, then, determines an important portion of a problem's significance.

Of the current conditions along the Park's trails, **soil erosion** is the most common problem, measured by total linear distance. Erosion is the loss of soil by wind or water. Recreation can loosen a trail tread's soil and make it more vulnerable to erosion. Soil loss is a problem when it occurs after a trail's construction and is significant. Marion (1994) obtained two measures of soil erosion: root exposure and significant soil erosion. Both measures are defined in a detailed manual provided with his report. Significant soil erosion, defined as greater than one foot below post-construction depth, is found on 14.6 miles of trail (4.5% of the assessed miles). Of the trails assessed, significant erosion occurs on each trail an average of 239 feet per mile or 1,071 feet (0.2 miles) per trail. Root exposure, defined as exposure of the tops and sides of many moderate or large roots, is found on 2.4 miles (0.7% of the assessed miles). Although root exposure typically shows loss of soil from erosion, it also can show soil compaction. Soil compaction occurs when an activity such as hiking or horse riding compresses soil more tightly than would naturally occur.

The most severely eroded sections of trail surveyed include the Bote Mountain Jeep Trail (the upper 1.7 miles of the Bote Mountain Trail) and Rainbow Falls Trail. Bote Mountain Trail is maintained for horse riding and is very popular for both hiking and horse riding. Rainbow Falls is a hiking-only trail. Much erosion along Rainbow Falls Trail, from the trailhead to the falls, also occurs off of the established tread because hikers have made shortcuts between legs of the trail. Two sections of the AT also have greatly eroded tread: from Newfound Gap to Ice Water Springs shelter, and from Clingmans Dome to Silers Bald. Another section of the AT, from Miry Ridge to Spence Field, contains several particularly deteriorated segments, especially near Thunderhead Mountain. Horse riding has been prohibited for about 20 years on the AT's currently most damaged sections, with the section between Russell Field and Spence Field the

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Table V Presence and Condition of Tread Drainage Features on Park Trails.

Category and Effectiveness	Assessment total[1]	Percentage of Category Total	Density per mile[2]
Drainage Dips			
Effective	837	20%	3.05
Partially Effective	1522	37%	5.68
Ineffective	1778	43%	5.99
Total (drainage dips)	4,137	100%	14.72
Water Bars (both wood and rock)			
Effective	1671	44%	4.67
Partially Effective	891	23%	2.52
Ineffective	1242	33%	3.40
Total (water bars)	3,804	100%	10.59

[1] Based on 328 miles of trail (41% of the Parks formal system). The current report assumes that figures in the table shown here represent 30%-50% of the figure expected for the Parks entire system, and that indicator values for the full system are between two and three times the total figures shown here.

[2] Approximately 1 water bar or drainage dip occurs every 209 feet on the trails surveyed and 1 effective drainage of either type occurs every 684 feet.

Source: Marion (1994).

Trillium Gap Trail, and the Appalachian Trail from Icewater Spring Shelter to Newfound Gap. Of these trails, only Trillium Gap is maintained for horse riding and, even there, the frequency of horse riding is low because, in part, parking for a vehicle with a trailer is often difficult to find. Exposed roots often occur when a trail is not properly benched into the side of a slope during construction, meaning that it was not dug into the slope enough to provide a wide and stable tread. Alternatively, exposed roots may appear if a trail's tread slumps down a slope for one reason or another.

Relational analysis shows that root exposure is associated with the trail's popularity (number of people per day) and is less likely to be found on trails located along drainage bottoms. Proper trail construction and maintenance can eliminate root exposure, although this means cutting roots to establish a properly wide tread. In most cases, cutting roots to install or maintain a tread will not harm trees to the point of killing them. If an area is considered sensitive to removing roots,

one may decide either to relocate the trail tread to an alignment requiring less construction or to elevate it on sections of boardwalk, turnpike, puncheon, or bog-bridges. These techniques are reviewed in trail maintenance guidebooks. Individual visitors can help by staying on intended treads and by letting Park employees know if a section of tread has begun to slump.

Wet soil is also common, with 11.3 miles of the surveyed miles affected. On a trail tread, such soil is a problem because it is easily damaged or churned to mud. Also, some people tend to go around muddy areas, although doing so easily leads to more mud and makes the tread wider than intended. Extreme cases of muddy soil can be 50 feet long, 15 feet across, and 2 feet deep. Occasionally, cases of wet soil located separately along a trail can occur quite close together and produce an even more magnified perception of mud. Muddiest trails include Long Bunk and Little Cataloochee, both in the Cataloochee area. Overall, the Cataloochee area contains exceptionally high amounts of wet soil. The Park receives consistent complaints that refer to wet soil on Russell Field Trail in the Cades Cove area, although Marion's (1994) report shows other trails as more problematic. The discrepancy between the complaints and Marion's (1994) report may stem from, on the one hand, a concentration of problems around where several reconstruction efforts have recently occurred or, on the other hand, the trail's popularity.

Relational analysis suggests that increased maintenance, relocation away from drainage bottoms, or decreased amounts of horse riding will reduce wet soil. Again, this finding is supported by trail maintenance guidebooks, referenced earlier, and other trail assessments (McQuaid-Cook 1978; Summer 1980, 1986; Whittaker and Bratton 1978). Informing visitors to remain within the intended tread and to expect some muddy sections may lead to fewer new incidents of excessively wide, muddy sections of trail.

Water running on a trail, as opposed to across a trail, also presents problems because running water can erode soil and, as with wet soil, some people will go around these areas. Walking outside an established trail tread will cause the tread to widen. In some extreme cases, a trail section is indistinguishable from a streambed. Trails with the most frequent occurrence of this problem are Fomey Ridge and Little Cataloochee, although several other trail sections also are nearly creek beds, including a section of the Lakeshore Trail known as Pinnacle Creek and sections of Indian Gap Trail, Jonas Creek Trail, and Enloe Creek Trail. Because of the Park's topography, trails often are located along streams. Trails most likely to have water running on them are in the Oconaluftee area.

More frequent drainage installation, careful drainage placement, and increased maintenance of those drainages can reduce or eliminate the problem of water running on a trail, as discussed in trail maintenance guidebooks. Extreme cases, however, may require relocation of the trail.

Trail with multiple treads is another problem in the Park, although the total lineal distance is not great (6.4 miles, 1.8% of total miles assessed). A trail section with multiple treads is a problem because it represents significantly greater width than sections of trail before or beyond the location, and greater width than when the trail was constructed. Multiple treads commonly occur where people, whether hiking or riding, perceive the trail's condition as a problem and leave the intended route so as to avoid that problem. Additionally, especially in open areas, people walking or riding two or more abreast may produce multiple treads. Sections of trail with

multiple treads are most frequent on Rainbow Falls Trail and Lead Cove Trail, and generally most common in the Cataloochee area.

Relational analysis shows that the problem of multiple treads is associated with wet soils, excessive tread grade, greater amounts of horse riding, and trails positioned on lower slopes. The problem may be addressed by installing or more frequently maintaining tread drainages or otherwise addressing reasons people leave the intended tread. In addition, informing people that walking or riding abreast leads to problems may promote greater tendency to stay within the intended tread. Prohibiting horse riding on trails with this problem is another potential solution.

Marion (1994) also provides an assessment of current design and maintenance conditions of backcountry trails. One of the more important design features to **assess** is **trail grade (see** Figure 4). A trail's grade refers to its angle of climb or descent expressed as a percentage ratio. In many places, a grade of more than 15% leads to problems. To simplify assessment procedures, Marion (1994) instructed surveyors to assess as excessive all trail sections with a grade greater than 20%, a lenient value. Nearly five miles of the Park's trail system exceed 20%, revealing sections where tread construction likely is very important, and, in some cases, relocation should be considered.

Marion's (1994) trail assessment procedures intentionally do not assess the presence or effectiveness of every possible trail reconstruction technique. This is because the assessment reviewed current conditions, not potential conditions. Unless a particular trail construction technique appeared frequently on the trails surveyed, the assessment would not reveal its effectiveness. Several techniques, described in various trail maintenance guidebooks, likely would alleviate trail problems as well or better than the options Marion (1994) revealed through statistical analysis of his available data.

Tread drainage is one category of tread maintenance that is both essential for a stable trail and relatively easy to assess. As shown in Table V, many more drainage dips are ineffective than are effective. Ineffective water bars also occur in great numbers. Because drainage items are needed fairly uniformly on trails, this document assumes that the 41% of the system assessed during Marion's (1994) study represents 30%-50% of the necessary drainages. Assuming this estimate is correct, it means that, for any category, the value for the entire trail system may be between two and three times (200%-330% of) the reported value shown. For the trails that were assessed, an average of one drainage occurs every 209 feet and one effective drainage occurs every 684 feet. These values do not reflect whether a sufficient number of drainages exist because surveyors were not assessing where additional drainages are needed. It is common for some fairly long stretches of trail to require only infrequently installed tread drainages, especially if the trail is well built. During this current project, however, an informal survey of ten trails occurred. The trails were selected because Marion's (I 994) report identified them as having problems. That informal survey showed that sufficient tread drainage is very often lacking and that the lack of drainage is often associated with tread problems.

A central need for Park trails is more frequent drainages, improved construction of those drainages, and reconstruction and continued maintenance of existing drainages. The severe topography, high amounts of annual rainfall, and large number of visitors will constantly combine

to stress any efforts to drain the trails. Increasing the number, type, frequency, and maintenance of drainages is necessary to protect the Park's trails from damage to natural and historic features, loss of trail quality, and loss of opportunities for visitors to find enjoyment.

Backcountry campsites and shelters

Opportunities provided by the Park's backcountry setting also depend on backcountry campsites and shelters. A related component of the backcountry trail system is the network of designated camping areas and shelters (see Table VI). That network facilitates overnight backcountry visits and protects Park contents by requiring that visitors camp in designated areas. Some exceptions apply (Appendix A explains applicable regulations), but nearly all backcountry camping occurs in these areas. There are 83 designated backcountry camping areas. For lack of a better definition, a camping area means a location marked on the Park maps and in whose general vicinity visitors are required to camp. Of those 83 camping areas, 15 are rationed, meaning no more than a fixed number of campers are allowed at any one time. Rationing is accomplished by a backcountry reservation system handled by the Ranger Division's Communications operation. Horses are allowed at 49 of the 83 areas. Horses are prohibited at camping areas located along trails constructed only to accommodate hiking. Most backcountry campsites are found below the 3,000 foot elevation, although there are exceptions including several over the 5,000 foot elevation.

There are also 18 open-faced camping shelters in the Park, including 13 along or associated with the AT. A total of 214 bunks are available at these shelters. Of the shelters, horses are allowed at 13 of the total number and 9 of those on the AT. Most shelters are found above the 4,300 foot elevation and have chain-link fencing across the open face to keep out black bears.

Background. The intention of a designated campsite system is to concentrate visitor activities so that the effects of those activities also are concentrated. Concentrating camping at designated campsites protects areas of the Park where camping is not allowed. In contrast, a dispersal camping policy, when applied strictly, requires people to camp where no previous camping has occurred so as to spread camping as lightly as possible across the entire area. A third alternative is at-large camping. Under an at-large policy, people camp wherever they wish.

Currently at the Park, the actual policy in effect is more akin to concentrated at-large camping because no specified camping sites exist within the camping areas (Marion forthcoming). People are required to camp in a general area, but within that area they can disperse. This can lead to problems separating campsites within a camping area from sites where previous campers have deposited their personal waste. In addition, such a policy can lead to more disturbance associated with camping than other policies. And, such a policy is difficult to enforce because a visitor can easily stretch the camping area's informal boundary.

Vehicle-accessible horse rider camps, commonly called horse camps, also are a component of the Park's network of backcountry camping areas. The primary reason for any horseback rider staying at one of these camps is access to the backcountry trail system. This distinguishes the horse camps from other developed campgrounds in the Park where access to the trail system is not necessarily a reason for visiting. These horse camps, therefore, are a component of the backcountry trail and camping system although they are located in frontcountry areas and provide

Table VI Great Smoky Mountains National Park Backcountry Campsites and Shelters.

Backcountry Camping Area Category	Total Number for Category	Percentage of total
Designated camping areas	83	100%
Rationed	15	18%
Horses allowed	49	59%
Rationed and horses allowed	8	10%
Number of campsites (total)	309	n/a
Undesignated (illegal) campsites	68	n/a
Shelters	18	100%
Rationed	18	100%
Open to horses	13	72%
Number of bunks	214	100%
		Capacity (people, horses)
Vehicle-access Horse Camps	5	(120,120)'
TN camps	1	(12,12)*
NC camps	4	(27,27)**

Total capacity.
Average capacity.

Sources: Marion (forthcoming) and 1994 Park Trail Map.

rustic accomodations such as horse stalls, toilets, and trailer-access. Five camps exist. Four are located in North Carolina and have an average capacity of 22 people and 22 riders. The fifth camp is in Tennessee and has a capacity of 12 people and 12 horses. No assessment of these camps has occurred that is comparable with assessments of backcountry campsites and shelters.

Conditions. Marion (forthcoming) provides the most recent assessment of backcountry campsite and shelter conditions. That work inventoried the physical effects of camping by applying a standardized set of procedures that are repeatable in the future. Careful procedures allowed surveyors to distinguish campsites from each other. The assessment does not capture the structural integrity of shelters, but it does capture the individual and cumulative condition of backcountry campsites, including soil and vegetation, location and description, and total area.

There are 309 legal and distinguishable campsites among the Park's 83 designated camping areas. Another 68 undesignated campsites also exist. An average of 3.8 distinguishable campsites are found at each designated camping area. One camping area has 12 separate campsites. Obvious erosion occurs on 13 campsites (4% of the total) and bare soil is widespread at another 114 campsites (29%). The typical campsite has lost much of its vegetative cover, is mostly covered by pulverized organic litter, and has bare soil limited to its core area. The area of one extreme campsite is 23,948 square feet, equivalent to a square with sides 155 feet long.

Of the shelters or legal campsites associated with designated camping areas, most campsites are located within sight of a trail (60% are within 25 feet). Also, many campsites are located within sight of other ones (47% of sites are visible from two or more other campsites). Of the designated, rationed camping areas, a typical associated campsite has an area of approximately 1700 square feet that includes 650 square feet of lost groundcover vegetation and 850 square feet of exposed soil. A median is the value separating the total number of campsites in two, meaning that 50% of the sites fall above and below this figure (this is not an average or mean of all values). Of the designated, unrationed camping areas, each associated campsite has contains approximately 900 square feet that includes 520 square feet of lost groundcover vegetation and 470 square feet of exposed soil. However, for all campsites, visibly damaged trees are rare (median <1) and the typical campsite has only a single firesite (median value).

Opportunities: Issues and Concerns

The Park's backcountry setting provides opportunities for people to enjoy it and the opportunities are assets of the backcountry area. Protecting the setting while providing opportunities for enjoyment requires stewardship such as management actions, informational materials, or maintenance efforts. At times, opportunities may be limited by stewardship efforts, such as restrictions, although the limitation is typically intended to offset problematic effects associated with those opportunities.

If a person responds negatively to a setting's condition or a steward's action, one may categorize the response as either an issue or a concern. Typically, two or more parties disagree over an issue, while two or more parties share a concern (Blahna and Yonts-Shepard 1990). It is possible for two parties to share a concern that a third party considers an issue. It is also possible for two parties to share a concern, yet disagree about a detail, making the detail an issue. For example and speaking generally, horse riders and hikers are concerned about the Park's trail conditions and seem to agree that trails need improvement. Sometimes, however, an issue arises when members of one group disagree with those of the other about whether a particular condition

is a problem and at what point it qualifies as a problem Not every issue is a problem, however, because differences can also present possible solutions.

Assessing whether the setting's condition agrees with Park mandates requires, among other sources of information, an understanding of visitors' responses to the setting and its opportunities. Visitor responses alone, however, are not a sufficient measure because they must be reviewed in light of Park mandates. Without the guidance of mandates, there can be no continuity or consistency in Park administration. Nevertheless, if a visitor's response fits within the inherent flexibility of Park mandates, then that response helps Park staff members and others decide whether the Park's conditions are acceptable. This is especially true when the responses of many visitors are considered together.

Visitor responses also allow one to consider the effects on opportunities of either existing or potential stewardship efforts. This is an important piece of information. Without it, one is unable to understand the effects of existing efforts or to consider comprehensively the possible effects of various alternatives. By listening to visitors explain how they respond to the setting's contents, character, and opportunities, one better understands what is important about the Park. Extending that discussion to include their ideas about existing problems and ways to address those problems, one better understands what is workable.

Opportunities are often assessed with social science techniques from the fields of psychology, sociology, or management. One means for assessing opportunities is to ask people for their reactions to the Park, its contents, other visitors, and administrative actions. Typically, a researcher employs a survey instrument to characterize visitors and their responses, although qualitative assessment of interviews is becoming more common as another technique for pursuing detailed understanding of selected issues.

No recent social science survey of backcountry visitors is available for the Park. A survey was completed in 1993, but has not been submitted to the Park nor reviewed by other social scientists. Therefore, it is incomplete and unavailable for this project. In lieu of the information collected through such assessments, it remains necessary to understand what people think about current conditions.

During discussions that occurred as part of this project, several hiking or horseback riding organizations offered their comments during meetings or through letters or telephone calls, as did many conservation organizations, Park staff members, and other people who expressed an interest in the Park's backcountry or trails. From the fall of 1994 to the spring of 1995, several newspaper articles addressed this project and its issues. Some people, after seeing this coverage, contacted the Park to offer their opinions. The opinions reported with this document do not represent results of a survey. Also, other issues and concerns likely exist beyond those communicated to this project.

Because no scientifically designed survey was completed, no effort is made to apply statistical analysis or derive the number or percentage of individuals associated with any particular opinion. Instead of focusing on characterizing those people who have concerns, this project focuses on the concerns alone. The information is anecdotal; yet, it also is very helpful because it highlights issues and ideas that might not otherwise be considered. In the presentation that follows, the

comments are grouped into topics and subtopics. They are not ranked or treated according to who or how many people mentioned the concern.

Generally, there are five broad groupings of people who care about the Park. These groups are NPS staff members, general Park visitors, hikers, horse riders, and conservation organization members and staff. Within each of these groups, there are some people who live locally and others who do not. These groupings are broad categories and, therefore, each group is quite diverse, although the degree of diversity likely varies. There is also some overlap between the groups because they are comprised of some people who are interested in several activities or are involved with a conservation organization and an activity-oriented organization such as a riding or hiking club. Because no available and current survey characterizes these groups well, none of the following discussion reflects group characteristics. Only the concern itself is emphasized.

Setting Conditions

Backcountry stewardship requires understanding the opportunities provided by the setting, as well as understanding unsatisfied or lost opportunities. Issues and concerns about Park conditions generally fall into one of three categories. Trail condition is one category, campsite and shelter condition is another, and trail system contents is a third.

Trail Condition. Trail conditions directly and indirectly affect opportunities for enjoyment. Visitors find the quality of a trail lessened by conditions they consider poor, although different visitors may disagree about whether a particular condition is substandard. Similarly, visitors may perceive conditions as lost opportunities for future enjoyment by others. Unsafe conditions can directly detract from enjoyment, especially if one is injured, and they can indirectly detract from the quality of a visit if one's worries about personal safety cloud one's perception of Park wonders.

Comments about trail condition include those that address either the presence of physical conditions or the absence of constructed or engineered conditions. Most comments about trail condition qualify as concerns because widespread agreement exists that particular conditions are undesirable and, therefore, problems. One concern is excessively **wide trail tread,** as when multiple treads occur or when people walk or ride around some difficult section. Another is the presence of **mudholes,** often associated with excessively wide trail tread. Many people-- horse riders, hikers, and Park personnel-- agree that mudholes should be prevented and, where they exist, the trail reconstructed. In contrast, another concern is that some locations have **insufficient tread width,** as may occur where vegetation encroaches on the corridor, where the tread bench has slumped below its original location, or where soil has slumped onto the trail bench from above. **Steep, undrained gullies** are also a common concern. Where they occur, relocation or reconstruction often is necessary. **Switchback shortcuts** are another concern because the shortcuts are scars that detract from a trail's quality and they allow water to run down steep slopes and erode soil or even wash-away trail tread.

At issue among some people is **the presence of horse manure.** Some people, usually hikers, find trail conditions and their enjoyment lessened by horse manure, but other people, usually horse riders, find trail conditions unaffected by manure. A related issue is **horse urine in mudholes.**

Some people are greatly bothered when they must traverse a mudhole that has manure and urine plainly evident. Other people are not bothered at all. People participating in discussions related to this project offered several opinions to explain this difference. Part of the difference in opinion may relate to an individual's proximity to the mudhole. Hikers must walk through or next to the mudhole-- with its smell and flies more immediate-- while horse riders are elevated above the mud by their horse. On the other hand, part of the difference in opinion may relate to the individual's experience with stock animals and corrals.

Although many people believe that the Park's backcountry should challenge people and that one challenge is the experience of crossing unbridged streams, a common concern is that several streams have **unsafe stream crossings** and need a bridge. These include the Hannah Mountain Trail across Abrams Creek, the Little River Trail across Little River, and the Goshen Prong Trail at Little River Ford. The **absence of tread engineering,** especially what is called *tread hardening* or *tread elevation* is another concern. Tread engineering refers to major construction or reconstruction, as opposed to intermittent installation of drainage or other items. Tread hardening in a backcountry setting does not involve paving or asphalt. It does include actions such as replacing muddy soil with rocks or gravel and properly draining the location. This concern is related to the physical condition of trails because a well constructed trail will have necessary tread engineering items and few mudholes, gullies, or excessively wide sections.

Campsite and Shelter Condition. Opportunities for enjoyment are influenced by campsite and shelter condition, sometimes even if one does not stay the night. The presence of unexpected conditions or the absence of expected conditions can detract from the quality of one's visit and reduce one's enjoyment of the Park.

Comments about backcountry campsites and shelters involve location, condition, and visitor behavior. Concerns about the backcountry reservation system are discussed under the heading of *Management* because it is a function of NPS administration. A concern about location that is associated with condition is that **some campsites are too accessible.** Examples of this include Ledbetter Ridge (#10), West Prong (#18), Pretty Hollow (#39), Lower Chasteen Creek (#50), Mount Collins Shelter, and Kephart Shelter, although relocating or removing any one of these sites may not eliminate camping at its existing location.

Several concerns related specifically to horses at campsites and shelters. The concerns are **riding gear (tack) inside shelters, the condition of hitch racks,** and **horse manure in the immediate area of a shelter,** as may occur when a horse is ridden or led to shelters for loading *or* unloading. Some of these concerns are related to **unpleasant smells.** Several of these concerns are also associated with **the location of hitch racks.** Riders need to tend their horses when they are visiting a shelter, but some hitch racks are located too far from a shelter to allow for this. Another concern associated with horse riding is **the introduction of non-native plant species** to the camping area.

Other concerns treat horses and hikers similarly. For example, **accumulation of horse manure or human waste** in or around campsites, and **pollution or disturbance of water sources** whether by horses or people, both are common concerns. The conditions that lead to these two concerns affects opportunities because health and aesthetics are potentially threatened.

A specific concern addresses the January 1994 **closing of Ice Water Springs shelter** on the AT. Because of its proximity to Newfound Gap, the shelter consistently attracted more people than it can accommodate. Without it, however, long-distance hikers must travel 15 miles between Mount Collins and Pecks Comer shelters because no alternative camping opportunities are available.

Trail System Contents. Opportunities for enjoyment are perhaps most influenced by the available contents of the trail system, as represented on official trail system maps and by Park regulations. If one wishes to pursue an activity without being bothered by the effects or presence of someone pursuing another activity, the contents of the trail system determines the possibility of realizing this wish. Likewise, if one wishes for complete freedom to go to a particular place in the Park, the design of the system determines whether this wish is realistic.

Concerns about trail system contents either related to trail purpose, trail system design, or trail denotation. The **designed purpose of trails** is a central concern for this project because, in numerous locations, current type or amount of activities exceeds a trail's design capacity. Redesign and reconstruction of trails where problems exist must occur, or changes in the activity type or amount must occur. In some cases, designation of a trail as horse trail or hiking trail occurred without concern for the trail's existing design or construction. This approach to trail designation has contributed to current problems. A related concern, therefore, is **the need for established criteria for designating trails.**

Trail system design concerns typically relate to trailhead access, intersections between public trails and concessionaire trails, and the distribution of trail mileage between different activities. Consideration of the latter concern is most difficult. Approximately seven times more hikers than riders visit the Park (see Table I), yet horse trails account for 65% of the trail mileage. On the other hand, an average horse can cover about twice the distance as an average hiker per day, and all trails (100%) are available to hikers, not just the 35% designed and maintained expressly for that activity.

Trail denotation refers to special route names, such as the Appalachian Trail (AT). Two concerns exist. The first is that **the denotation of the AT** along the Park's primary ridgeline poses a conflict for some hikers and some horse riders. Both hikers and riders enjoy the opportunities provided by a ridge trail, regardless of whether the trail is designated the AT. Some hikers, however, believe horses should not be allowed anywhere on the AT, an interpretation that disagrees with the AT legislation (National Trail System Act, P.L. 95-625). interestingly, because some hikers are most concerned about AT principles, while most riders are concerned about access to the ridge-- as opposed to riding on the AT-- the difference presents an opportunity for solving the issue by realigning or redesignating the AT, perhaps off of the ridge if necessary. Another possibility is to construct a new trail designed for horse riding and that parallels portions of the existing AT.

The second concern is that **two new denotations are available** to overlay existing denotations and that **this project should consider them.** The two denotations are the Benton MacKaye Trail and the Mountains-to-Sea Trail. In either situation, the proposed new denotation would not alter

existing trail administration efforts. Essentially, these denotations are co-alignments, not re-alignments or re-denotations.

Stewardship Activities

Backcountry stewardship, like broader Park stewardship, requires actions that give care to the setting so as to provide opportunities for enjoyment. Concerns about stewardship fall into three broad categories: Park administration, visitor information, and maintenance. Park administration is treated as a topic distinct from maintenance activities or programs, although there is overlap. Concerns under the heading of Park administration include administrative policy, regulations, and public participation. Visitor information is treated separately from Park administration in order to highlight *information and education* as a management tool separate from *visitor regulation* or *resource maintenance.* Maintenance refers to programs and activities that give direct care to backcountry trails, shelters, or campsites.

Park Administration. Concerns about Park administration range from philosophical to practical. The large number of concerns about Park administration reflect the interest of outside individuals and organizations. It also shows the willingness of Park staff members to think critically about their own operations and how those operations affect the backcountry's setting and opportunities.

One concern addresses **the direction of this project** and is related to **the direction of backcountry management** efforts. Some people worry that this project or other backcountry management efforts may over-emphasize conservation, while other people worry about too much emphasis towards promoting recreation. This philosophical debate between promotion and protection is at the heart of the NPS Organic Act, written 80 years ago, and central to discussions now occurring throughout the United States. To address this concern, this project brought people with opposing viewpoints into a discussion about the project's philosophical direction. The result is a set of materials referred to as the Vision Statement material. This set of material spells out the vision, priorities, goals, and objectives that follow from this effort. It is found later in this document and forms a substantial component of this project's recommendations.

Two concerns are related to a more general need for **inter-divisional coordination of backcountry** efforts. Each Park operational division has responsibilities in the backcountry. Coordinating efforts to fulfill those responsibilities is important for consistent Park administration.

The first related concern is **the role, function, and membership of the Backcountry Use Committee.** The committee is the Park's only inter-divisional, cross-operational backcountry management effort, yet it remains unclear whether Park staff members will work with the committee or around it. Also, there is some overlap between the Backcountry Use Committee and the separate AT Management Committee. Finally, no opportunities exist for members of the public to participate in any of the Backcountry Use Committee's deliberations.

The absence of a position dedicated to backcountry management is another concern associated with coordination. As with the Backcountry Use Committee, such a position could integrate and facilitate the Park's backcountry operations. Although the Backcountry Use Committee currently fulfills this role, there is a concern that specialized expertise in backcountry

management remains absent despite the many Park staff members who work in backcountry operations. Without a position description containing direct responsibility for backcountry management, the Park's trails and backcountry are quite dependent upon the willingness of the Chair of the Backcountry Use Committee to shoulder additional responsibilities. A directly related concern is **whether a position dedicated to backcountry management is feasible and realistic in the current federal budget situation.**

Several concerns relate to trail management and two predominant concerns address horses. One is **a perception that a movement exists to eliminate horseback riding from the Park.** Another concern questions **the appropriateness of horseback riding on the AT and in the Park.** Together, these two concerns are the most divisive. It is the opinion of this document that both stem from misunderstandings and some degree of self-interest. For example, some people would like to see horses prohibited because, in large part, they attribute poor trail conditions solely to horseback riding or they mistakenly believe that the Park's soils are too highly organic to support horse riding. Other people would like all trails open to horseback riding because, in some cases, they believe trails are interchangeable, that designation can occur separate from design and construction, and that concerns about horse manure are unrealistic. Every one of the previous comments was heard during this project. Yet, both lines of argument, as shown throughout this document, over-simplify the situation. On the one hand, horseback riders must recognize the greater effects on trails of horses and take responsibility for helping to offset those effects. On the other hand, hikers and others who suggest horse riding is inappropriate in the Park must recognize that greater trail maintenance capacity would alter the situation, perhaps dramatically. It is the opinion of this document that dramatic restrictions are unjustified until all alternatives have been exhausted.

One concern that is also **an** issue is the **disproportionate effect on trails of horse riding.** Some people do not accept that, compared to a hiker, a horse more easily damages a trail; other people believe that the disproportionate effect is justification for restricting or prohibiting the activity. Horses unequivocally affect trails greatly, especially particular segments of trail. Nevertheless, improved trail construction, selected relocation of some trail segments, and an increased maintenance capacity can offset this concern, at least to some degree. That is the direction of this work.

Related to the previous concern about the direction of this project, some people are concerned that **any administrative strategy built around increased maintenance is unrealistic.** They believe that the current budget situation and the mood in Congress makes such a direction foolish. They believe the direction to pursue is to reduce maintenance demands by reducing or eliminating horse riding as an acceptable activity along some or all formal Park trails.

Another concern about trail management is that **some trails are closed unnecessarily.** For example, some Park staff members have sought to close trails according to their own interpretation of GMP directives, believing that increases in trail mileage must be offset with closures elsewhere to retain a 19751976 level. As discussed earlier, such an interpretation of the GMP is erroneous. In addition, **some spur trails have been closed** in the belief that they are difficult to maintain because they require a maintainer to cover the same terrain twice. However,

there are only two types of trail maintenance: 1) seasonal patrolling, and 2) construction or reconstruction. Reconstruction efforts typically require travelling the most direct route into and out of a work site, so a circuit route is unimportant. **A** larger number of volunteers is available for seasonal maintenance, so NPS crews should not have to perform as much of the seasonal clearing that requires travelling circuits. Therefore, closing spurs simply because they are spurs is no longer necessary or justifiable. If, on the other hand, the condition of the spur trail is extremely poor or there is no attraction for visitors, then the trail should be considered for closure.

Some trails are simply closed administratively, as opposed to eliminating the trails on the ground. If a trail is justifiably deleted from the official system, then it should be eliminated physically, too. Otherwise, visitors may become confused, lost, or injured, and, as they continue to travel the trail, will keep the reason for closing the trail a continuing problem.

Similarly, **the contents and status of the formal trail system** is a concern. Although Park staff members maintain an accurate list of formal Park trails and their mileage, no single listing of official trails, their mileage, and their characteristics is maintained. Categorizing trails according to the type of activity, level of maintenance, amount of visitation, and other qualities is a helpful exercise that should be completed and then updated. as appropriate. Such a system does not exist in the Park; yet, it could be an important management tool that would facilitate maintenance of the formal system and reduction of the informal system.

Related to questions about closure and system contents is a concern that **a process is needed to select actions for maintaining, reconstructing, redesignating, or closing trails.** Currently, little documentation occurs to illustrate work needs and alternatives. Prescriptive worklogs, described earlier in this document, provide an important means for compiling this information, yet they require the time and expertise of someone with broad trails experience. In addition, they must be transcribed and presented. Such worklogs, however, provide a means for establishing priorities for completing projects and selecting alternatives from well documented options.

Some people asked about **seasonal closures or restrictions** as an administrative alternative to closing a trail to some or all activities. Unfortunately, such an option is unlikely to work. Compliance and enforcement would be difficult to ensure, although not necessarily impossible. One argument supporting such an idea is that a trail might recover from the effects of previous activities. Technically, this is referred to as a rest-rotation scheme. While an intuitively appealing notion, the scheme does not work in practice because trails are harmed at a faster rate than they recover without assistance, meaning that a trail would have to rest for many years for every year it is open. A better alternative is to assist trail recovery by proactively repairing the problem and installing construction that prepares the trail to support all-season activities wherever possible, especially on trails that are popular year-round.

In some cases where seasonal closures presently occur, concern exists that the closures eliminate too many opportunities. Specifically, **seasonal closure dates of horse camps** is a concern. Horse camps are closed on a schedule that coincides with all other frontcountry campgrounds, with the exception of some campsites that are open year-round. According to the campsite schedule for 1995, 106 of 954 frontcountry campsites (11%) are open year-round. Apparently, the horse camps are closed during some prime riding periods (late spring and late

fall), yet the camps are open during what some riders consider poor riding periods (apparently, in this area, two of the hardest things on a horse are yellow-jacket stings that can send an animal out-of-control and excessive heat, both of which are common during July and August). However, early spring and late fall. are commonly periods of the year when soil is more wet and, therefore, most susceptible to damage. In addition, spring is when new vegetation growth occurs and is easily damaged or destroyed if people or horses go outside the intended tread to avoid a muddy section. The 49 designated backcountry camping areas usually available to people with horses remain open year-round.

A concern related to campsite and shelter location is **the lack of high-elevation campsites (non-shelters).** Currently, camping along the AT is restricted to shelters. In places other than along the AT, shelters are less common, and most camping areas are at lower elevations along drainages. Work by Bratton and others (1978a,b,c) led to restrictions on high-elevation camping that are still in effect. Justification for the restrictions is that shelters provide the best means of concentrating visitor activities in sensitive areas and that high-elevation areas are quite susceptible to damage. High-elevation areas that have sparse overstories and a predominance of grasses among the understory may not be as susceptible to damage as many people presume (Marion forthcoming). Nevertheless, concentration of camping activities remains an effective method of reducing the effects of camping in popular areas.

Several concerns relate to **backcountry and Wilderness management.** A number of people indirectly or directly expressed confusion about **formal Wilderness status** and its implications, in particular some people are concerned about **the appropriateness of various management responses to** issues **or concerns.** The discussion of Wilderness and the minimum-tool principle, found earlier in this document, is intended to provide information related to this concern.

An over-riding concern is **assessing whether trail conditions are improving or decaying.** Unless people agree on the means to assess trails, they are far less likely to agree with the results. Decision-frameworks, such as those called *Limits-of-Acceptable-Change* (LAC) or *Visitor Experience and Resource Protection* (VERP), are available to guide people through the process of assessing Park resources in a participatory manner. One result of an LAC process is that acceptable conditions can be defined objectively, as opposed to the more divisive, subjective definitions commonly available. *A monitoring program* is an essential component of an LAC process because it is the means to assess trail and campsite conditions. Marion's work (1994 and forthcoming) furnishes initial material for such a program, although the trail assessment project was not designed as long-term monitoring program and may require some modification.

Related to Park management and decision-frameworks are several concerns connected to **public participation** in Park stewardship efforts. One concern is that **there is a real or perceived lack of partnerships between the riding and hiking communities,** despite past work between the Smoky Mountain Hiking Club (SMHC) and Smoky Mountains Trail Riders (SMTR) and more recent work between Backcountry Horsemen of North Carolina, the Appalachian Trail Conference, SMHC, and SMTR. Although rapid change is occurring, the breadth and depth of that change can expand greatly. Another concern is that **there is a lack of public participation in Park management** efforts. This is related to a concern that **too much public participation**

without someone designated to facilitate the interest might frustrate NPS efforts to accomplish work. Both of these last two concerns are associated with a need to **attract** and **retain commitment of private individuals and organizations as Park stewards.** The Park's backcountry trails, shelters, and campsites require work that exceeds the current capacity of the Park's maintenance program. Completing the needed work also requires funding that overburdens the current Park budget.

Some people are also concerned about **the Cataloochee Ranch and its operation's effects on trails in the Cataloochee area.** Cataloochee Ranch is located outside of Maggie Valley, NC. People not involved with the Ranch are concerned that the Ranch runs such a number of horse rides into the Park that damage to trails is occurring that would not otherwise exist. Ranch operators are concerned, likewise, about ensuring that they do whatever they can to offset their operation's effects on the Park, including working on trails and clarifying the formal relationship between their operation and the NPS.

Visitor Information and Education. An important function of Park management is informing and educating visitors. A well-informed visitor is less likely to aggravate an issue or concern and more likely to act as a steward who understands a Park's purpose. Opportunities to enjoy the Park without compromising it depend often upon the contents and accessibility of information.

Informational and educational programs are topics of concern, including **accessibility of information, distribution of information,** and **format of information.** Specifically, there is a general concern that many visitors may miss some important information because they avoid busy locations such as visitor centers, backcountry permit centers, and other places where Park information is distributed. This is especially true if the method for distributing the information requires face-to-face contact between a visitor and a Park employee. A portion of the backcountry's problems may be related to some visitors not realizing the implications of their actions. Targeting backcountry visitors is an important function of visitor information and education efforts.

There are concerns about the **coordination of the Park's map and sign system,** an essential informational tool. The Park's Backcountry Use Committee has a subcommittee dedicated to signs. In the last several years, the Backcountry Sign Committee has instituted a three-year sign inventory and replacement cycle. The objectives and details of the system are explained in the Backcountry Management Plan (GSMNP 1993). Some of the concerns appear to stem from the period prior to the institution of this system, although a current concern is the need for improved signs where concessionaire trails intersect with the formal Park trail system. Coordination of maps and signs is an ongoing, never-ending effort.

A central objective for informing and educating visitors is to promote visitor behavior that does not conflict with Park purposes. A broad area of concern, then, is **visitor behavior.** Specific concerns include **travelling in large groups, leaving garbage and litter, not complying with regulations,** and **lack of consideration for others** especially at shelters or campsites. In addition, there are **real or perceived conflicts between people,** whether they are pursuing similar

or different activities. Various individuals have described these conflicts as insufficient trust, lack of respect, or absence of common courtesy.

Maintenance. One of the more direct ways to ensure that the setting provides opportunities for enjoyment is by maintaining access to it, as with a trail program. Concerns about maintenance fall into two broad categories. The first is maintenance capacity and the second is maintenance techniques. Maintenance capacity refers to the programs and resources available to complete needed backcountry work on trails at overnight areas. Maintenance techniques refer to work items and methods for installing those items.

The primary maintenance concern is **expanding the capacity to maintain Park trails, backcountry camping areas, and shelters.** A common belief is that the current capacity is insufficient to maintain trails so that the setting is protected and appropriate opportunities are provided. Related concerns are **increasing trail work opportunities for volunteers, obtaining funding necessary to expand the maintenance capacity, instituting expanded training programs for volunteers and Park trail crew members,** and **tracking work needs and completion.**

Coordination of backcountry maintenance is another broad concern. Connected with that concern is **setting Park-wide priorities for trail work, coordinating trail efforts Park-wide** (e.g., as opposed to only at a district-level), and **effective interaction between Park trail crews and volunteers.**

The need to apply prescriptive trail worklog techniques is a notable concern. Prescriptive worklogs are a tool for documenting work needs, scheduling work projects, or contracting trail projects. They provide a guide to field crews and allow supervisors to document work progress. Any expansion of trail maintenance programs would benefit from the application of prescriptive worklogs.

An expanded volunteer **effort** leads to a concern that **the Park's trail crew be furnished the means to work with an expanded volunteer program.** A larger volunteer program likely will place different demands on the Park's trail crew, including time and staffing demands that could require funding beyond current levels. In many ways, the Park's trail crew is the key to successfully implementing most of this project's recommendations. If the Park trail crew grows as necessary to keep pace with expanded volunteer efforts, then the entire trail program's potential will be realized.

The chief concern associated with maintenance techniques is **the lack of standards for acceptable construction techniques and items.** For example, Park staff members do not apply consistent guidelines for **operating mechanized equipment in backcountry areas.** Similarly, the appropriateness of **metal culverts in backcountry locations** is a concern. Other associated concerns include proper procedures for **windfall clearing** (e.g. removing windfall from the trail corridor), **drainage construction and clearing** (e.g. width, depth, and technique), and **brush removal** (e.g. cutting brush out of trail corridors). Another broad concern is **the** need to **apply the most applicable techniques for constructing and maintaining horse trails.** For example, turnpiking-- elevating the tread with a foundation of rocks and stones-- is nearly absent from

Park trails and corduroy-- throwing sticks and logs across a mudhole which traps water and produces organic debris-- is too common.

Several concerns relate to work schedules. **Accomplishing remote trail work** is one concern and **scheduling work seasons** is another. Many sections of trail that need significant work are located in remote areas. Efficiently completing this type of work will require spike-camps and extended overnight stays in the backcountry, as opposed to day-trips. Work seasons refer to periods when trail work is accomplished. In the Smokies, August and July are the hottest months, but winters tend to arrive late and leave early. This weather pattern suggests that fall and spring are good times to complete trail projects, especially remote ones, because drinking water is more plentiful, and heat, foliage, and yellow-jackets are less. Another scheduling concern is associated with **the need for Park trail crew members to be responsive to volunteers' schedules.** The Park's trail crew has begun scheduling weekend projects to accommodate the availability of volunteers. Such scheduling needs to continue. In addition, **volunteers need to be responsible for productively using the trail crew's time** by arriving promptly and working diligently.

Summary of issues and concerns

In general, a widespread perception exists that there are problems on trails and at backcountry camping areas, although there is also some disagreement about the specifics of particular problems. The perception agrees with that of many Park personnel. The NPS, however, is not presently prepared to complete all the necessary work or to address all existing concerns. Congress is unlikely to provide the NPS with the funding necessary to accomplish this work, given the recent mood in Congress and the scale of the Park's needs. With assistance of others acting as stewards, however, attempting the job becomes realistic. In accepting that assistance and generating more public interest in providing that assistance, preparation is required on the part of the NPS and other cooperating organizations. That preparation includes structural administrative changes, redirection of backcountry maintenance efforts, and reconsideration of information and education materials and programs. Existing stewardship efforts must continue to expand along with the resources necessary for stewardship. The bottom line is that tread drainage, a position dedicated to backcountry management, prescriptive worklogs, and an expanded trails program stand out as paramount needs for stabilizing and improving the trail system.

Stewardship Efforts

Conserving the Park's character and contents and providing for the enjoyment of future generations requires stewards and stewardship. Stewards are those who give care to the backcountry setting, its contents, and its characteristics, and work to see that the setting continues to offer opportunities for visitors to find enjoyment. Complete understanding of the current situation requires a review of existing stewardship efforts. These efforts include management, information and education, and maintenance, but these are not restricted to those of the NPS. Management encompasses administrative decisions, as well as the means of reaching those decisions. The category of information and education refers to programs and efforts to promote safe and considerate enjoyment that leaves the backcountry's character and contents unimpaired.

Maintenance, on the other hand, is comprised of the programs and techniques available for constructing or repairing trails, shelters, or camping areas.

Management

Backcountry management generally relates to recreational settings or activities, although occasionally other efforts to protect or study the setting's natural contents might also apply. **As** a category of stewardship, then, management addresses the location and condition of backcountry trails and camping areas, as well as the activities occurring on them, whether recreational or administrative.

Two administrative committees of the Park are responsible for recommending decisions to the Superintendent regarding Park trails. These are the Backcountry Use Committee and the Appalachian Trail Management Committee. Membership of both includes representatives of Park organizational divisions with backcountry responsibilities, including Maintenance, Resource Management and Science, Ranger, and Interpretation and Visitor Services. The AT Management Committee is also attended by representatives of the Smoky Mountains Hiking Club (SMHC) because they are the local maintaining club of the Appalachian Trail Conference (ATC).

The purpose of each committee is to maintain consistency in decisions and to ensure representation of various operational perspectives. Issues relevant to the AT Committee are isolated to those concerning the AT and shelters along it. Those relevant to the Backcountry Use Committee include all backcountry management issues, especially those related to trails, campsites and shelters, and information such as maps and signs. Recommendations to the Superintendent about backcountry maintenance techniques and design of backcountry engineering items, such as bridges or trail reconstruction items, typically come from this committee. Currently, there are some questions about each committee's relationship with the other because of overlap among the issues, as reviewed earlier. In addition, there are questions about the feasibility of greater, more balanced public participation in these committees.

For backcountry camping areas, as with backcountry trails, the Park's Backcountry Use Committee and AT Management Committee are most often responsible for forwarding relevant recommendations to the Superintendent for approval. Most recent management decisions regarding campsites or camping areas involve new locations, relocations, or closures of either campsites or camping areas. Information from Marion's (forthcoming) assessment is expected to provide an opportunity for additional proactive decisions about location and maintenance of camping areas or sites. Because most shelters are associated with the AT, the Smoky Mountains Hiking Club often participates in discussions about possible recommendations or decisions involving backcountry shelters.

Visitor Information and Education

An important tool available for backcountry management is visitor information and education. Visitors who enjoy trails, campsites, or shelters responsibly affect those areas in ways that require less maintenance and less frequent rehabilitation, and detract less from enjoyment by others.

Information provided to those visiting the Park's backcountry is available in several forms and through several avenues. The Park's *Interpretation and Visitor Services Division* is most commonly responsible for reviewing or producing the information and, oftentimes, for coordinating its distribution. Arriving in the Park, a visitor might go to the Visitor Centers at Sugarlands or Oconaluftee and pick up a Park Newspaper or purchase a map of Park trails (GSMNP 1994b). The newspaper is printed seasonally and contains information about Park features, possible activities, and backcountry etiquette. Other versions of maps and publications, like the Hiking Trails of the Smokies (NHA 1994), are also available at the Visitor Centers. The Park's Trail Map is available at Ranger stations throughout the Park's periphery. Backcountry Registration Stations furnish visitors with more detailed information. These stations are located at the two Visitor Centers and are staffed by volunteers who provide information about current backcountry conditions, assist visitors in completing overnight permits if necessary, and dispense tips about the Park's backcountry and trails. General information about the Park is also available at bulletin boards displayed Parkwide. Backcountry-related information is occasionally distributed through the Park's low-power, limited range 1610 AM radio transmitters, located near several of the Park's entrances. Informal contacts between visitors and Park Rangers, other Park employees, and Park volunteers is another common and important source of information for visitors. An example of a recent addition to the means for contacting backcountry visitors is the Ridgerunner program operated jointly by the NPS, ATC, and SMHC. The program consists of individuals who spend most weekends during busy times of the year hiking along the AT in the Park, contacting visitors who have questions, or informing visitors who need guidance.

Another opportunity for more focused, intensive learning about the outdoors and acting responsibly in the backcountry is available through the Smoky Mountain Field School. The program is operated cooperatively between University of Tennessee, Adult Education Office and Great Smoky Mountains National Park. Short courses ranging from several hours to several days are available on a variety of topics, including occasional courses on backcountry hiking or camping.

Efforts to furnish visitors with information tailored to backcountry activities have expanded recently. New initiatives include one originating with several conservation and recreation organizations-- ATC, Backcountry Horsemen of NC, Haywood Trail Riders, SMHC, and SMTR-- who cooperated in producing a brochure and providing it to the Park. Those groups provided the Park with brochures to distribute and are also distributing the brochure themselves, helping reach some backcountry visitors who might not otherwise receive such information. The main purpose of that brochure is to promote common courtesy between the Park's horse riders and hikers and to suggest ways each visitor can help protect its resources by acting in a responsible manner. Another new initiative-- a pamphlet-- has also been recently completed. The National Outdoor Leadership School's Leave-No-Trace office took the lead in its production, with important contributions from Park staff members and members of Virginia Tech's Forestry Department. In addition, several local riding or hiking organizations provided editorial reviews of the pamphlet's contents. Distribution of the brochure and pamphlet targets backcountry visitors, rather than the general visiting public.

One difficulty in contacting visitors who are headed to the backcountry is that many of them intentionally avoid more crowded visitor centers and other locations where information and educational materials are commonly distributed. This is a concern throughout the country, as methods and means of contacting visitors are debated along with alternatives for conveying suggestions like those of the NOLS Leave-No-Trace effort. Reaching visitors individually has proven to be effective, but the great number of people visiting the Park make this difficult. With the majority of Park visitors not entering its backcountry, targeting only those for whom the information might make a difference is important.

Maintenance

Currently, there are three separate and established efforts to maintain Park trails. One is an NPS Maintenance Division Trail Crew, another is the volunteer Adopt-A-Trail program, and the third and more occasional program is cooperative trail maintenance with external trail clubs such as the ATC. A fourth effort is starting to become established because of recent work by the Park's Trail Crew and local trail volunteers.

The Park supports two Trail Crews, one in North Carolina and another in Tennessee. In total, the NPS crew currently has 21 positions, including 2 permanent foreman positions, 9 other permanent year-round positions, and 10 seasonal positions. Each crew has a foreman and its members may break into smaller crews when working in local Park areas. Most trail work is done on a day-trip basis, meaning the crews travel to the site, work, and return in one day. Overnight and multi-day trips also occur, although much less frequently than day trips. Several backcountry facilities are available for housing Trail Crew members when working remote sites. Occasionally, the Trail Crew's members work on projects that are not oriented towards trails or backcountry, as assigned by Maintenance Division supervisors and within their job description. **A** concise handbook of maintenance techniques was produced in 1979 for the Park's Trail Crew.

A volunteer Adopt-A-Trail program began in the late 1980's under the guidance of Park Rangers. The purpose of the program initially was to provide greater presence in the backcountry by having volunteers serve as non-law enforcement contacts. The program has evolved into a effort that provides basic trail maintenance as well. In 1995, nearly every mile of trail in Tennessee has been adopted, as have many miles in North Carolina where the program is going through a period of significant growth. Approximately 180 volunteers donate their time and effort annually, although indications suggest this number will be much higher in the next year or two.

Opportunities for volunteering are expanding as a fourth type of trail maintenance program is becoming established. Recently, volunteers and NPS Trail Crews have been working more closely together, most often on the North Carolina side of the Park. Oftentimes, their efforts fall outside the existing Adopt-A-Trail program. Much of this change is due, on the one hand, to the willingness of Park Trail Crew members to modify their work schedules and, on the other hand, to the expanding participation of horse riding enthusiasts in volunteer trail work projects. For example, the Smoky Mountains Trail Riders has participated in an annual spring clean-up and rapid trail condition inventory for several years. Similarly, the Haywood Trail Riders have provided assistance to the Park for much of the last decade. In the last year, however, the number

of people and groups involved has expanded greatly, in part because of discussions occurring as part of the project that led to this document. Recent efforts include trail reconstruction along the Cataloochee Divide Trail in the fall of 1994; large-scale trail clearing and drainage maintenance during the spring of 1995; chainsaw safety training provided by the Park's Maintenance Division; installation of tread drainage on Bote Mountain Trail; replacement of the hitch-rack at Russell Field shelter; and reconstruction of two sets of horse stalls, one at Walnut Bottoms and the other at Cataloochee. Already, several hundred people have become involved, and some people have volunteered especially remarkable time and effort.

Until the spring of 1995, few recent exchanges of trail skills occurred between the Park's Trail Crew and outside organizations. Cooperative trail maintenance and skills training are offered by several external groups and organizations. Several not-for-profit organizations offer trail design, construction, and maintenance skills, and can direct those skills towards either projects or training. Examples of organizations available for such efforts include the ATC Konnarock Trail Crew based in southwest Virginia and the Student Conservation Association (SCA) Wilderness Workskills Program coordinated from Seattle, Washington. The Konnarock program is a hybrid of volunteers and seasonal employees funded jointly by the US Forest Service and ATC. Its main purpose is to provide assistance to AT maintaining organizations who face technically demanding projects. The Konnarock crew has worked in the Park several times, including during the spring of 1995. The SCA Wilderness Workskills program is designed to offer a trail skills exchange and training program that is flexible and responsive to local agency needs. The emphasis of Wilderness Workskills is on backcountry or wilderness trail work where power equipment is largely absent, although chainsaws, portable power drills and jackhammers, and other mechanized equipment has been included in various programs.

Recent discussions between SCA and Park staff members led to several Park Trail Crew members participating in an SCA training program during the spring of 1995. Park staff members also have scheduled a training session at the Park this fall that will include opportunities for volunteers to participate. These training efforts illustrate the commitment of Park staff toward the actions described in this document and their willingness to invest in trails, Park employees, and volunteers, Financial assistance for the training is being generously provided by the Friends of Great Smoky Mountains National Park.

At backcountry campsites, the Park's Ranger Division is responsible for most maintenance. Typical maintenance includes removal of unnecessary fire-rings, collection of litter and trash intentionally or mistakenly left by campers in violation of Park regulations, and general monitoring of site conditions. Because of increasing demands along roads and in other frontcountry areas, Rangers have been compelled to reduce the amount of time they spend in the backcountry. This makes efforts to maintain backcountry campsites secondary to their primary responsibilities. Currently, there is no established program to actively maintain campsites such that the effects of camping are reduced, litter and fire-rings are removed, and designated campsites are free of hazardous standing-dead trees.

Some stewardship efforts are pursued independently by cooperative organizations. One of the more exciting events and one that is likely to have long-term benefits for the Park's trails is a

pending Memorandum-Of-Understanding between several horse riding and hiking organizations who are agreeing to jointly maintain sections of the Appalachian Trail. By working together, these groups will provide an example of volunteerism at its best. With their memorandum, more horse riders and hikers can focus on trails rather than each other.

DIRECTION OF BACKCOUNTRY CONDITIONS

The mandate for leaving the Park unimpaired and enjoyable is a question of trends, as well as of conditions. A primary concern is whether current conditions represent a stable situation or one that is changing. If current conditions are part of a trend towards an increasingly changed Park setting and if that trend is related to visitor activities, then we must understand the direction of that change-- whether it is toward greater or lesser impairment, and whether any existing or anticipated impairment can be offset. We also need to understand whether the trend and any associated impairment of the setting detracts from visitors' opportunities for enjoyment.

The following section discusses how trails and campsites change over time. First, a summary is presented of the effects of backcountry recreation on trails, campsites, and visitors. At issue is whether those effects conflict with Park mandates, how visitors tend to respond to those effects and to each other, and what stewardship actions or programs might offset those effects. The Park's current backcountry conditions, reviewed extensively in previous sections, fit into a trend. The following summary will establish a case for several possible directions of that trend. Each direction heads towards one of several scenarios. With the best information available, this section addresses the second strategic question: ***where are the Park's backcountry conditions going if nothing changes?***

Background

Backcountry conditions change according to characteristics of the setting, the effects of recreational activities, and the capacity of stewardship efforts to offset those effects. Stated generally, recreation changes a setting's characteristics and contents, but one can offset those changes with stewardship efforts such as informational and educational programs and trail maintenance. Scientists have studied the effects of recreation on trails and campsites most extensively since the 1960's, although earlier work also was completed. Whittaker and Bratton (1980) compare the effects of horse riding and hiking in Great Smoky Mountains National Park. Hammitt and Cole (1987) summarize some of the literature available concerning recreation's effects on backcountry settings, especially of camping. More recent work by Seney (199 1) reveals some of the more complex differences and similarities between effects of the two activities.

Backcountry recreation can affect areas near and including trails, camping areas, and other destinations such as waterfalls or panoramic views. Effects are seen commonly in soil, vegetation, water, and the habits of animals or the opinions of visitors. Some of the effects are direct and others are indirect. For example, a person may compress soil directly while hiking or riding. This may affect a nearby plant indirectly by making water absorption more difficult.

Change associated with a trail occurs most during construction, as opposed to changes related to later recreation; change associated with a campsite, however, is due mostly to camping activities (Hammitt and Cole 1987). On trails and campsites, soil is affected by two processes: erosion and compaction. Vegetation, however, is affected by two other processes: abrasion and shearing. In addition, plants can be stressed by changes to the soil that are attributed to recreation.

Erosion

Erosion is the loss of soil caused by water or wind (Hammitt and Cole 1987). On a well designed, constructed, and maintained trail, most soil loss occurs during construction when soil is removed intentionally to create a trail-bench. Ideally, after construction, such a trail remains stable, but this does not always happen. Water and wind, for example, can remove considerable amounts of soil after a trail is constructed, especially if the type or amount of activity exceeds either the trail designers' assumptions or the capacity available to maintain it. Erosion of soil from one location deposits it at another. On a trail, eroded soil is often first deposited as mud either on or off the trail.

Although both hiking and horse riding can contribute to erosion by dislodging soil and making its transportation easier (Seney and Wilson 1991), a trail is susceptible to erosion even without recreation. After rainfall or during snowmelt, a trail may cause water to deviate from its natural flow along the ground's surface. In addition, trail construction requires cutting a bench into the terrain (see Figure 4). The cut-bank or back-cut of a trail can expose wet-weather seepage. Rainfall, snowmelt, and seepage will put water onto a trail and, once water enters the trail, the trail acts like a channel, collecting water or keeping it from flowing out of the trail. Trails deviate water from its natural course. If water collects on a trail, the tread can become muddy; if water flows on a trail, it may erode, especially where recreational activity has loosened soil.

Where water collects, it can deposit eroded soil, increasing the likelihood of mud forming. This mud may appear highly organic when plant matter, like leaves and twigs, are washed onto the trail and deposited along with the soil. This appearance can lead one to believe that the soil is more highly organic than it is in actuality.

One can, however, offset erosion either by collecting water above the trail and channelling it to one central point where it crosses the tread or by diverting water from the trail frequently enough that it does not build up volume or velocity. Collection drainages include lateral drains along the edge of a trail and "Y" or "T" drainages to collect water running or seeping down a slope. Once the water is collected, it is moved across the trail tread, often in an open dip that, if necessary, is hardened with rocks. At times, covered culverts carry water beneath the trail surface, but culverts are easily clogged, susceptible to high water, and easily over looked during seasonal maintenance.

Specific diversionary drainage design depend on the anticipated volume and velocity of water. For example, a drainage can be a simple dip excavated across the trail (drainage dip), a log installed at an angle across the trail (wood water-bar), or a series of moderately large rocks

installed at an angle to the tread (rock water-bar). These forms of drainages are retrofitted to an existing trail or installed after the initial trail alignment is constructed.

Trail design also can offset erosion. A trail designer can lay out a trail with drainages, called grade-dips, by changing the grade of a trail from an incline to a slight decline for a distance of 10-30 feet before returning to an incline (Figure 5). Grade-dips tend to require little-to-no maintenance unless water begins to pool. Maintenance of installed drainages, however, must occur, usually not less frequently than once a year. Another technique for draining a trail is called out-sloping, meaning that the trail bench is sloped outward from the terrain's slope (Figure 4). One should install out-sloping when building a trail, but may also retrofit it. Outsloping requires maintenance and sometimes even reconstruction.

The purpose of trail drainage is to return water to a more natural flow off the trail and to protect trails from water flow. By draining water from the tread, one can often prevent mud from occurring, although one might also consider relocating the tread to more stable soil that is less easily dislodged. After all, mud is either dislodged soil washed down from the tread above or existing soil saturated with water and disturbed or dislodged by trail traffic. Whatever the reason, draining water from the trail will address all or part of the problem.

In addition to protecting soil from flowing water, one can also offset erosion by protecting soil from becoming dislodged. Several construction techniques are available and are referred to broadly as tread-hardening techniques. Examples of tread-hardening techniques include rock steps, log steps, and staggered steps. Rock steps and log steps are difficult for horses to negotiate unless the steps are placed far enough apart for a horse to walk comfortably. Rock steps are large rocks typically installed closely together like a staircase where a trail climbs steeply. They will work well on a hiking trail and protect soil by providing a surface that is resistant to the effects of hiking and of flowing water. Closely positioned log steps provide a similar role and, again, will work on hiking trails. They extend across the entire width of a trail's tread, are often anchored with either rocks or a log runner, and protect soil by damming it behind the log. Staggered steps, whether rock or log, can work on hiking trails or trails for horse riding because the staggered steps retain soil behind them like a soil-dam yet are negotiable by horses. At locations with more organic soils or more seepage, replacing the soil with rocks or gravel is effective, although it may appear excessively artificial and should be considered carefully. In cases with standing water or deep organic soil, techniques that elevate the tread and provide a more durable surface-- such as turnpiking, puncheon, or bog-bridges-- become necessary, although relocation of the trail should be considered if the problem likely will return.

One may consider an eroded trail unacceptable for any of several typical reasons. Depending upon the degree of erosion, an eroded trail offers visitors fewer opportunities for enjoyment and the trail can also be unpleasant or unsafe. Additionally, maintaining an eroded trail is more difficult because drainages must extend through the soil bank on either side of the tread, a task made harder as the tread becomes more eroded and deeper. An eroded trail is not an intended condition, so it is a park condition that has not been conserved. And, an eroded trail carries water during a rainstorm, sometimes leading people to travel outside the intended tread because they do

not enjoy travelling in a stream of water. When people travel along the edge of a trail, the tread tends to become wider and more eroded as soil is dislodged and eventually washed down the trail.

Eroded sections of trail, especially severely eroded sections, impair the enjoyment of current and future generations, violating a central part of the Park's mandate. In addition, these sections are an example of Park conditions not conserved. Therefore, significantly eroded trails also violate the other central part of the Park's mandate and must be considered unacceptable.

Compaction

Compaction is the compression of soil, as when hiking, horse riding, or camping packs soil tighter than it is naturally packed (Hammitt and Cole 1987). Compaction can reduce the potential for water to flow within the soil, forcing water to the soil surface. More densely packed soil allows water to move faster across its surface because, first, the soil surface no longer absorbs water rapidly and, secondly, it is smoother and does not slow the water. Compaction can also harm or eventually kill plants, leading to a loss of plant roots that previously held soil in place.

In brief, compaction of soil leads to reduced "porosity," meaning the space between soil particles. Water normally moves in this space when soil is wet. Less space between particles means that, in some cases, water is unable to flow through the soil, becomes trapped, and turns the soil's upper portion to mud. Also, it may mean water is forced upwards until it reaches the soil surface and becomes visible as either standing or flowing water. Or, it may mean water is unable to penetrate the surface where the soil is compacted, staying instead on the surface and making mud or flowing across the surface and causing erosion. As with erosion, the effects of compaction can be offset with trail design or construction techniques such as rock or log steps.

One may consider compaction unacceptable, but only with reasoning different than that applicable to erosion. Compaction, unlike erosion, does not directly reduce opportunities to enjoy a park. Instead, opportunities are reduced indirectly because compaction leads to more muddiness in vulnerable locations. This muddiness can force people outside of the intended trail tread or it can be unsafe if a horse pulls a shoe or a hiker turns an ankle. It also can be unpleasant, especially for a hiker contending with manure or mud mixed with horse urine. Also, because excessive or long-lasting muddiness is neither an intended nor desired trail condition, it exceeds desired park conditions. In some cases, however, a compacted trail tread is more durable and compaction becomes desirable.

Compaction, then, does not impair the enjoyment of current and future generations or violate the Park's mandate. Some consequences of compaction, however, do cause impairment and represent Park conditions that have not been conserved. Accordingly, excessive muddiness, as with erosion, exceeds Park mandates and is unacceptable.

Differences between the Effects of Hiking and Horse Riding

Hiking affects trails differently than horse riding. Both activities affect undisturbed areas differently than they affect established trails. Understanding the differences helps identify potential requirements of workable trail designs. Seney and Wilson (1991) show that both horse riding and hiking expose soil to erosion. They also show that horse riding makes significantly

more soil available for erosion regardless of whether trail tread is wet or dry. On trails where both activities occur yet more hiking occurs than horse riding-- as in the Park-- hiking and horse riding lead to trail problems by dislodging soil and contributing to erosion. In addition, both activities cause compaction of soil beneath the surface.

Notwithstanding that both these activities dislodge surface soil and compact soil beneath the surface, there is an important difference of scale to consider. Horse riding tends to dislodge more surface soil and to compact soil to a greater depth than does hiking (Figure 6). The amount of soil dislodged and the depth to which soil is compacted depends upon the soil type, water content, and other characteristics.

Although the difference is intuitive, Bainbridge (1974) reviewed several sources to compare the effects of horse riding and hiking. He noted that a horse's heavy weight, relatively small hoof area, and metal shoes combine to produce this difference. Veterinarians Frederick and Henderson (1970) found that a horse hoof can generate nearly 1500 pounds of pressure per square inch. Although this figure is the extreme of a range, the tremendous pressure possible beneath a horse hoof is important. Pressure generated by a heavy animal bearing a load on small, shod hooves will compress soil beneath the hoof, displace soil to the side, and lift soil as it moves on.

The combination of pressure, weight, and shod hooves can cut plant roots or remove vegetation as soil clods are lifted, although the actual effect depends on characteristics of the location's soil and topography, as well as the trail's design and construction. When soils are dry and hard or rocky, the effect is not as great as when soils are wet and softened. Likewise, when the terrain is steep the effect is greater than when the terrain is more flat. However, when the terrain is very flat and water collects, especially where soil is more organic, horse riding can lead to water-filled pockmarks and mud. Marion's (1994) findings show this relationship as well. One can, however, either design a trail that avoids areas likely to develop problems or construct it with techniques appropriate to prevent those problems.

Another effect unique to horse riding, when compared to hiking, is related to a horse's stride. Different horses tend to have fairly similar stride lengths. Although a very small horse will have a stride shorter than a very large horse, many trail horses are close enough in size that their strides are quite uniform. The effect of uniform strides on wet or organic soil is that they produce a pattern of smaller, confined mudholes across the width of the trail tread and alternating with more solid sections of soil. These alternating muddy and solid sections may run along the length of a larger

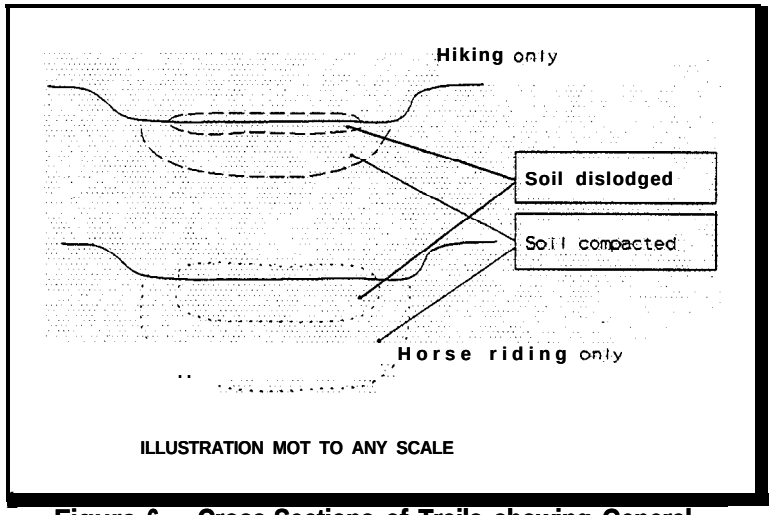

Figure 6 Cross-Sections of Trails showing General Effects of Hiking and Horse Riding. Effects are Similar, except that Changes Differ by a Matter of Degree

mudhole or quagmire. In effect, the pockmarks combine to form a single trough across the tread that contains mud and often, depending on recent rainfall, standing water. Again, however, one can design or construct a trail to avoid or prevent these problems from occurring.

Hiking, on the other hand, tends to produce mud without pockmarks, although soils that are exceptionally poor for trails will pock under either activity. At an especially bad mudhole, hikers and horse riders may begin going around the mud. By going around a mudhole, people spread their effects further onto areas never intended for hiking or riding. They also make more mud. Hiking, like horse riding, can compact soil and stress nearby plants and plant roots. Again, Marion (1994) shows the association between muddy stretches of trail and tread widening, an intuitive relationship confirmed by study. Hiking, however, usually does not lift soil the way a horse hoof often can lift it.

Several implications follow from the differences between the effects of horse riding and those of hiking. A primary implication is that the design, construction, and maintenance of hiking-only trails should be different from that of trails where horse riding is intended. The reasons for this difference lead one to understand that horse/hiking trails frequently cost much more to construct and maintain compared with hiking-only trails. Another implication is that riders can minimize the effects of their horses by riding only on trails and areas that are intended or constructed for the animals, just as hikers can minimize their effects by not going around mudholes. A third implication is that a trail's layout and existing construction determines whether it is stable under existing activities and whether it will remain stable under any newly introduced activity. This means that trails are not interchangeable without considering both the existing construction and the likely effects of any activity other than the one for which the trail has been designed and maintained.

Two implications, however, are most fundamental. The first is that-- because there are ways to offset differences between the effects of horse riding and those of hiking-- those differences alone do not imply that either horse riding or the effects of horse riding are incompatible with the Park's mandates. This is especially so if actions to offset the problematic effects are implemented and successful. The second implication, however, is that the effects of horse riding would become incompatible with the Park's mandates if efforts to offset them are insufficient and existing trail conditions continue to deviate substantially from intended conditions. Such deviation would represent impairment, a lack of conservation, and a loss of opportunities.

Camping Areas

Camping is a common activity for many horse riders and hikers. Camping effects are quite similar regardless of whether a person accesses a campsite by hiking or riding. Some specific conditions, however, are related to the presence of horses. Camping tends to affect soil and vegetation in a progressive, yet tapering manner (Figure 7). Most changes due to camping occurs early in a campsite's life. The general condition of a campsite is revealed by the condition of indicators, as explained by Hammitt and Cole (1987). For the purposes of this discussion, an indicator is any element of a campsite that changes because of camping, although trail indicators would apply to assessing the effects of horse riding or hiking.

Important effects of camping include compaction and dislodging of soil, trampling of plants, and pulverization of surface organic debris such as leaves and twigs (Hammitt and Cole 1987). These effects progress from barely noticeable changes in the types of plants on a site all the way to obvious and widespread erosion caused by water washing in a sheet across compacted soil and carrying dislodged soil and organic debris with it. In the Park, most noticeable campsites tend to be somewhere between these extremes (Marion forthcoming).

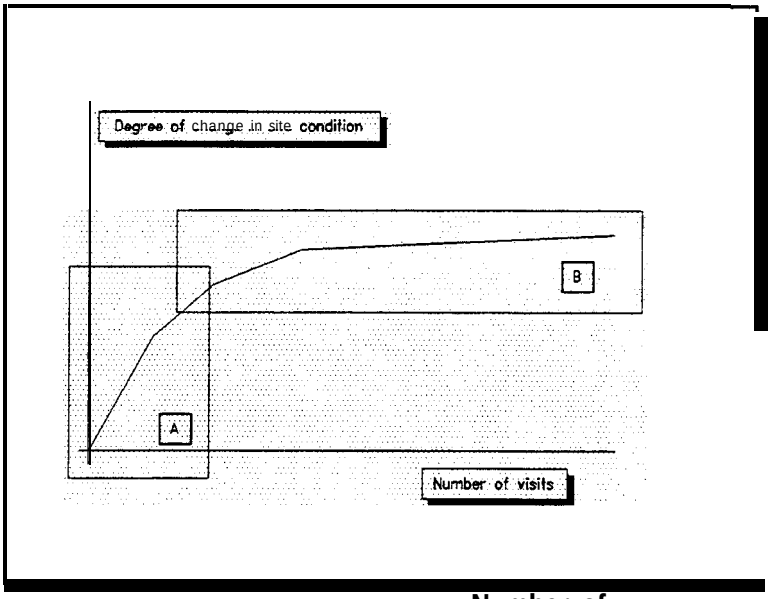

Figure 7 Relationship between Number of Visits and Recreation Site Condition. Region A: few visits lead to marked change. Region B: many more visits lead to relatively less additional change.

The pattern of change seen on a campsite does not occur in reverse when camping is removed from a previously active campsite (Figure 8). Vegetation slowly returns and compacted soil naturally loosens during a gradual return toward undisturbed conditions (Cole 1994). The rate at which a former campsite recovers and whether conditions ever return to those that existed prior to when camping first occurred depends upon environmental characteristics such as soil type, the surrounding plant community, and climate. This progression is shown in Figure 8 as a line between general conditions on a campsite before ending camping and the conditions on the site prior to any camping. In the Park, because of its lush vegetation, most locations currently affected by camping might eventually recover fully if no continued camping occurred.

Several implications follow from this understanding of how a site responds to camping and its removal. First, because most change on a campsite occurs quickly and recovery occurs slowly, an existing campsite will account for less future change than will a new one. Second, because most change occurs quickly, containing camping within existing

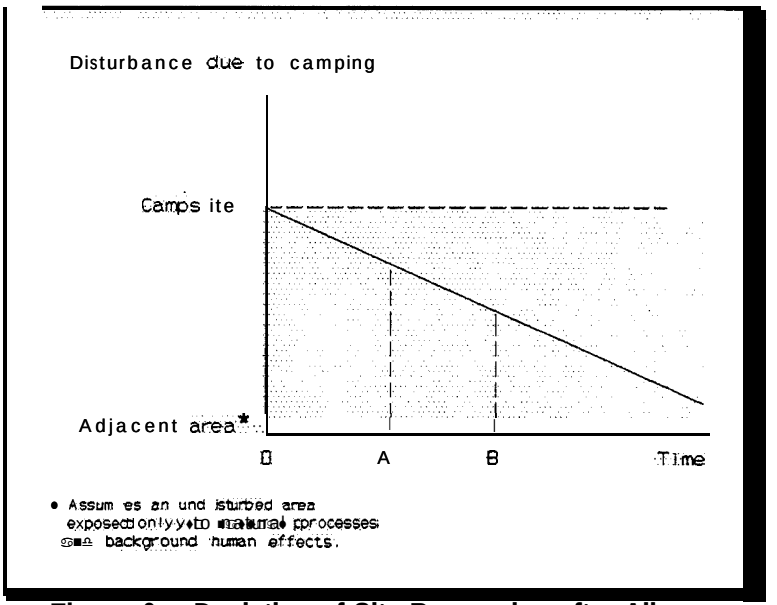

Figure 8 Depiction of Site Recovering after All Camping Ends.

campsite boundaries leads to less additional change than if a campsite begins expanding. Third, because change occurs rapidly, efforts to lessen soil compaction, such as by loosening soil, are ineffective because soil so quickly compacts again. In addition, such efforts can be counter-productive if people begin camping nearby at a previously undisturbed location because they find the uncompacted soil makes the intended site too uncomfortable. Restricting camping to designated locations is effective, although occasional maintenance and rehabilitation is often necessary to keep the site from expanding.

One's behavior greatly influences both the effect of camping and the scale of those effects. For example, large groups require more space and will compact a greater area. Similarly, a person who builds large, hot campfires directly on the ground will sterilize soil by burning all its organic material, whereas a portable stove need not affect the soil at all. A sterilized patch of ground remains recognizable for many years because vegetation cannot grow in such soil. And, a person who drives nails into trees or builds constructions, such as a lean-to or bench, damages trees and leaves a highly altered campsite for future visitors. Changes in visitor behavior will reduce these and other effects. Educational and informative brochures and programs can help, as can pleasant reminders from other visitors. Regulations also can help, most effectively when visitors expect enforcement.

Differences between campers with horses and those without are important to consider (Hammitt and Cole 1987). Although the effects of people are generally consistent, people with horses add the animal's effects to their own. Many of these differences are related to behavior. For example, a horse, if hitched to a tree, can damage the tree greatly either by pawing at its roots or by chewing on its bark. Also, a horse requires much water and, if its rider allows it, can foul water sources by trampling soft soil or by urinating. Horse manure is another difference because it can contain seeds from non-native plants and its presence and odor and the flies it can attract can greatly reduce other camper's enjoyment.

As with their own activities, however, visitors who change the behavior of their animals will reduce their animal's effects. In addition, proactive steps to design, construct, and maintain campsites can help, especially those sites where stock is expected. For example, tieing horses to existing hitchracks or bringing high-lines will greatly reduce damage to trees. Water sources can be protected by instructing riders to carry a collapsible bucket to water their animals away from a source. Other options for protecting water include constructing a watering trough or constructing an access trail to water that is well below where people collect water. Such a trail should be designed to support horse traffic. Manure problems can be addressed by locating hitchracks away from shelters or to the far side of a camping area and then instructing riders to disperse manure before leaving. Riders can reduce or eliminate the concern about non-native seeds by giving their animals weed-free pelletized feed or by assisting efforts to eliminate non-native plants.

Other Considerations

Aside from recreational activities, such as horse riding and hiking, trails and campsites are affected by other processes, too. When combined with changes in activity patterns, these processes can be especially important to consider.

Erosion and compaction are influenced by seasonal differences, such as rainfall and temperature. For example, if more hiking or riding occurs during wetter times of year, then more soil is dislodged for flowing water to erode. Because of additional standing water during these times, a person is more likely to go around mudholes and cause the holes to widen. When freezing temperatures occur, hoarfrost easily becomes mud. And, when more people ride or hike during wet periods, more people notice conditions present at such times. Some of these people may attribute conditions, at times incorrectly, to recreation or to particular recreational activities.

Trails are influenced by the number of people engaged in various activities, but not to the degree commonly assumed. In the past, many people assumed that the number of hikers or riders on a trail was particularly important. This presumption has led to incorrect interpretations of the *carrying-capacity* idea. Although many people have suggested otherwise, no area has an innate, predetermined, preordained carrying-capacity because its capacity varies according to subjective, human decisions such as what are either desirable conditions or acceptable activities (Stankey and others 1990). In addition, a few individuals behaving inappropriately can cause far more damage to an area than many people who act responsibly, so, again, the number of people is less important. And, finally, one can take steps to offset many undesirable conditions.

Although the number of visitors does influence tread width and will aggravate existing problems, other considerations-- such as soil type, terrain, and waterflow, along with trail design, construction, and maintenance-- affect physical trail conditions more. The number of people is less relevant to trail conditions than the type of activity, visitor behavior, maintenance capability, or soil and topographic characteristics. The most important reason for this is that most change occurs when a trail is constructed and that it eventually stabilizes if sufficient maintenance occurs. However, if a change occurs in the type of activity on a trail, if maintenance efforts are insufficient to offset the effects of recreation, if more visitors begin recreating during wet seasons, or if a severe storm overruns existing maintenance structures, a trail can become unstable.

Visitor numbers do affect an area's opportunities. Opportunities for enjoying a park depend upon the area's character, as well as the condition of its contents. Although the condition of trails and campsites is important, so are other considerations. For example, the number of visitors is an important characteristic of a protected area, as is the behavior of individual visitors, regardless of how the behavior affects an area's contents. Some people will no longer visit an area that they once enjoyed if they feel that too many people are there. Some people also may be bothered by seeing other visitors engaged in behavior or activities that they assume, rightly or wrongly, harms the area. Both the number of visitors and the behavior of visitors affects the condition of an area's contents, but they also affect that area's character, as it is perceived by an individual.

Addressing an area's character is challenging because people individually perceive character, and their perceptions do not necessarily agree. Occasionally, for example, changes to an area's character, possibly caused by the behavior of a few people, detract from some visitors' enjoyment, but not from that of others. At times, one can increase enjoyment of those who are bothered without decreasing the enjoyment of those whose behavior is bothersome or whose behavior is believed to produce effects that are bothersome, but this can be difficult. On the other hand, maintenance actions can offset some bothersome effects, just as informative materials can remind

a person to act in a less-bothersome, more considerate manner. Taken together, these three approaches may be quite effective in conserving an area's content and character, while simultaneously providing opportunities for enjoyment by current and future visitors. Administrative actions, carefully considered, can help balance the interests and concerns of different people. Maintenance actions, appropriately applied, can help reduce specific conditions that are either bothersome or even unacceptable. And, informational materials, tactfully presented, can help remind people of ways they can help both conserve an area and provide opportunities for its enjoyment long into the future.

Possible Future Scenarios

By understanding the current situation as part of a trend, we are better able to comprehend where the Park seems headed. If the situation does not change, those trends reveal several possible scenarios for the Park's setting and opportunities. Although predicting exact future conditions is impossible, the best available information suggests likely future conditions in general. By understanding the current direction, we are prepared to recognize whether the current situation is acceptable or unacceptable, and to whom and why that is the case.

Several situations that might follow from the current situation are illustrated in Figure 9. From an understanding of trends in the conditions seen on individual trails, the diagram shows generalized trends for the entire system of trails in the Park. If trails did not exist, as shown at time (0), there would be no trails to change. Most change associated with a trail, however, occurs during its construction, as discussed earlier. The change that occurred during construction is shown between time (0) and time (1) of Figure 9. Ideally, a trail remains stable after construction and no change occurs, illustrated as the line labeled "none." This ideal situation presumes and requires sufficient means to maintain and repair trails so as to offset inevitable change.

The Park's trail system, however, is not stable. Since the system was constructed, it has changed more than anticipated or desired, as trail assessments together with the current issues and concerns associated with the Park's trails illustrate. This trend is displayed between time (1) and time (2) as a line depicting conditions deviating from a stable situation. The current situation, then, is that the trails have changed more than intended and that the

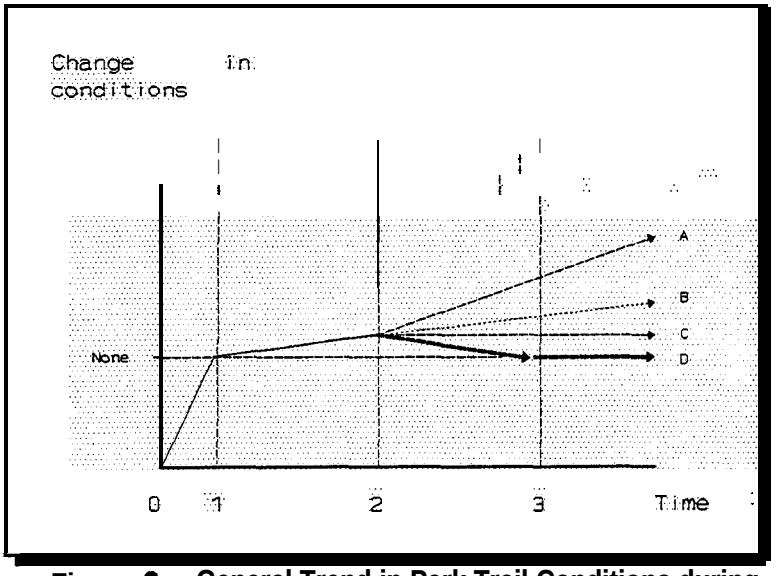

Figure 9 General Trend in Park Trail Conditions during Construction (Time 0 to 1) and Since Construction (Time 1 to 2). Four Possible Future Trends are Shown from Time 2 to 3, as Discussed in the Text.

situation is part of a trend toward more change and greater deviation from the trail system's original and intended condition.

Understanding how trails change and what likely contributes to that change allows one to anticipate future conditions. A quick review of the current situation helps this discussion. Recently, several new initiatives have added to the capacity to maintain Park trails. These initiatives include increased volunteerism and several informational efforts intended to help visitors leave fewer traces of their stay. Together, these initiatives could slow or arrest the trend toward greater change and convert it to a trend toward less or no change-- a stable system. However, several other circumstances or possibilities might continue the trend or cause it to accelerate for some period of time. For example, consider the increasing numbers of visitors riding or hiking the trails, shown earlier. Or, as another example, consider the likely effects of more people visiting in early spring or late fall when soil and vegetation are more susceptible to damage. And, as a third example, consider the potential for inevitable yet unpredictable storms or snowmelt to damage trails and overwhelm existing maintenance capacity by making repair of the damaged sections a priority over maintenance.

Possible future situations, then, range from an accelerated trend toward more change (shown as line A in Figure 9) to a stable trend with existing problems repaired and the sufficient maintenance capacity to keep the system repaired, stable, and unmistakably acceptable (line D). Accelerated change could result from increases in the number of visitors such that maintenance capacity becomes less sufficient. Continued, consistent change could result from new initiatives that only offset increases in visitation (shown as line B). Alternatively, a situation with no further change could result from the new initiatives completely offsetting any additional sources of change and also stabilizing all existing ones (shown as line C).

Some trail locations, however, have existing conditions that need repair, not just stabilization. Those conditions are the ones described earlier as unacceptable. Specific examples of those conditions are surmised from the review of Marion's (1994) assessment. Notwithstanding the current situation, likely changes in it, or potential events that might affect it, if sufficient maintenance capacity becomes available, even locations with unacceptable conditions might be repaired and maintenance, then, could keep the system stable and acceptable (shown as line D).

Implications

Comparing the current situation and potential future situations with what the Park should contain and offer, according to Park mandates, reveals inconsistencies. In addition, the issues and concerns of those who care about the Park furnish an additional level of understanding about the inconsistencies and appreciation for potential solutions to those problems.

The question, then, becomes one of how to stabilize the Park's trail system, repair locations with unacceptable conditions, and maintain the system despite potential increases in the number of visitors, changes in when people visit the Park, and inevitable storms. More to the point, the question is how to accomplish the need to improve the trail system so it can continue to provide opportunities for enjoying the Park and its backcountry.

IMPROVING THE TRAIL SYSTEM

By examining the current situation and describing the likely directions it may head, one is prepared to discuss whether that situation is acceptable. If either the current situation or direction is not acceptable, according to some appropriate measure, one is also prepared to consider how to lead the situation in a different, more broadly acceptable direction. Questions about what is acceptable are complex, and some people may offer answers that disagree with those of others. Returning to the Park's mandates, however, can help focus the discussion, but, as reviewed earlier and emphasized now, a mandate does not provide specific answers. Instead, mandates provide guidelines. People still must interpret each mandate and understand its flexibility. To interpret the Park's mandates, the current project relied upon detailed review of mandating documents and discussions with Park staff members and members of the public, including horse riding and hiking enthusiasts and conservation advocates.

Currently, as measured against mandated Park purposes and as measured by Park staff members and members of the public, **unacceptable conditions exist in places along the Park's trails and at some of its shelters and campsites.** Returning to the original picture of the current situation (Figure 2), some setting conditions are impaired because those conditions are not intended or desired ones and, as such, are examples of unconserved Park objects. Additionally, those conditions impair opportunities for enjoyment by visitors and, as such and in conjunction with the previous point, detract from the Park's intended values and purposes. Both these statements have been substantiated during the previous portions of this document. The remaining and most crucial question is: ***what to do about the situation?***

Recommended Management Direction

This project's task has been to produce recommendations for actions that will improve the trail system of Great Smoky Mountains National Park. To improve something implies changing it. Constructive change requires consistent, purposeful direction. The first step, then, towards improving the Park's trail system is to establish direction. Direction allows one to act with purpose and to prevent fate from taking control. Moreover, purpose and direction keep combinations of little decisions from implying intent where none exists. Additionally, having a clear sense of purpose ensures more rapid recovery should some unforeseen event push one from the selected course. The final portion of establishing a strategy, then, is to determine direction and priorities that will ensure consistency and make easier the task of establishing goals and objectives. With a completed strategy, one can weigh recommended management actions against the objectives for those actions, instead of against some other, perhaps more arbitrary standard.

Vision of an Ideal Park Backcountry

One way of simplifying an effort to define what is acceptable is to begin by describing the ideally acceptable situation. Such a description is often called a Vision Statement. During this project, many people worked together to help produce one for the Park's backcountry. The proposed Vision Statement represents the commitment towards which to work. It demands action and solicits involvement. In effect, it establishes a desired direction for backcountry efforts.

The proposed Vision's text, shown on the next page, describes a backcountry that offers people opportunities for enjoying or learning from an area where natural processes are predominant and people, both in and out of the National Park Service, work together to ensure that those opportunities and processes remain available for future visitors. The Vision Statement begins by depicting those qualities of the backcountry that make it important to people, according to those who have been involved with this project. These qualities are the ones people care about, will work together to conserve, and desire to keep from becoming impaired. The Vision also describes the activities that the backcountry should provide opportunities for people to enjoy. It describes the role of trails, shelters, and campsites in promoting and conserving backcountry qualities, and the importance of cooperative stewardship efforts to ensure that those qualities remain unimpaired. The Vision concludes by distinguishing appropriate backcountry activities from inappropriate ones.

Great Smoky Mountains National Park's Vision is a description of what those who care about the Park's backcountry hope to find when they visit it. The Vision provides direction for administrative actions and programs, no matter at what level or scale, and promotes consistency among the Park's efforts and the efforts of volunteers, cooperating organizations, and many individual visitors.

Priorities Necessary for Consistent Efforts

Because a Vision can be quite vague to apply, the next step towards establishing a consistent direction is to set more specific priorities. Priorities remind us of how work in the Park is to be conducted. They are not goals, but they are guides that support a steady purpose. The following priorities reflect the comments and ideas of many Park staff members and members of the public. They are organized into the three categories of setting, opportunities, and stewardship. The Park's staff members will adopt, widely publicize, and emphasize these priorities to all those people who are involved with the backcountry and its care.

Setting

- **Promote and Regulate Activities so that the Character and Contents of the Park's Backcountry Remain Unimpaired for the Enjoyment of Future Generations.**

  This priority is an abbreviated version of the National Park Service's Organic Act. It ensures that the Park's mandate is clearly evident as a guiding priority.

Proposed Vision Statement for Managing and Maintaining
Backcountry Resources of
Great Smoky Mountains National Park.

The heart of Great Smoky Mountains National Park is its backcountry, where .a person is a visitor who -does not remain. The backcountry is a predominantly natural, unmodified, and untamed area. Those qualities distinguish the backcountry from parts of the Park that contain roads, dwellings, or administrative buildings. The backcountry's naturalness makes it special. Here, one finds clean air and water, and native plants and animals, each freely responding to the others and to the seasons.

The backcountry with its naturalness is for people to enjoy. It offers a place for simple recreation-- activities requiring no motorized or mechanical means of transportation. It also offers a place to learn about the natural world and cultural heritage of the southern Appalachians through scientific study, educational programs, or an independent visit.

Access to the backcountry is provided by a system of well maintained trails, campsites, and shelters. This system complements the Park's natural character and protects-Park wonders. It concentrates the effects of people and provides opportunities for simple recreation. National Park Service employees work with members of the public to design, construct, and maintain the trails. Together with the National Park Service, these individuals and organizations seek to accommodate types and amounts of activity they agree are compatible with the Park's purpose af preserving an exceptionally diverse area and providing for public enjoyment in ways that leave its contents and character primarily unaltered.

Those who administer, study, or enjoy the backcountry do so as stewards entrusted by future generations. Many. people and organizations join their efforts to see that those who visit learn to respect the wilds, are courteous, and need few rules and regulations. They encourage visitors to actively participate in programs that care for the Park. National Park Service employees provide stewardship in cooperation with individuals and organizations who are concerned about the 'Park and enjoy visiting it.

In the backcountry, visitor activities and National Park Serviceactions are appropriate only if they minimally change natural conditions or processes and minimally affect those who enjoy the backcountry. Neither an action nor an activity is appropriate if it merely provides comfort to a visitor or convenience to a manager.

In the-backcountry, natural conditionsdominate except where carefully considered exceptions exist, such as trails, shelters, or campsites. In every way possible, even these exceptions are plain, rough, sturdy, and natural-appearing. Unrestricted visitors are expected' and invited wherever possible. Restrictions that exist are the minimum necessary to protect natural Park features, to preserve its primitive and historic character, or to provide opportunities for simple recreation.

- **Ensure Sustainable Backcountry Conditions that are Predominantly Wild, Natural, and Unmodified.**

  These qualities of the Park's backcountry are the ones that people care about most. Together, they are the reason people enjoy it and are what people would most like their children or grandchildren to see in the future.

- **Protect and Nurture the Appalachian Trail's National Significance and Special Purposes by Working Alongside Its Extended Community of Stewards.**

  The Appalachian Trail (AT) is one of the premier trails in the Park and, in several ways, it is unique among Park trails. Although many Park trails are special in their own way, the AT has specific legislation that elevates its status. One quality of the AT is that, all along it, volunteers play a central role in its maintenance and in decisions about its management.

- **Ensure that Anyone's Actions to Care for the Backcountry or to Provide Its Visitors with Opportunities for Simple Recreation are Compatible with Relevant Legislation'.**

  Legislation provides some of the most important guidelines for actions related to the backcountry. Although guidelines are flexible, they are also mandates that require compliance. Earlier material in this document reviews several of the more central pieces of legislation.

Opportunities

- **Provide Opportunities for People to Enjoy Primitive Recreation in the Park Without Compromising Its Fundamental Purpose of Conserving the Backcountry's Character and Contents for Future Generations.**

  One of the best ways for people to enjoy the backcountry is through recreation. Every possible opportunity should be available that will not compromise the backcountry setting's most valued qualities.

- **Provide Opportunities for People to Learn about the Backcountry, Its Parts, and How Those Parts Interact.**

  The Park's backcountry provides tremendous opportunities for a person to learn about the natural world. The National Park Service, cooperating organizations, and interested individuals can help individual visitors realize those opportunities by providing educational programs or informative materials.

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[1] **Examples include, but are not limited to: National Park Service Organic Act (1916 and 19781, establishing legislation of Great Smoky Mountains National Park (1926 and 1942), Wilderness Act (1964), National Trails System Act (1978), Archeological Resources Protection Act (1979), Historic Sites Act (1935), National Historic Preservation Act (1969), and the National Environmental Policy Act (1969).**

Stewardship

- **Treat the Backcountry-- Together with Its Contents and Character-- as One of the Park's Most Valuable Assets, One that Needs Service and Care If It Is to be Available Unimpaired for Future Visitors.**

  Even people who never venture far into the backcountry come to the Park because of spring wildflowers, fall foliage, waterfalls, streams, mountains, and views that are all rooted in the Park's backcountry. More adventurous people access the backcountry along trails and may stay overnight at a shelter or campsite. Trails, shelters, and campsites all need care in order to conserve the setting and its opportunities.

- **Inform and Educate Visitors and Park Employees to Enable Them to Protect and Care for the Backcountry and to Leave No Trace of Their Passage or Activities.**

  By their actions, each individual can help ensure a sustainable, high-quality backcountry filled with opportunities or, on the other hand, can hurt the efforts of others. People, however, must know how to help and that requires good information to keep each person from unknowingly burdening broader efforts to care for the backcountry.

- **Encourage Cooperation, Participation, and Responsibility from Park Visitors by Providing Incentives and Motivation for Volunteerism and for Support of Park Efforts.**

  Park visitors should be encouraged to work with Park employees and others who are serving as stewards. Their assistance, together with the work of Park employees and volunteers, can improve the current situation and allow Park staff members to avoid some difficult decisions.

- **Incorporate the Knowledge, Experience, and Ideas Available Among Park Employees, Volunteers, Visitors, and Other Agencies and Organizations in Maintaining the Integrity of This Area and in Recognizing Its Value to Present and Future Generations.**

  Those who care about the Park have valuable experience, and skills. They can offer great ideas for maintaining and improving the Park's trails and backcountry so that its most valuable and important assets are conserved together with opportunities for enjoyment.

- **Expect and Ensure Continuity and Consistency in Park Operations When Decisions Affect the Backcountry's Character, Contents, or Visitors.**

  As more people become involved with decisions, their involvement risks taking decisions in erratic directions. A desired measure of effectiveness is that the process remains consistent and responsible, rather than haphazard. Those participating in the process must, therefore, adhere to a common set of guidelines and expectations. A Vision Statement, Priorities, Goals, and Objectives establish such guidelines.

Decision frameworks. Stewardship requires decisions; effective decisions require continuity and consistency. Yet, a highly structured process might threaten creativity or reduce the willingness of some people to participate constructively. Several decision frameworks are available that avoid these problems while still obtaining the benefits of consistent decisions. Decision frameworks allow decisions to be more comprehensive and comprehensible.

Currently, two frameworks are popular among land management agencies such as the U.S. Forest Service (USFS) and the National Park Service (NPS). One is Limits-of-Acceptable-Change (LAC), and the other is Visitor Experience and Resource Protection (VERP). Both frameworks are similar (Figure 10). VERP has been solely applied to NPS-managed areas. LAC, however, has been widely applied by the USFS and adopted by several NPS-managed areas, as well.

LAC and VERP both evolved from an idea called *carrying capacity*. For wildland recreation, carrying capacity suggests that a limited number of people can recreate in an area without degrading it (Stankey and others 1990, Wagar 1964). Unfortunately, the idea of a carrying capacity is easily misunderstood as suggesting that scientific study or a bureaucratic decision can define a preordained number of people that are appropriate for an area. Such an understanding implies that an emphasis upon limitations and regulations is a preferable method for managing backcountry recreation, as opposed to maintenance and information.

LAC and VERP evolved because people recognized that the idea of a carrying capacity is much

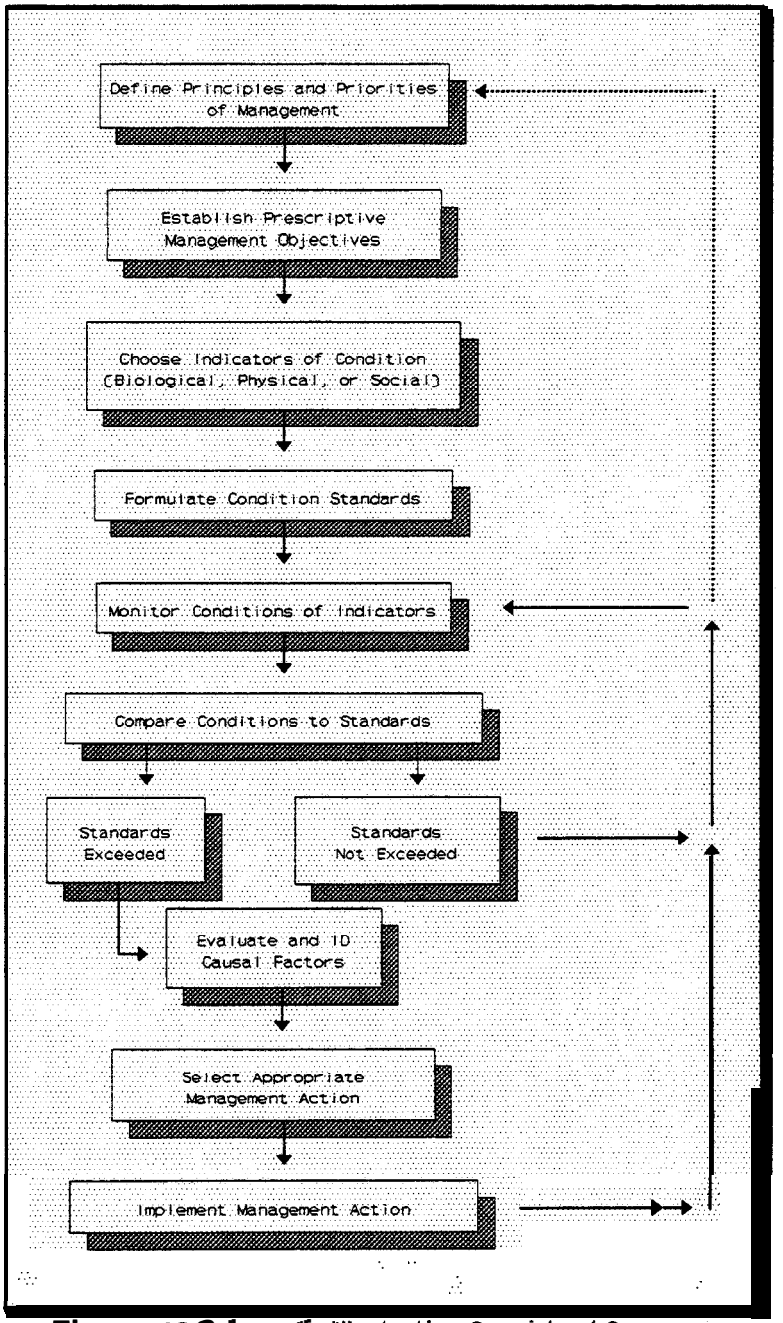

Figure 10 Schematic illustrating Consistent Sequences of LAC and VERP Frameworks for Planning and Management.

more complicated and has implications they needed to address. One of the most important and complicated implications is that acceptable conditions are often quite subjective and that to approach a subjective issue in a constructive manner requires an open, participative process,

Both LAC and VERP, when fully implemented, do not end. Those who are applying either LAC or VERP follow a sequence of steps that loop back to each other. Each process begins with establishing meaningful management objectives and then choosing relevant physical, biological, and social indicators of change or condition. Once indicators are selected, standards of acceptable conditions are established. Subsequently, actual conditions are monitored to determine where those conditions meet acceptable standards. The actual sequence of monitoring and standard-setting may vary according to the needs of a particular application. In some situations, those involved in the process may decide to monitor conditions prior to selecting standards.

Indicators are defined as any component of the natural setting that changes in response to a process or activity of interest. Some potential indicators are better than others (Figure 11). When considering the effects of recreation, an indicator's condition provides a gauge of how and where recreation has changed a setting.

A standard is a specific condition of an indicator or a rate of change in an indicator's condition. Standards typically represent the limit of acceptable conditions. When this limit is reached, a management action will be taken. At times it is possible to select likely actions in advance so that people know generally what to expect. Good standards, produced with public involvement, establish commonly shared and unambiguous statements of when resource conditions become unacceptable and what will be done if this occurs.

Each framework, applied successfully, requires a commitment to apply an involved process so as to grapple with complex issues. The complexity of both frameworks are their greatest asset and weakness. Each framework also has potential drawbacks compared to the other. LAC, for example, has been misapplied by some who ignored the importance of an open, public process. VERP, on the other hand, is based largely upon the concept and terminology of *carrying capacity*. Although VERP's text clarifies that its authors' intend a broader defmition, the phrase "carrying capacity" remains easily misunderstood as implying that the number of visitors is more important than how or where they act.

Because it is difficult to clarify the all too easily misunderstood ideas associated with the carrying capacity concept, a planning model based upon the terminology of carrying capacity begins from a disadvantaged position. For many people, the idea of a carrying capacity suggests a need to focus attention on the number of people visiting an area, perhaps according to categories of activity such as horse riding or hiking. For some people, it follows that one should pursue restrictions on that number or pursue other forms of regulatory responses as a key management tool, as opposed to treating restrictions as simply one of many tools that have individual advantages and disadvantages that depend upon specific situations. VERP documentation defines carrying capacity more carefully than the erroneous understandings just described. Nevertheless, for at least some and possibly many people, even those attempts at clarifying the meaning of carrying capacity are likely insufficient to overcome a tendency to attach apparently implicit definitions. For these reasons, VERP risks problems that LAC does not.

INDICATOR CRITERIA	CONSIDERATIONS
Quantitative	Can the indicator be measured accurately?
Relevant	Does the indicator change -according :to th-e process or activity of interest?
Feasible	How complex are the measurements? Can the measurements be taken by availabfe personnel? can the required measurements be taken within: available funding limits?
Reliable	How precise are the measurements? Will different individuals consistently obtain similar data when measuring the same indicator?
Responsive	Will management actions affect the indicator? Will visitor actions affect the- indicator?
sensitive	Will the indicator. reveal change..occurring-in one sampling cycle?
Integrative	Does the indicator reflect only its condition or is its condition i-elated to that of other, perhaps less feasi bly measured, elements?
Significant	Does the -indicator reveal relevant environ:mental:or social conditions?
Accurate	Will the measurements be close to the indicator's true condition?
Understandable	Is the indicator understandable to people who do not have specialized training in monitoring of natural areas?

Figure 11 Criteria for Selecting Indicators of Resource Condition.

Carefully applied, both LAC and VERP offer a framework for decisions about the Park's backcountry. As a priority for backcountry stewardship, the Park will discuss, select, and adopt a decision framework as the means to ensure that decisions affecting the backcountry or its visitors are continuously consistent.

- **Implement a Process for Taking Management Actions Based on Indicators and Standards of Acceptable Conditions that are Established in a Participatory Manner Open to the Public and All Park Employees.**

  Effective actions are more likely when one has indicators to show whether progress is occurring and conditions are conserved or, where necessary, improved. In addition, one way to ensure that indicators capture relevant conditions and that proposed management actions do not have hidden costs is to promote participation among all those who might be affected.

Monitoring program. Effective stewardship requires monitoring to know whether one's actions are producing desired results. Regardless of whether a decision framework is applied, monitoring is necessary in order to know if backcountry conditions are improving. By monitoring, one can assess the effects of management actions. A monitoring program also allows one to predict future conditions with greater accuracy, thereby anticipating future problems and preparing to defend actions proposed to offset those anticipated problems. To accomplish this work, however, one must carefully plan and design a monitoring program (Figure 12, page 84).

By monitoring conditions of indicators, one provides quantification of those conditions. A monitoring program typically has raters measure conditions at different locations and, eventually, at different times. One then compares those conditions so as to note change. In an LAC or VERP process, monitoring allows one to gauge the effectiveness of management actions, to "see" backcountry conditions, and to anticipate future conditions. Effective monitoring must be well-designed, efficient, and scientifically valid. Monitoring projects should include a component to assess and report rater consistency. With an understanding of rater consistency, it is possible to understand and interpret assessments.

Several monitoring methods exist that are applicable to certain types of questions. Examples include *surveys* of people's opinions, *assessments* of physical or biological conditions, *prescriptive worklogs* to determine work necessary to repair or maintain a trail or camping area, and *coincidental assessments* completed as work or maintenance is completed.

Any effective monitoring program must have seven specific components (Figure 13). Depending upon one's intent for the program and characteristics of the local area, some monitoring programs may include other components as well.

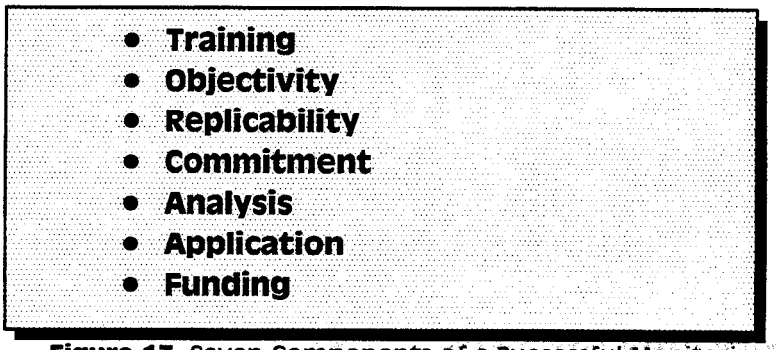

Figure 13 Seven Components of a Successful Monitoring Program.

Training promotes consistency among raters, and consistency is required for reliable data. Without consistent raters, one can confuse real change with the effect of differing opinions among raters. Without good data, monitoring results become suspect. An exceptionally simplified monitoring program might reduce complexity, but the cost is a loss of accuracy, sensitivity, and reliability, meaning the information is not sufficient for any difficult management decisions. Training, then, ensures more consistent findings from different raters and leads to more precise monitoring results.

Objectivity is also important. Both assessment and analysis must be completed without bias or prejudice. Programs operated with a real or perceived bias can threaten or destroy the work's applicability. Political agendas among the raters or among those analyzing the data make the results suspect and can convert an open and scientifically designed program into a squabble about issues unrelated to the backcountry or its care.

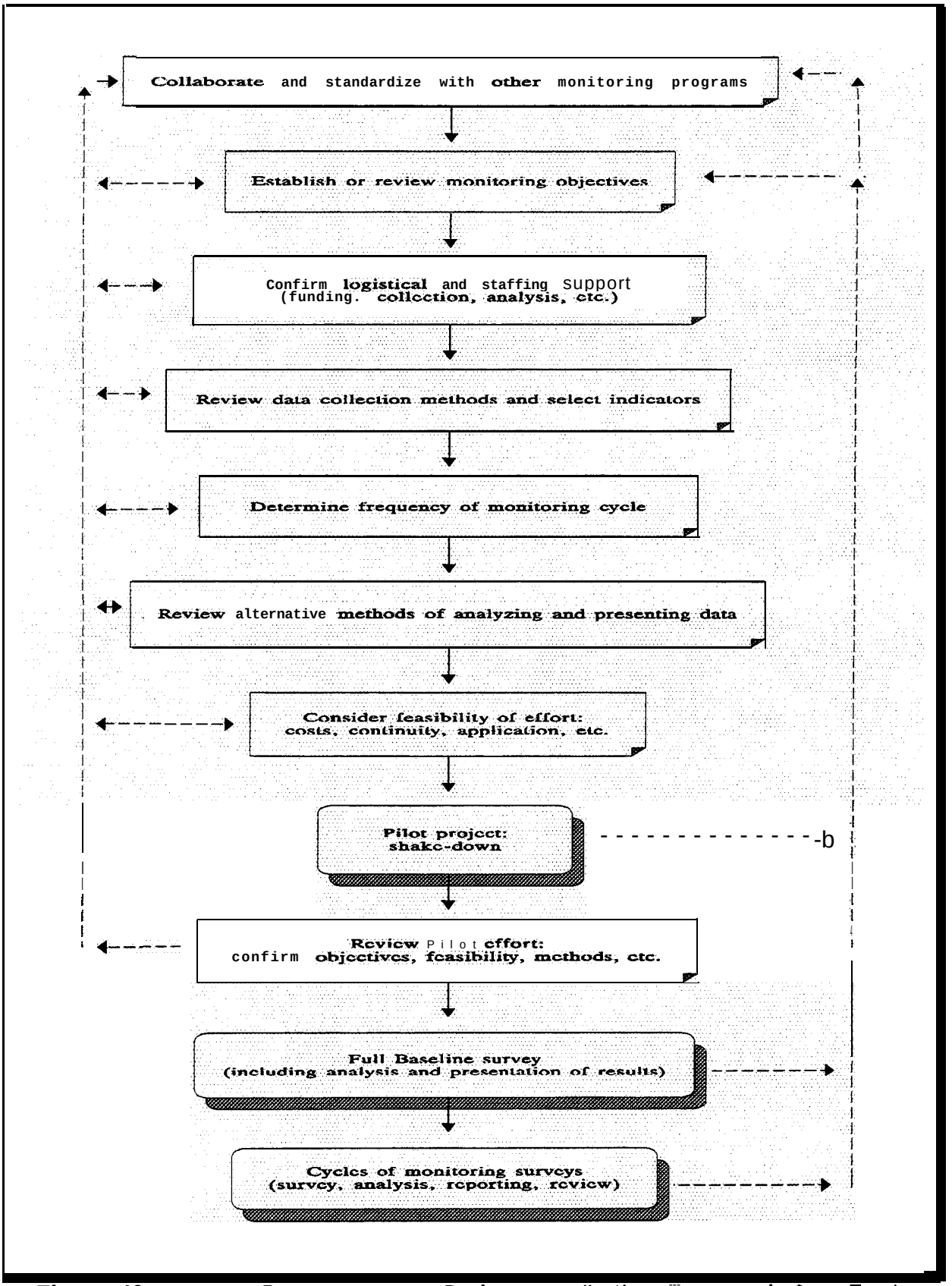

Figure 12 Monitoring Program Planning, Design, and Application. sequence is from Top to Bottom. Reflective Loops Emphasize Careful Design and Administration (left) Combined With Field work and Application (right).

To compare conditions at different times, a monitoring program must also be **replicable, a** fundamental aspect of the scientific method. Changes in condition can be quantified validly only if raters apply consistent procedures each time and in each location. Surveyors must apply extremely similar or identical methods to detect actual changes in condition. A carefully designed method can remain comparable to a previous, slightly different one, but great differences between methods lead to questions about whether the same items were measured.

All monitoring efforts require **analysis.** At times, data are collected when there is no means to assess it. Analysis requires a person with time, statistical expertise, and equipment. Monitoring is only as good as the analysis.

Commitment-- both short-term and long-term-- is necessary for a monitoring program to produce valuable information. Raters should work for extended periods so that they become skilled and proficient through practice. Good data depends upon rater commitment. Working one day a week is not enough to become technically proficient. Again, simplification might appear to be an answer, but there are costs such as reliability (eg, precision and consistency). Long-term commitment is also necessary because, with rare exceptions, neither improvement nor damage occur quickly. Unless a program is in place continuously, only part of the needed information is collected. This does not mean it is necessary to assess every trail or campsite every year, instead it means that an appropriate assessment schedule must be continuously applied.

One way to guarantee commitment is to ensure that a monitoring program has a clear **application.** As examples, a monitoring program can serve as fuel for a decision process such as LAC or VERP. It could also serve as a means to assess management actions such as trail or campsite maintenance, informational programs, or restrictions on visitors or their activities. One of the most useful applications, however, is when such a program provides people with information necessary to anticipate future conditions and to defend actions to offset anticipated conditions that are impairments of a park's purposes (Duinker 1989). A monitoring program is unlikely to be supported unless it is clearly part of either a decision process or management actions. Monitoring without application serves little purpose. One can apply a monitoring program to decide locations where management actions are needed or to assess the effectiveness of a particular action.

Another necessary component of an effective monitoring program is **funding** in the form of budgeted monies or donations. Even if raters volunteer their services, an effective monitoring program requires funding or donations because someone qualified must spend time coordinating the work, compiling the data, and analyzing the results. Equipment is also needed, such as survey tools, computers, software, paper, and pencils. Without adequate funding, a monitoring program will not produce desired or applicable information.

A carefully designed and applied monitoring program is essential for backcountry stewardship. Such a program allows one to assess current conditions and anticipate future ones. The Park will establish a monitoring program to assess the backcountry setting, visitor opinions regarding setting conditions and their opportunities for enjoying that setting, and the effectiveness of stewardship actions at offsetting the effects of visitors.

- **Establish a Scientifically Designed Monitoring Program to Study Biological, Physical, and Social Effects on the Backcountry of Management Actions and Visitor Activities.**

  A monitoring program supplies information to those who are applying decision frameworks. Such a program ensures consistent and objective understanding of backcountry conditions, how those conditions are affected by visitors and stewardship efforts, and what future conditions may entail.

Comprehensive and Integrated Trails and Backcountry Program. Backcountry stewardship addresses the setting with its character and contents and the opportunities available from the setting. Many resources are available to provide comprehensive stewardship. Each resource, however, is strengthened when it benefits from other compatible efforts. Effective stewardship, therefore, integrates those resources to compound the value of each.

To be comprehensive, such a program must have each of three components and some means must be available to integrate those components (Figure 14). Training is essential because it supports the remaining three components and promotes consistent work standards. Professional

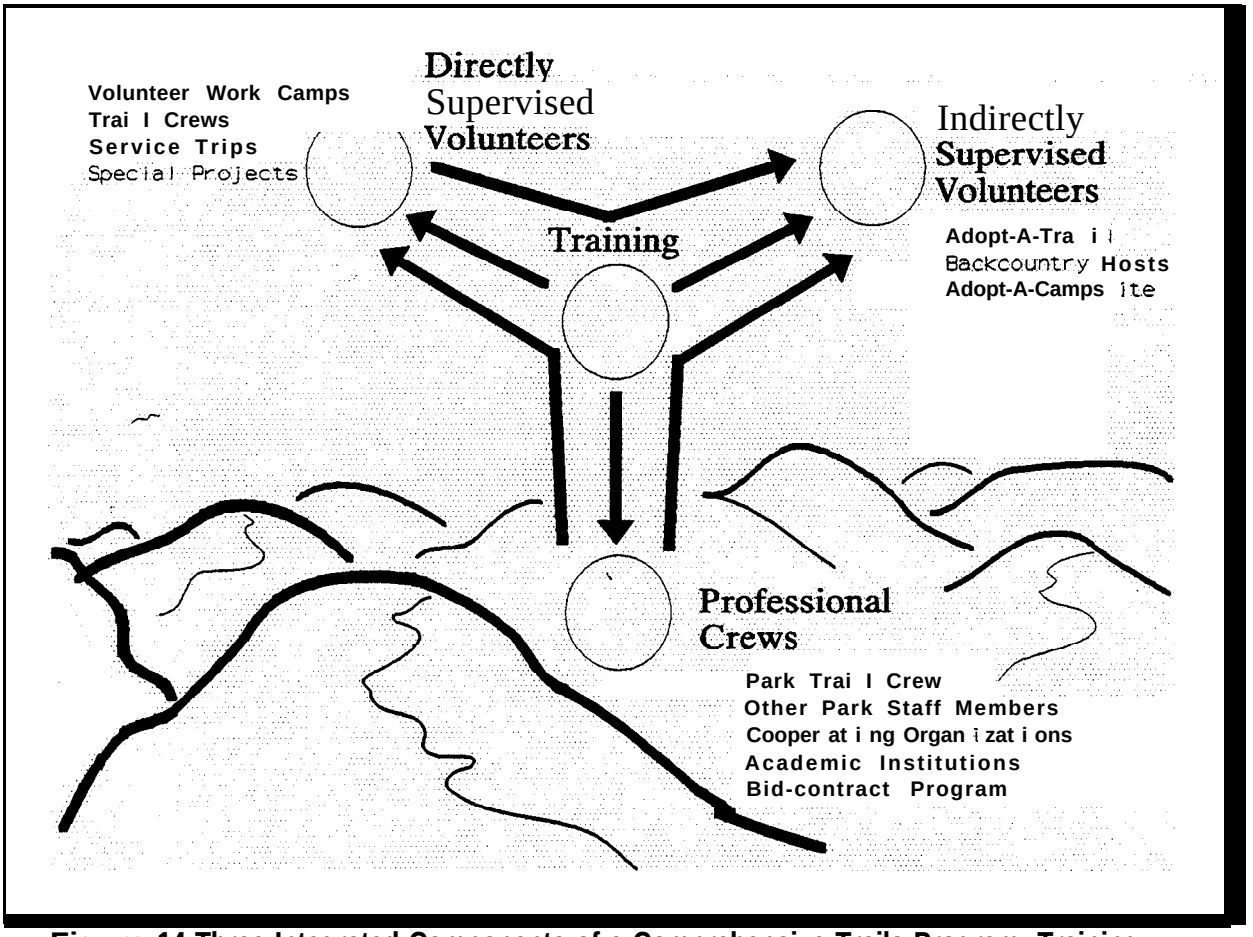

Figure 14 Three Integrated Components of a Comprehensive Trails Program: Training, Professionals, and Volunteers (both indirectly and directly supervised).

trail maintenance is another crucial component because individual professionals can supervise the efforts of others and ensure consistency. This component includes the Park's Trail Crew, and might also include professional Trail Crews of some cooperating organizations, and faculty or students of academic institutions. The third category is volunteers, whether directly or indirectly supervised.

Coordination between components of the proposed backcountry program is essential. An integrated program should comprehensively attend to the Park's backcountry and its needs. Means must be available to establish priorities for trail work, identify concerns at campsites, and balance personnel and funding between shelters, campsites, and trails. These efforts should consider the Park as a whole, not as Ranger or Maintenance Division districts. Resources should be directed to the Park's highest priority problems. To be most effective, a backcountry program must include opportunities for the public to participate. Members of the public should feel able to contact Park staff members with suggestions or concerns about the backcountry. A Backcountry Stewardship Coordinator and a Volunteer Project Coordinator, together with a revised committee structure, can provide for this need.

Several alternatives are available to fulfill needs within each of the proposed program's three components. **Training** is the core that holds a comprehensive program together. It provides direct support to professional and volunteer efforts and ensures consistency in skills and techniques. Examples of existing training opportunities include the Student Conservation Association's (SCA) Wilderness Workskills Program and the Appalachian Mountain Club's (AMC) Trail Skills Program. The Appalachian Trail Conference's (ATC) Konnarock Trail Crew provides another possibility, although it is not designed as a training program. Currently, the Park's Trail Crew provides training for volunteers, especially chainsaw safety and operation. A mixture of Park Trail Crew's training programs and external training would ensure that skills are current and shared by all those who are working on the Park's trails.

Professional efforts can assure that technical skills and proficiency are available for demanding projects and to supervise volunteer efforts. Within the Park's professional Trail Crew, several needs are apparent. The primary need is to retain a core of skilled trail workers within the Park's staff. Such a core group of people allows for necessary supervision and training of volunteers, and coordination and standardization between the professional effort and that of volunteers. The second greatest need for the Trail Crew is a continuous broadening of skills needed to reconstruct and maintain the Park's trails. With a volunteer effort properly in place that can take responsibility for less technical yet more time demanding work, the Park's professional Trail Crew can direct their effort towards more technical and remote projects. In completing these projects, the Trail Crew can benefit from familiarity with skills and techniques successfully applied elsewhere.

Enhancement of professional Trail Crew efforts can also occur through projects with cooperative organizations. The Park's Trail Crew and crews from other organizations can share their skills with each other. Together, they can adapt techniques to the Park that are successfully applied in other places. In some cases, a particular trail crew may have specialized skills they can bring to the Park, completing a project either as a demonstration or because there is a specific

need. Examples of cooperative organizations include the ATC, the SCA, the California Conservation Corps (the C's) (similar programs exist in several states), and the AMC. The Park's Trail Crew would play a crucial role with expanded cooperative trail maintenance, for they are best suited to provide guidance and supervision to ensure that the work is as expected.

Expansion of professional efforts might also include a Bid-Contract program. With such a program, Park staff members document a project's specifications and then advertise it. The Park's contracting officer accepts bids and then lets a contract. Such a system is dependent upon the skills of the project supervisor who sets the project's specifications and administers the project. Members of the Park's Trail Crew, again, can play a central role in such a program because one or more members could serve as project supervisors.

Volunteer-oriented efforts can be central to successful implementation of a comprehensive and integrated backcountry and trails program. Several forms of volunteer programs are possible, including directly supervised and indirectly supervised efforts. Either Park staff members or employees of cooperating organizations could supervise volunteer efforts.

One means of supporting such efforts are volunteer work camps, such as those operated successfully in several locations by the US Forest Service, the ATC, the SCA, and the AMC. Such camps typically provide a staging area for supplying work teams with tools and rustic accomodations. A camp might be permanently constructed or it could be mobile if wall tents and support vehicles provide necessary accomodations (showers, bathrooms, kitchen, tool cache, and sleeping quarters). Mobile work camps might work best in the Park because they could rotate to different areas either on a regular basis or as needs arise. By establishing portable camps, one would reduce the commuting time of work crews and allow more work to be accomplished. Permanent work camps, however, might be constructed in one or more locations on each side of the Park. Other opportunities could stem from greater cooperation with the Job Corps operation located within the Park and near Cherokee, NC. For example, Job Corps participants might serve as Trail Crew members or leaders, learning skills and gaining the experience of directing others.

Other directly supervised volunteer programs might include service trips, trail crews, or special projects. Service trips refer to short-term, one to two week, projects attended by volunteers who might live in widely scattered locations but come together to work in an attractive location and to accomplish needed trail work. Examples of organizations currently operating such a program include the AMC, the Sierra Club, and the American Hiking Society. Typically, volunteers pay a fee that offsets the cost of operating the program and they also provide their own transportation to the base camp. Supervision could occur through either Park employees, such as trail crew members, or through staff members of a cooperating organization.

Indirect supervision refers to the lack of supervision while work is being completed. Instead, supervision occurs indirectly by assessing the quantity and quality of work. Members of the Park's Trail Crew may be best suited for the responsibility of indirectly supervising such efforts. Indirectly supervised volunteer efforts might include Adopt-A-Trail, Backcountry Hosts, and Adopt-A-Campsite. Several examples of Adopt-A-Trail or Backcountry Host programs exist, including a currently operating Adopt-A-Trail effort in the Park. During background work for

this document, no examples of an Adopt-A-Campsite program were identified anywhere in the country, but the idea seems appropriate for the Park.

An Adopt-A-Trail program is typically oriented towards routine and basic trail maintenance, such as clearing windfelled trees, cleaning drainages, and identifying locations where more complicated work is needed. Adopt-A-Trail volunteers often select or are assigned one trail or section of a trail as their responsibility.

Backcountry Hosts, on the other hand, often work along any number of trail sections providing information to visitors about trails, backcountry recreation, and wildland ethics. Horse riders serving as Backcountry Hosts, for example, might station themselves at horse camps to talk with other horse riders about the Park and what they can do to help conserve the trails. Likewise, hikers serving as Backcountry Hosts might rove along sections of a popular trail to serve as a contact should any visitor wish to ask questions. A Backcountry Host program would provide an additional avenue to distributing specially tailored informational and educational materials to backcountry visitors.

An Adopt-A-Campsite program could coordinate volunteer maintenance of designated campsites. Responsibilities might include eliminating any unnecessary campfire rings, removing trash, identifying hazardous trees, or rehabilitating portions of the area.

The diversity of the three proposed indirectly supervised volunteer programs reflects specific Park needs. Coordination of these volunteer efforts with the professional efforts is essential for successful implementation of the proposed Comprehensive and Integrated Trails and Backcountry Program. Consistent work standards and techniques must be taught, priorities established, and logistical needs addressed. Training programs, supervision, and coordination are critically important. In addition, Park staff members can benefit from inviting the participation and cooperation of outside organizations as this comprehensive program is implemented. By working together, more ideas and resources can be brought to bear on an issue or project.

A well designed, comprehensive trails and backcountry program is indispensable for improving the Park's trails. The Park will begin careful and incremental implementation of such a program.

- **Establish a Comprehensive and Integrated Trails and Backcountry Program that Combines the Strengths of Park Employees, Volunteers, and Cooperating Organizations in a Joint Effort to Provide Stewardship to Backcountry Trails, Campsites, Shelters, and Visitors.**

  Backcountry stewardship requires hard work from both volunteers and professionals. Coordinating all backcountry efforts to efficiently utilize the available resources is vital to successfully improving the Park's trails.

Backcountry management. Stewardship is a form of management and administration that requires guidance and coordination, especially in Great Smoky Mountains National Park where the backcountry is popular and efforts to care for it are diverse and complex. Currently, the Park's backcountry management efforts are handled by two administrative committees with some overlap and some public participation. In addition, multiple efforts, including at least one program within each of four Park Divisions, attend to backcountry maintenance and field work. For example, the Maintenance Division operates a Trail Crew; the Visitor Services Division provides maps, other sources of information, and opportunities for education; the Ranger Division operates the Park's Adopt-A-Trail program; and the Resource Management and Science Division attends to non-native plants and problematic animals that at times are in conflict with backcountry recreation.

Diversity among the Park's backcountry operations and the interest and involvement of the public in this project suggests that either the current structure of committees should be refined or, in addition to refining that structure, a position should be established to coordinate backcountry efforts throughout the Park. Insufficient discussion occurred during this project to select a specific action. It is possible, however, to provide background information so a more thorough discussion can occur.

The Park's Backcountry Use Committee (BUC) is comprised of the five District Rangers and representatives from the Resource Management and Science Division and the Visitor Services Division. Recently, the individual filling the new Volunteer Project Coordinator position began attending the meetings as well, although not as an official member. The BUC is chaired by one of the Park's Resource Management Specialists. There is overlap between the BUC's functions and those of the Appalachian Trail Management Committee (ATMC) because issues or concerns associated with the AT are also associated with the backcountry and, at times, awkward to handle separately. The ATMC, in contrast with the BUC, has some limited public representation because representatives of the Smoky Mountains Hiking Club attend ATMC meetings.

One alternative to the existing committee structure would involve rolling ATMC functions into the BUC, either by making ATMC a subcommittee of the BUC or by assigning BUC the ATMC's functions without a subcommittee. Additionally, the BUC might become more available for public participation on some regular basis. The new committee might be redesignated the Backcountry Management Committee to emphasize its focus on all backcountry management questions, not just use and regulation.

Another alternative for addressing the need for greater coordination of backcountry management efforts is to establish a Park employee position dedicated to the wide responsibilities of backcountry management and part or all of the Comprehensive and Integrated Trails and Backcountry Program. The planned comprehensive program for improving the trails and backcountry must address at least eleven critical responsibilities (Figure 15). These responsibilities are diverse and essential, and they cross NPS Division boundaries. One alternative for such a position is to establish it as a member of the Superintendent's immediate staff because that is where the Divisional structure joins. As a member of the Superintendent's immediate staff, the position can help facilitate cooperative backcountry management efforts among Park staff members and between the Park and the public. Continued participation by members of the public,

especially horse riders and hikers, demands the attention of a responsive individual.

This is a large set of responsibilities, especially as the comprehensive program continues to grow. The Integrated and Comprehensive Trails and Backcountry Program will likely benefit from the expertise of a Backcountry Stewardship Coordinator. Whether that role is combined with the Volunteer Project Coordinator or is crafted to complement the Volunteer Project Coordinator is an important question that Park staff members must resolve.

A comprehensive trails program, a monitoring program directed towards the backcountry and the opportunities it provides, and implementation of an open, participatory process of making decisions about the Park's backcountry demands careful coordination. Park staff members will consider advantages and disadvantages of several possible staffing or committee configurations. They will then implement a workable means for coordinating efforts to improve the Park's backcountry and trails.

- establishing priorities and pursuing backcountry projects at a Park-wide level
- facilitating implementation of a decision framework for backcountry management
- supervision of .a program to-monitor resource conditions
- integrating backcountry effortsacross all Park 'Divisions
- coordination of training to ensure consistency
- trail relocation lay-out and design
- -compilation of prescriptive maintenance worklogs
- compliance with TUEPA and other legislation
- professional trail work facilitation
- volunteer project coordination
- volunteer 'program operations

Figure 15 Eleven Responsibilities of an Integrated and Comprehensive Trails and Backcountry Program.

. **Establish the means to effectively coordinate and administer the proposed growth or changes in backcountry management and maintenance efforts.**

Successful implementation of a backcountry program that integrates existing and proposed efforts requires coordination. Several alternatives are available and Park staff members should discuss possibilities in light of any present opportunities and any existing or likely constraints.

Goals of Integrated Backcountry Management

The final elements of the management direction for improving the trail system are proposed goals that emphasize integration of efforts. Because goals are more specific than priorities, they help promote a consistent heading by broadly stating what one is striving toward. Goals focus the Vision's direction and give substance to the priorities. The following goals reflect the interests, issues, and concerns of Park employees and members of the public who have been involved in this effort. As with previous material, the goals are presented within the three categories of setting, opportunities, and stewardship.

Setting

According to discussions that occurred as part of this project, certain contents or qualities set the Park's backcountry apart and make it special. Goals for the setting express the interest in conserving those qualities for future visits and other visitors.

- **Control or eliminate non-native plants and animals.**

  Non-native plants and animals can disrupt an otherwise fairly balanced system, as when wild hogs root up a trail or a non-native weed chokes out native grasses or wildflowers. NPS efforts to control such plants and animals have been in place for some time and are on-going.

- **Ensure that water remains unpolluted, free of contamination and subject only to natural processes.**

  The backcountry's health-- its fish, birds, and wildflowers-- depends on water, as does the health of backcountry visitors and, if they have any, their stock animals. Horses require good water, just as hikers require fresh water.

- **Reduce the intrusion of unnatural noise and pollution to the lowest levels possible.**

  Some of the backcountry's greatest assets are the relative absence of technologically produced noise and trash, and the presence of fresh air. Bird songs, babbling streams, rain drops, and other natural noises combine to produce opportunities for an experience that can be memorable. For many people, however, that experience is easily lessened if previous visitors have left litter, trash, or improperly disposed human waste. Unnatural noise can also detract from an otherwise enjoyable experience, especially in remote locations. Likewise, the backcountry's contents and character can be greatly altered-- one's opportunities for enjoyment lessened-- when air pollution damages trees, reduces views, or affects a person's health.

Opportunities

The Park's backcountry setting provides opportunities for enjoyment. Specific opportunities make the backcountry important to people. The following goals reflect the continual need to provide and conserve those opportunities.

- **Provide well designed, constructed, and maintained trails and sanitary shelters and campsites that offer opportunities for simple recreation and that do not change the backcountry more than the least amount necessary.**

  Trails and campsites offer the simplest means of accessing the backcountry and enjoying it. A system of trails and campsites ideally complements an area's content and character, minimally alters natural processes, and offers a challenging yet safe way of exploring.

- **Educate and encourage backcountry visitors to leave no trace of their presence or passing.**

  One way of reducing the maintenance burden, enhancing opportunities for enjoyment, and conserving an area for others in the future is to leave no trace of one's visit. Informational and educational efforts oriented towards promoting this idea are essential.

- **Provide visitors with opportunities to participate in interpretive programs that emphasize the backcountry's special qualities, its parts, and how those parts interact.**

  The Park's backcountry is a tremendous resource for learning and many current programs recognize this resource. Continuing and, where possible, expanding the opportunities will encourage enthusiasm toward the backcountry and an understanding its wonders.

- **Provide every opportunity for visitors to experience simple recreation that features a natural and undisturbed setting, solitude, and a physical and mental challenge.**

  Perhaps the most common way for a visitor to enjoy the backcountry is through simple recreation, such as hiking, walking, horse riding, or camping. For people to willingly volunteer their time and labor to care for the Park, opportunities for such recreation must be protected.

- **Allow no evidence of controls or restrictions except the minimum necessary to protect backcountry features and provide opportunities for simple recreation.**

  Even simple recreation can impair an area and lead to a loss of current or future opportunities. At times, controls or restrictions are necessary, but only when natural processes or recreational opportunities are threatened. Where necessary, they should be as transparent as possible so as not to interfere with the backcountry's processes or its visitors' enjoyment.

Stewardship

The backcountry setting and its opportunities require stewardship if they are to remain available for future visitors. Goals associated with stewardship are perhaps the most essential, for they articulate the means of caring and form of that care.

- **View the issues facing the Park and its backcountry not as individual problems, but as integrated concerns of all Park operations, as well as of visitors, volunteers, and local residents.**

  Many people care about the Park and its backcountry and when needed are willing to offer their assistance, ideas, or labor. Park staff members can benefit greatly from the ideas and efforts available from members of the public. A comprehensive perspective on the backcountry and its stewardship has been applied during this project and should continue.

- **Apply the minimum tool, equipment, regulation, or technique necessary to construct, reconstruct, or maintain the system of trails, shelters, and campsites, as well as other components of the backcountry.**

  Conserving natural processes while providing opportunities for enjoying the backcountry require a careful approach to management, construction, maintenance, and regulation. The minimum tool that will complete the job without compromising the reason for doing the job is the tool that is appropriate. regardless of whether it is motorized or not. Justification for selecting one tool over anther should be well thought-out and explicit about how any likely concern will be mitigated.

- **Understand both the effects of visitors and the effectiveness of actions taken by Park employees.**

  Every visit, regardless of activity, to any backcountry, regardless of location, changes that backcountry to some degree. The same is true for actions taken to offset the effects of visitation. Understanding those effects, how long they last, whether they are an issue or concern, and to whom they are an issue or concern is necessary for comprehensive backcountry management. Only with such an understanding can knowledgeable people make fair and intelligent decisions in an open, participatory manner.

- **Reduce the effects of people and their activities on the backcountry's character and contents so that the only changes from otherwise natural conditions and processes are those minimally necessary for simple recreation.**

  Simple recreation leads to change and some changes are undesirable for one reason or another. One can, however, often offset an undesirable change with maintenance and reduce future change with different behavior. By reducing the effects of simple recreation and offsetting those that remain, the Park's backcountry will remain available unimpaired for future generations.

- **Proactively and aggressively disseminate information to local media about Park efforts that is not restricted to actions or problems, but that solicits positive, educated public involvement as well.**

  Stewardship benefits from a knowledgeable and supporting public. Current efforts to inform the public have enhanced the-efforts of this project and should continue.

- **Integrate the efforts of Park staff members and volunteers.**

  Oftentimes, volunteers can amplify or complement the work of Park staff members. Integration of all efforts to care for the Park's backcountry is crucial. Without integration and coordination, however, those efforts are unlikely to realize their potential. A current emphasis on coordinating the work of volunteers and Park employees such as Trail Crew members should be expanded.

- **Involve the public in an open, participative effort to identify, clearly define, and respond to the issues and concerns facing the Park and its backcountry.**

  The Park's backcountry, trails, and campsites need help from those who enjoy them. Simply offering good, constructive ideas about issues, concerns, or their mitigation is one of the easiest and most meaningful ways to help. Continuing the open, participatory effort to involve members of the public in the care and management of the Park's backcountry will benefit both the Park and those who enjoy it. By welcoming more people into efforts to care for the Park, broader support is likely.

- **Implement a continual, iterative process to define limits of acceptable conditions based on indicators of backcountry condition and standards of acceptable condition reached through an open, public, and participative process.**

  An on-going process based on a decision framework and open to those involved in caring for the Park is necessary for the backcountry's long-term health. Without a formal process, decisions may appear haphazard and changes in Park administration or personnel can produce disconcerting changes in the direction of backcountry management. A comprehensible and effective process will constructively respond to external change without loss of direction.

Management Actions

Once the direction of effort is established, prescriptive management actions will be implemented as resources permit. The Vision, priorities, and goals state the desired direction, but they also allow the Park and others to select actions that are consistent with that direction. The material that follows contains specific objectives for an integrated backcountry management program and modifications to the existing system. These categories of actions reflect the broad direction of this document. The goals are to increase the capacity to maintain the system, increase the understanding among visitors about how each person can help reduce the effects of recreational activities, increase the opportunities for enjoyment provided by the system, and decrease the demand for maintenance.

This document's direction and the actions that follow stem from an understanding of the current situation. It reflects the ideas of those who participated in discussions during with this project, the limits and latitude provided by applicable legislative mandates, and the backcountry's contents, character, and opportunities as understood from the best information available. Each action is believed part of a sum that alters the current equation and moves the Park's backcountry contents and character in a widely desired direction. The consequence of failing to implement any single action is unknown, but the consequence of failing to move in the stated direction is more clear: continued decline in the quality of the backcountry.

Objectives for an Integrated Backcountry Management Program

Any comprehensive effort to administer a complex situation will benefit from objectives. Ideally, objectives provide such an effort with realistic and relevant targets. Each objective should be phrased in terms that are easily translatable into action and that allow progress to be assessed. A useful objective is unambiguous, quantifiable, and time-bounded. If the dimensions of an objective are clear, it becomes more obvious when the objective is attained. If the desired time period for attaining an objective expires, a clear, initial statement of the objective makes it possible to know whether the objective remains realizable or why it has become unrealistic or irrelevant. Once a desired objective is reached, Park staff members can then return to their goals for integrated backcountry management and, with appropriate participation and discussion, establish a new objective, if necessary. Accomplishment of an objective will most likely occur if an individual or group is assigned responsibility for its fulfillment. As in previous sections of this document, the objectives are organized according to the backcountry's setting, its opportunities, and stewardship efforts toward it.

Setting

The backcountry setting provides opportunities for enjoyment and requires the efforts of stewards if it is to remain unimpaired. Objectives associated with the setting, then, directly address the contents or character of the backcountry.

- **Within three (3) years, reconstruct all existing drainages and install all necessary new drainages on all trails maintained for horse riding.**

  The greatest need for the Park's trail system is stabilization to arrest any continued decline. Drainage provides the foundation for a stable system. By initially focusing on trails maintained for horse riding, one addresses the majority of the system (65%, 517 miles). In addition, compared with hiking, horse riding is the activity with the greatest potential to impair the system. By offsetting some of the activity's effects, the system's present decline is more likely to slow.

- **Within five (5) years, reconstruct all existing drainages and install necessary new drainages on all trails maintained only for hiking.**

  Again, the greatest need is to stabilize the system and drainages provide the basis for a sustainable trail system. Accomplishing this objective in conjunction with the previous one will ensure that the entire trail system is adequately drained and maintenance efforts, as opposed to reconstruction and installation, can take over completely.

- **Within three (3) years, initiate an integrated effort of rehabilitation and education towards the goal of containing visitors to trails in popular or sensitive locations.**

  By staying on trails in popular or environmentally sensitive locations, visitors help minimize their effects. Effective techniques will likely include low rubble scree walls, rehabilitation, and revegetation. Assistance from volunteers will benefit these efforts.

- **Within three (3) years, obliterate the first and last 1/4 mile of all "manways" and other non-maintained, informal trails in the Park.**

  "Manways" constitute an unofficial system of trails. They are not maintained, so, where erosion or other examples of poor trail conditions appear, the conditions represent unconserved Park resources and continued impairment. In addition, they are potentially hazardous. Visitors have become lost or injured as a result of inadvertently turning onto a manway. By obliterating the beginning and end of each manway, the likelihood of continued access is minimized and the remaining section should recover naturally. This objective assumes open, frank discussion about whether particular manways belong as part of the formal trail system.

- **Within five (5) years and every five (5) years after the initial effort, reconstruct, relocate, or close the 20 miles of the Park's trails that are in the worst physical condition.**

  One way to improve the ability to maintain a trail system is to stabilize its worst trails, improve their location, or close them. Many of the worst trails in the Park today are identified in Marion's (1994) work. Additionally, the final section of this document contains planned modifications to the system. That section also contains a review of the available information concerning many Park trails. The Park will re-visit implementation of this objective every five years.

- **Within three (3) years, implement a cooperative program between Park staff members and volunteers to minimize the presence of non-native plants at grassy balds and other sensitive locations.**

  Non-native plants can greatly alter the setting. Current programs operated by Park staff members to eliminate them can benefit from the assistance of volunteers. Because of the real and potential likelihood that horses contribute to the presence of non-native plants, horse riders are an especially appropriate group to provide assistance.

- **Within three (3) years, install appropriate protective measures at any water source in the Park's backcountry where either horses or hikers are damaging either the water or adjacent soil or plants.**

  Clean water is important for hikers, horse riders, horses, and all the Park's native plants and animals. Protecting water sources helps conserves the Park for future generations and increases opportunities for enjoyment. Criteria for determining appropriateness is discussed throughout this document, but specific decisions depend upon the particular circumstances.

- **Within three (3) years, rehabilitate any and all backcountry vistas judged as appropriate for the stewardship objectives associated with conserving the Park's scenery and providing opportunities to visitors for its enjoyment.**

  The Park's scenery is one of its most characteristic contents. A program to rehabilitate and maintain the historic vistas once available in the Park will be established, provided consensus exists that such vistas are an appropriate component of the Park's backcountry. Insufficient discussion occurred during this project to offer any statement regarding the appropriateness of backcountry vistas. That discussion will occur and is an objective for Park stewardship.

Opportunity

Opportunities for enjoying the backcountry require a conserved setting and the efforts of stewards if current opportunities are to remain unimpaired for future visitors. Objectives associated with backcountry opportunities, then, ensure opportunities for knowledgeable, responsible enjoyment of the backcountry.

- **Every six (6) years, openly and publicly evaluate the trail system and the program of maintaining it to identify where problems exist and what options are available to address them.**

  The Park's backcountry trail system provides tremendous opportunities for enjoyment. A continual, regular effort is needed to assess the system and where opportunities for enjoyment could be further realized. This effort will be coordinated by the Backcountry Stewardship Coordinator and the Backcountry Use Committee.

- **Within two (2) years, openly and publicly evaluate the need for all present campsites and shelters, the need for any additional designated camping areas, and any concerns associated with either existing or potential locations for staying overnight in the backcountry.**

  Like the trail system, the network of camping areas and shelters also offers opportunities for enjoyment. Following Marion's (forthcoming) assessment of campsite conditions, an open and public evaluation of all present campsites and shelters will occur. That evaluation will include discussion about the appropriateness of each camping area and shelter and whether any new camping opportunities should be established. It will also identify any concerns associated with existing or potential camping areas and propose actions to resolve problems.

- **Within three (3) years, provide backcountry visitors with a renovated backcountry campsite and shelter reservation system that (a) serves identifiable purposes, (b) is sufficiently staffed with Park employees and volunteers to serve those purposes, (c) is accessible to visitors, and (d) is simple to operate.**

  Park staff members operate a backcountry campsite and shelter reservation system that has evolved over several decades. Although it is an essential component of the current backcountry management effort, this project did not attempt to produce specific actions related to the reservation system because of the its complexity. This objective reflects the four concerns most relevant to the system.

- **Within three (3) years, establish an interpretive program throughout the Park, oriented toward the backcountry, and with the purpose of educating program participants about backcountry components and activities.**

  The Park's Interpretation and Visitor Services Division has recently initiated an effort to provide even more current services to Park visitors. This objective relates to the backcountry component of their effort.

- **Within three (3) years, establish an integrated and participatory means of coordinating, evaluating, and distributing educational and interpretive information pertaining to trails, shelters, and campsites.**

  The Park's Interpretation and Visitor Services Division has initiated an effort to provide visitors with opportunities to learn more about the Park. The backcountry offers a setting for groups or individuals to learn. The Visitor Services Division offers a means of coordinating educational and interpretive information across all Park Divisions. Any effort to coordinate educational and interpretive information related to the Park's backcountry would benefit from a participatory program of evaluation. Concerns include contents, effectiveness, and distribution avenues. Examples of distribution means include maps, brochures, and displays.

Stewardship

A backcountry setting and the opportunities it provides for enjoyment require stewardship if current opportunities are to remain unimpaired for future visitors. Objectives associated with backcountry stewardship, then, ensure that the backcountry setting is conserved and opportunities for its enjoyment are provided.

- **Within six (6) months, establish priorities for each objective contained in this document and, within one (1) year, designate an individual or group as responsible for realizing that objective.**

  Objectives are most likely fulfilled when one individual or group is assigned responsibility for its completion. Park staff members will determine the Division, Branch, group, or person who will be responsible for each objective.

- **Within six (6) months, establish the means to effectively coordinate and administer the needs and complexity of current and planned inter-Divisional backcountry management efforts in an open and participatory manner.**

  Integration of existing and proposed programs requires coordination and facilitation. Several means for addressing this need are available, including realignment of the current committee structure and creation of a Backcountry Stewardship Coordinator position to complement the new Volunteer Project Coordinator position. Establishing a Backcountry Stewardship Coordinator position as a member of the Superintendent's immediate staff is the preferred means for accomplishing this objective. Coordination and integration of current programs and their anticipated future growth is the most pressing stewardship need. That need will be addressed carefully and without delay.

- **Within one (1) year, clearly state Park policy regarding backcountry vistas and guidelines for tools, stream bridges, and vehicles in the backcountry.**

  Currently, some Park policies are unclear or loosely defined. Some confusion has occurred as a result. Clearly stating policies and guidelines about backcountry management will more explicitly define its direction.

- **Within two (2) years, produce an extensively revised, technically explicit, and current manual for trail work in the Park.**

  No single Park document exists that contains outlines of NEPA compliance information along with trail lay-out and design, construction, and maintenance guidelines. The materials will be compiled into a single reference manual reflecting Park policy.

- **Within one (1) year, select and apply an open, participatory decision framework applicable to consideration, selection, and assessment of actions to address the backcountry's needs based upon indicators and standards.**

  Several frameworks are available to facilitate comprehensive and comprehensible decisions about a backcountry. Examples include LAC and VERP, discussed earlier in this document. A framework would objectively articulate changes in backcountry conditions and would benefit decision processes and purposes.

- **Within one (1) year, begin implementing a monitoring program-- completed within three (3) years-- to provide objective, replicable, and applicable information to those participating in decisions affecting the Park's backcountry.**

  The advantages and structure of a well designed program to monitor change and anticipate future conditions are described in previous sections of this document. Although one year is insufficient time to design and implement a monitoring effort, a year is sufficient to establish monitoring objectives applicable to the backcountry, assess whether gaps exist in current monitoring efforts, confirm logistical and staffing support, and review data collection methods along with potential indicators. Such an effort will have immediate and long-term advantages to the Park and those who care for it.

- **Within one (1) year, begin compiling *prescriptive maintenance worklogs* for each Park trail based upon its initial priority among all trails.**

  A prescriptive maintenance worklog provides detailed a description of the existing and needed work along a trail (Appendix D). From the description, alternatives for repairing or relocating a route can be compared against redesignating or closing it. This information is crucial.

- **Within one (1) year, provide training to all Great Smoky Mountains National Park Trail Crew members and selected volunteer trail workers in the most current techniques of backcountry and wilderness trail layout and design, construction, reconstruction, and maintenance.**

  Backcountry stewardship begins with trails because trails provide access and opportunities for enjoying the backcountry setting. The Comprehensive and Integrated Backcountry and Trails Program requires the participation of a skilled, knowledgeable group of professional and volunteer trail workers. Training is at the core of this program and it will remain an ongoing need.

- **Within three (3) years, establish a comprehensive program that integrates a training program (begun with completion of the previous objective), professional Trail Crews (National Park Service and cooperative organizations), and volunteer trail workers (indirectly and directly supervised) and has the purpose of reconstructing, constructing, and maintaining the Park's official system of backcountry trails, campsites, and shelters.**

  The preliminary outline of an Integrated and Comprehensive Backcountry and Trails Program is found earlier in this document. It is the means for accomplishing the most immediate work needed along the Park's trails.

- **Within three (3) years, establish a system of basecamps located outside the backcountry for the purpose of providing shelter and supplies to 500-800 volunteers each year, and to crews of cooperating organizations, all working on trails or other backcountry projects in the Park.**

  To fully realize the potential for an expanded volunteer program requires more infrastructure than currently exists in the Park. Basecamps, described earlier, provide an essential component of the needed infrastructure. They will provide a staging area, tool cache, and rustic accomodations.

- **Within three (3) years, establish a well-trained, volunteer-staffed Backcountry Host program to provide informational and educational presence in the backcountry.**

  When members of the Park's Ranger Activities Division established the current Adopt-A-Trail program, they intended the program to provide an informational and educational presence in the backcountry, among other responsibilities. The idea was to have volunteers serve as hosts should a backcountry visitor need or desire friendly assistance. The current Adopt-A-Trail program does not provide an opportunity for individuals who might be more attracted by that original idea than by basic trail maintenance. A Backcountry Host program would restore that opportunity by separating the function from the Adopt-A-Trail maintenance program. More detailed discussion of this and the following objective is found earlier in this document.

- **Within three (3) years, establish a well-trained, volunteer-staffed Adopt-A-Campsite program to maintain the backcountry campsites and shelters.**

  Campsite maintenance is currently overlooked and, in some areas, the Adopt-A-Trail program is overwhelmed by enthusiastic people willing to volunteer their efforts to care for the Park. An Adopt-A-Campsite program would complement the Adopt-A-Trail program and the recommended Backcountry Host program by focusing on campsites and providing another opportunity for people to assist the Park.

- **Every three (3) years, complete a cycle of reviewing, evaluating, and maintaining the system of backcountry trail signs.**

  Backcountry trail signs are a component of the trail system and camping area network. This objective is currently in effect and will continue.

- **Within one (1) year, following open and reasonable discussion, decide whether a second seasonal window in the fall is appropriate for using chainsaws and other motorized equipment in the backcountry.**

  The current spring chainsaw window allows some windfallen trees to remain long enough that by-pass trails form, causing erosion and compaction of soil and damage to vegetation outside the intended trail tread. Discussion should occur about the appropriateness of a second chainsaw window in the fall.

- **Within one (1) year, establish a schedule and priorities for completing modifications to the existing system.**

  Modifications to the Park's backcountry trail system are described in the remaining portion of this document. Park staff members will establish a schedule for implementing the actions. Some actions depend on successful completion of others and the schedule should reflect that interdependence.

Modifications to the Existing Trail System

Accomplishing the objectives requires specific actions. Each action reflects at least one of three reasons. One reason is to reduce the demand for maintenance by redesignating the activities for which a trail is maintained. Another reason is to improve opportunities for enjoyment, as might be achieved by reopening or redesignating a trail as part of the formal trail system. And, lastly, one reason is to repair or maintain a trail, campsite, or shelter.

Each action is the result of extensive discussion. Horse riders, hikers, Park employees, and Conservation Organizations offered their ideas, expressed their concerns, and suggested options. Appendix C of this document contains a listing of the organizations and groups who were approached or who chose to participate in this project. The people who participated in these discussions reviewed Marion's (1994) assessment of trail conditions, suggested where other problems likely exist, and shared understandings about the trail system and what affects its quality. In addition, they explored ideas found in the most current literature about trails and backcountry recreation. Potential means for addressing concerns about the Park's trails and backcountry were discussed and the actions that follow are the result of those talks.

For most of the actions, specific options are not yet selected, Park staff members will complete prescriptive maintenance worklogs for each trail section affected by an action. Information from the worklogs will allow selection of a specific alternative. Once a specific action is proposed, the applicable NEPA compliance work will begin. In many cases, a Categorical Exclusion will apply, but, in some cases, more involved work is likely necessary. The Park may modify specific actions from the descriptions that follow if NEPA compliance work reveals an unexpected need.

Reducing Maintenance Demand

The simplest way to increase the capacity to maintain a system is to reduce the system's need for maintenance. Trails maintained for horse riding require more maintenance and, if a trail is inadequately prepared to withstand the effects of riding, the work necessary to reconstruct the trail can be great. If, in addition, a trail is not located where riders can enjoy it, then the benefits of investing the needed work to repair and maintain the trail for riding far outweigh the costs.

Two of the Park's trails that are currently maintained for horse riding will be redesignated and maintained as hiking-only trails. The effect of these changes is to free maintenance efforts and resources for the remainder of the Park's trail system.

- **Redesignate Brushy Mountain Trail as hiking-only.**

  The Brushy Mountain Trail ascends Mt. LeConte from the Porters Flat area of Greenbrier Cove. It is rarely ridden by horse riders, in part because access and parking are inappropriate for vehicles with trailers. Although the trail is adequate for hiking, it needs much additional work to become again a safe, enjoyable horse riding route. The effort required is better spent on more popular trails that are part of circuit or loop rides.

- **Redesignate Trillium Gap Trail as hiking-only.**

  Trillium Gap Trail ascends Brushy Mountain until it joins the Brushy Mountain Trail. Parking for the trailhead is along the Roaring Fork Motor Nature Trail and is limited for someone with a vehicle and trailer. In addition, the trail needs much trail work, especially to return it to conditions that will sustain horse riding. For these reasons, continuing to maintain the trail for horse riding diverts resources from trails that are more critical to the network of trails maintained for riding. Maintaining the trail for hiking-only will not divert resources.

Improving opportunities for enjoyment

By increasing opportunities for enjoying the backcountry, one can improve the system's quality. Careful consideration is necessary, however, so as not to unduly add to the existing maintenance demand. The existing system has problems and actions to improve opportunities must avoid adding new problems. Each of the following actions require that adequate steps are taken to offset any anticipated effects of implementing them. Those adequate steps constitute the conditional work upon which each proposal is based.

- **Redesignate trails proposed for incorporation into the Mountains-to-the-Sea Trail.**

  The route of the Mountains-to-the-Sea Trail traverses the width of North Carolina. It would enter the Park near Oconaluftee Visitor Center near the Blue Ridge Parkway and the Cherokee Indian Reservation. The route would then cross under Newfound Gap Road in an existing underpass and follow an existing woodsroad to join the Deeplow Gap Trail. It would then ascend towards Newton Bald and Thomas Divide, traverse to Sunkota Ridge and descend to Deep Creek Trail. It would finish by ascending to Fork Ridge Trail, climbing to join the Appalachian Trail, and traversing to Clingmans Dome. The redesignation would not affect any current trail designation or maintenance category. Some trail work is necessary to establish the route along the existing woodsroad near the Cherokee Indian Reservation.

- **Redesignate trails proposed for incorporation in the proposed Benton MacKaye Route.**

  The proposed Benton MacKaye Route parallels the Appalachian Trail below the ridge, offering an alternative low elevation route connecting either end of the AT in the Park. The proposal associated with the Route does not include any alteration of existing designation or maintenance category.

- **Connect Noland Divide Trail with the Appalachian Trail.**

  The upper end of Noland Divide Trail ends at the Clingmans Dome Road, approximately 200 yards from the AT. This gap will be bridged. The new section of trail will be designed and maintained for hiking-only because the AT, in that section, is hiking-only.

- **Install a connector trail between Ace Gap and Cane Creek Trail [conditional].**

No connection exists within the Park between Ace Gap, where Ace Gap Trail and Beard Cane Trail intersect, and Cane Creek Trail on the other side of Hatcher Mountain. This area is popular for horse riding and the trails are well designed, built, and maintained for riding. Currently, riders exit the Park and traverse private land to connect the two trails. However, work by Park Rangers, Park Trail Crew members, and the author of this document located a viable route within the Park boundary for resolving this situation. The route follows several old railroad grades along Hesse Creek, Johns Branch, and the lower portion of Johns Ridge before ascending along a short traverse of a steep slope to crest Johns Ridge. Much of the remaining portion of the route then follows an alignment laid out by Park Rangers that is expected to require only basic installation such as tread clearing and benching and corridor clearing. The final two to three tenths of a mile descending to Cane Creek Trail will follow the existing alignment of an abandoned woodsroad. The trail should be designed and constructed to accommodate year-round horse-riding [wide, well drained tread within a corridor free of brush]. The estimated distance of trail added to the Park's formal trail system is between four and five miles. Most of that distance would follow old railroad grades. The availability of personnel and funding to complete the needed work remains the primary condition for implementing this action.

- **Reopen the Greenbrier Pinnacle Trail [conditional].**

The Greenbrier Pinnacle Trail ascended the southwest slope of Greenbrier Pinnacle to reach the former site of a firetower. It is approximately 2.5 miles long. When open, it provided a hiking-only access trail with views and other attractions. It was closed to offset the addition of the Old Settlers Trail and the maintenance burden of its mileage, following previous interpretations of the Park General Management Plan's directive regarding trail mileage. Currently, the lower end of the trail is clearly visible and most maintenance needs are addressed by volunteers on an unofficial basis. Some short sections of the trail may need repair or reconstruction. Park employees will assess the trail for problems and the means for completing any needed work pursued. If the trail is deemed inappropriate for reopening, the lower end will be obliterated for one-quarter (1/4) mile to prevent continued access. If obliterated, Park staff members will annually monitor the trail to ensure it remains closed.

- **Establish a designated campsite at High Rocks [conditional].**

  High Rocks is the site of a former firetower above the Cold Spring Gap Trail on the North Carolina side of the Park. Water is available at a spring along the access trail. The site at High Rocks currently is a somewhat popular location for undesignated, illegal camping. It also is quite contained, so a designated campsite is unlikely to expand to an undesirable size. Because of the amount of riding in the area, Park staff members will assess the High Rocks trail for any needed work in anticipation of implementing the action. Three alternatives are present. First, if the trail can feasibly support horse riding, the campsite will include a hitchrack. Second, if any work determined as necessary to support increased horse riding outweighs the need for horse riding access, then Park will designate the campsite and access trail as hiking-only. And, third, if the trail is determined as unfeasible to repair or maintain, the Park will obliterate the trail and not implement this action.

- **Begin maintaining the upper 1.6 miles of the Miry Ridge trail for horse riding [conditional].**

  The upper portion of Miry Ridge trail, located between the Appalachian Trail and Lynn Camp Prong trail in the Tremont portion of the Park, **is** currently maintained only for hiking. If maintained for horse riding, it would offer a means to access the ridge from either Tremont or from Elkmont. Horse riders could then ride east to Silers Bald and descend Welch Ridge, if they desired. This would allow more access between Hazel Creek and Fomey Creek areas of North Carolina and the Elkmont and Tremont areas of Tennessee. Full implementation of this action requires immediate work to prepare upper Miry Ridge trail, the AT from Miry Ridge to Silers, and Welch Ridge trail for the additional effects of increased horse riding. Implementation of this action will not occur until the appropriate preparation is complete.

- **Reopen the Hyatt Ridge Trail [conditional].**

  The former Hyatt Ridge Trail ascended from the McGhee Spring campsite (#44) to the area of Tricomer Knob on the North Carolina side of the Park. It is approximately four (4) miles long. It provided more direct access to the ridge from the Raven Fork area. Because of existing conditions as the trail ascends the ridge (reportedly, exposed roots and alignment constraints), the Park will maintain the trail as a hiking-only trail. Assessment of the work needed to reopen the trail will occur before any final decision. If that assessment reveals that the work necessary to ensure a sustainable trail outweighs the advantages of having the trail as part of the Park's formal trail system, then the Park will not implement this action.

Repairing and maintaining trails, shelters, and campsites

The Park's formal trail system contains segments of trail with problems that demand immediate attention. By identifying the known problems associated with the trails, shelters, and campsites, the steps necessary to repair the problems and maintain the entire system can begin. The planned work addresses the most prevalent issues and concerns that people have about conditions found along the Park's backcountry trail system.

- **Begin a gradual effort to remove all metal culverts from the backcountry and replace each of them with an appropriate backcountry design, a short wooden bridge, or an open drainage dip, depending upon specific situations.**

  Metal culverts do not belong in the backcountry and the Park will begin removing them as time and resources allow. Problems with culverts include aesthetics and maintenance. Clearing closed culverts is difficult, yet a blocked culvert is easily washed out by high water. In addition, a severe storm can block and then rupture or wash out a culvert even if the culvert is clean before the storm. They will be replaced with an aesthetically appropriate culvert design modeled after Civilian Conservation Corps techniques, small wooden bridges, or an open drainage dip. Specific actions will depend upon local circumstances. This action will occur gradually as each trail section containing a metal culvert receives work.

- **Relocate the Panther Creek Trail.**

  Panther Creek trail ascends from Middle Prong trail to Jakes Gap in the Tremont area of the Park. It was not assessed during Marion's (1994) work, but reportedly has several sections in poor condition, especially as it ascends to Jakes Gap. Another route, however, might be possible along an abandoned railroad grade along Marks Creek to Bearpen Gap. At some point the route likely becomes an abandoned woodsroad or trail and ascends to Blanket Mountain. Park staff members will complete an assessment of both the existing route and the possible relocation. Comparison of the two routes will reveal whether reconstruction of the existing route is preferable over relocating it to the abandoned routes. Blanket Mountain at one time provided a scenic vista. The estimated distance closed is 2.2 miles. The estimated distance opened is 3.2 miles.

- **Relocate the section of Lakeshore Trail between the lower ends of Eagle Creek and Jenkins Ridge trails.**

  This is one of the worst designed sections of trial in the Park. It crosses a stream 15 times in less than a mile. By establishing a new route that mostly utilizes abandoned roads and trails to bypass the existing Pinnacle Creek section of the Lakeshore Trail, existing problems with alignment, safety, and water on the trail are likely avoided. If possible, the lower end of this new route will leave the existing route just upstream of the lowest bridge over Eagle Creek and ascend toward Flint Gap. Two alternatives present themselves at this point. The first is to ascend Pinnacle Ridge, probably with a completely new route. This alternative should be selected only if the route is extremely feasible. The second alternative is to descend Pinnacle Ridge toward Ramp Cove. From there an old roadbed connects with Possum Hollow and Proctor, where Proctor campsite (#86) is located. Entering this old road from the north, along Hickory Bottom Branch, is an old trail with switchbacks to ascend Pinnacle Ridge toward Soapstone Gap. Once the new route is properly cleared, and, as needed, drained and stabilized, close and rehabilitate that section of the Lakeshore Trail between Pinnacle Creek and the new upper junction with the proposed route (roughly at Pickens Gap). The entire length of the new alignment will be designed, constructed, and maintained for year-round horse-riding. The estimated distance to be closed is three miles. The estimated distance of trail opened is between four and five miles.

- **Relocate the Jenkins Ridge trail below Blockhouse Mountain [conditional].**

  The lower end of Jenkins Ridge is in poor condition. A potentially viable alternative, however, is present. An abandoned roadbed descends Forrester Ridge to Deep Gap where several other abandoned railroad grades or woodsroads begin. Depending upon ground conditions, the route will either descend east on abandoned roadbed to Bone Valley Trail or descend west on abandoned roadbed to Haw Gap Branch and then to Sugar Fork Branch section of the Lakeshore Trail. Park staff members will assess the amount of work needed to complete each of these options and decide whether any option is realistic. If so, when the new route is properly cleared, drained, and stabilized as needed, the section of Jenkins Ridge Trail from below Blockhouse Mountain to its junction with the Lakeshore Trail will be abandoned and obliterated. The estimated distance of trail to be opened is five miles, all on old roadbed. The estimated distance to be closed is also five miles.

- **Relocate the Mount Sterling Ridge Trail from Laurel Gap to Pretty Hollow Gap [conditional].**

  This four (4) mile long section of trail is in poor condition. Several alternatives will be considered, including relocating its entire length. An abandoned railroad grade skirts the southern shoulder of Mount Sterling Ridge for the entire length of this trail. Park staff members will assess the existing route to determine the scale of needed work and the abandoned railroad grade to compare with work required to repair the existing tread. If the existing tread is preferable, the trail should be reconstructed as soon as possible. If, however, the railroad grade is a viable alternative for a sustainable route, then work should begin to convert the grade into a trail. Once that work is completed, the existing route along Mount Sterling ridge should be obliterated and the new route opened.

- **Determine the most applicable means to improve the trails that are in the worst condition.**

  Park staff members will further investigate and decide the most reasonable alternative for completing currently necessary repairs to the backcountry trails. Park staff members will, depending upon the specific situation, either reconstruct, relocate, redesignate as hiking-only following repair, or close and rehabilitate the trails listed in Tables VII, VIII, IX, and X. The Park will adhere to a schedule of five years to initiate and complete either repair, relocation, or closure of those trails. Specific actions will be selected after prescriptive maintenance worklogs are applied to document alternatives and the work needs and costs associated with each one.

Table VII Appalachian Trail and AT shelters Most in Need of Major Work. Assume that Any Trail Not on List Requires Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Appalachian Trail	Russell Field to Spence Field	Entire section	Erosion and muddy quagmires are mostly the result of poor trail alignment. Relocate the trail with sufficient cross-slope to install needed drainage or install turnpiking to harden and elevate the existing tread.
	Spence Field to Cold Spring Knob	Spence Field and scattered other segments.	Spence Field needs a hitch rack to allow riders to hitch their horses outside the grassy area. The section east of Thunderhead needs relocation or reconstruction to offset the 30% grade. Many other segments need reconstruction, drainage, or short relocations.
	Clingmans Dome to Newfound Gap	Entire section	Drainage and other reconstruction work is needed.
	Newfound Gap to Charlies Bunion	Entire section	Drainage, drainage, drainage and occasional rocksteps to offset existing gullies. Some sections of rock cribbing are also needed.
Shelters	Tricorner Shelter	Spring area and hitchrack area	The spring requires work to provide a protected route to the source for people and horses. The hitchrack is located far enough from the shelter that horse riders often prefer to hitch their animals at the shelter. Installation of one or two tent platforms near the existing hitchrack is recommended to provide horse riders with a place to camp in tents near their animals.
	Pecks Corner Shelter	Spring area	Trail drains into spring. Relocate and properly construct access trail to prevent damage to water source. Install spring box.
	Icewater Spring Shelter	Spring area and shelter.	Install spring box. Remove bunks if the shelter is to remain closed for camping.
	Double Spring Shelter	Spring area	Install spring box and instruct visitors to dispose of human waste properly so as to protect water supply.
	Silers Bald Shelter	Spring area	Install spring box.
	Derrick Knob Shelter	Spring area	Relocate and properly construct access trail to prevent damage to water source.
	Spence Field Shelter	Spring area	Install spring box, including separate location for horses with a good access trail.
	Russell Field Shelter	Spring area	Install spring box. Relocate trail and install properly designed and constructed route to spring.

Table VII Cataloochee and Cosby Area Trails Most in Need of Major Work. Assume that Any Trail Not Listed Requires an Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Cataloochee	Caldwell Fork	3.3 miles between the trailhead and McKee Branch	**One of the worst sections of trail in the Park.** Most of this stretch requires major reconstruction, including rock cribbing, drainages, and turnpiking. An assessment of the needed work should compare the advantages of reconstructing the trail for horse riding or for hiking. If reconstruction for riding is unrealistic, redesignating the trail for hiking-only is recommended following reconstruction.
	Polls Gap	Scattered sections	Existing problems require assessment. Likely problems include gullies, tread widening, trail layout, and root exposure.
	Pretty Hollow Gap	From Little Cataloochee Trail to Pretty Hollow Gap	Trail aligned along drainage bottom. Assessment needed to determine alternatives for either relocation or reconstruction.
	Mount Sterling Ridge	Pretty Hollow Gap to Balsam Mountain Trail	Drainage and reconstruction. See recommendation for relocating trail.
	Long Bunk	Entire trail	Mud and root exposure. Park staff should assess this trail to determine whether relocation or reconstruction is warranted. This trail is an important riding trail and closure should be considered only if no other alternative is viable.
	Little Cataloochee	The 2.5 miles from Pretty Hollow Gap Trail	Muddy quagmires, excessive grade, eroded gullies, and multiple treads. Trail requires extensive work and possible relocation of some sections.
	Spruce Mountain	The mile between Balsam Mountain Road and Polls Gap Trail	Excessive grade. Relocation, as proposed by members of the Park trail crew, should be pursued.
Cosby	Low Gap	From Low Gap to Big Creek Trail	Existing problems require assessment. Likely needs are drainage and some reconstruction.
	Snake Den Ridge	Upper two miles below Inadu Knob	Drainage is needed to offset erosion and gullying. Effects of recent access by motorized vehicles should be repaired.
	Mount Cammerer	Entire trail	Effects of recent access by motorized vehicles must be addressed.
	Albright Grove Loop	Entire trail	The trail's alignment has led to root exposure in some localized areas. Relocating the trail for short stretches and installing an adequate trail bench (see Figure 4) is necessary. Near some of the old-growth trees, efforts to protect roots from damage should be considered.

Table IX Mt. LeConte, Clingmans Dome, Elkmont, Tremont, Noland Creek, and Oconaluftee Trails Most in Need of Major work. Assume that Any Trail Not on List Requires Assessment and Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Mt. LeConte	Rainbow Falls	From Cherokee Orchard Road to Rainbow Falls	Extensive erosion and shortcutting of switchbacks are problems. Reconstruction of trail, proper drainage, barriers, and rehabilitation of shortcuts are needed.
	Trillium Gap	From Roaring Fork Motor Nature Trail to Grotto Falls	Partial reconstruction and drainage is needed for existing trail route.
	Baskins Creek	Last one-quarter mile to Falls	An unofficial spur trail to the base of the falls should be brought into the system. It needs proper location and construction, including extensive rock steps, rock cribbing, and drainage. This is a hazardous situation.
	Grapeyard Ridge	From Roaring Fork Motor Nature Trail to Dudley Creek	Erosion, slumping, and root exposure are all problems. The trail should be reconstructed with adequate drainages. Several sections require proper benching of the trail to stabilize it and prevent slumping. A few, short relocations may be needed.
Clingmans Dome	Road Prong	Entire trail.	Drainage, trail layout, tread corridor clearing are problems. Fewer than 10 drainages exist along the 2.4 mile trail. Windfall should be removed from the corridor and drainage installed along the length of the trail.
Elkmont	Jakes Creek	Above the first 1.2 miles of trail	Excessive root exposure, wet soil, water running on trail, and erosion are all problems. Reconstruction and drainage is necessary.
Tremont	Panther Creek	Entire trail	Erosion, muddy soils, and steep grades are problems. See the proposal for relocating the trail.
	Lynn Camp Prong	Upper 1.5 miles	This trail should be assessed. Reported problems include steep grade and erosion.
Noland Creek	Noland Creek	From Mill Creek campsite (#64) to the Noland Divide Trail	Poor location is the problem. Proper drainage, reconstruction, and partial relocation are needed.
Oconaluftee	Enloe Creek	Entire trail	Wet soils and erosion are the problems. The trail needs drainage to eliminate water running along it.
	Hughes Ridge	Entire trail	The trail traverses private property within the Cherokee Indian Reservation. A final route for a proposed relocation should be established and installed or the trail should be closed.

Table X Cades Cove and Hazel Creek Trails Most in Need of Major Work. Assume that Any Trail Not on List Requires Assessment and the Installation of Adequate Drainage at a Minimum.

Park Area	Trail	Section	Problems or Work Needs
Cades Cove	Finley Cane	The one-half mile from Laurel Creek Road	Muddy quagmires and poor stream fords are problems. Turnpiking and drainage are needed.
	Turkey Pen Ridge	Entire trail	Trail is in remarkably good condition given the lack of drainage and an absence of tread hardening as it crosses streams. Drainage is needed for entire trail, every stream crossing requires stabilization, and turnpiking is needed in several locations at the lowest point of the trail.
	Russell Field	Entire trail	Drainage, reconstruction, proper tread benching, and turnpiking are needed immediately.
	Bote Mountain	Upper 1.7 miles	Huge gullies require drainage, staggered steps, and possible relocation. Assessment of possible routes should occur. No alternatives present themselves other than construction of new trail or major reconstruction. This is a major endeavor.
	Rich Mountain Loop	One mile as the trail climbs Cave's Ridge	Excessive grade and a lack of drainage are problems. Assessment of situation is needed. Likely actions include drainage and reconstruction of the tread's bench.
	Little Bottoms	Entire trail	This trail was never designed or constructed. Much of it simply happened. It should be properly constructed where the trail bench is absent and drainage installed along its length.
Hazel Creek	Jenkins Ridge	Below Blockhouse Gap	See proposal for relocation.
	Lakeshore Trail	Jenkins Ridge Trail to Eagle Creek	See proposal for relocation.
	Cold Spring Gap	The two miles above Hazel Creek Trail	Drainage, reconstruction, and at least partial relocation are all needed. This trail has maior problems.
	Jonas Creek	The mile above Forney Creek Trail	Poor location and a lack of drainage are problems. Reconstruction, drainage, and partial relocation should be considered. An assessment is needed.
	Forney Creek	Jonas Creek Trail to Whiteoak Branch	Poor location is the problem. Drainage, reconstruction, and partial relocation should be considered. An assessment is needed now.
	Forney Ridge	Andrews Bald to Clingmans Dome parking area.	Insufficient drainage, water running along the trail, and tread erosion are all problems. Extensive reconstruction is needed, including rock steps and water bars.

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Appendix A

EXPANDED DESCRIPTIONS OF EIGHT KNOWN NATIVE AMERICAN ROUTES PREDATING THE PARK'S ESTABLISHMENT

Cataloochee Indian Trail

Beginning with the eastern end of the Park, Cataloochee Indian Trail appears to have parallelled the Park boundary from northwest of Davenport Gap to near an area known as Mt. Sterling Post Office, near the current Big Creek Ranger station and where Big Creek exits the Park. In that section, a portion of the route may be within today's Park boundary, although it also may be within the current corridor of what is now Tennessee Route #32. A separate report by Wilbum (1940) indicates that between these points the route closely followed a stream then known as State Line Branch. From the vicinity of Mt. Sterling Post Office, the route followed what is now Laurel Creek toward Ivy Gap and then on to Mt. Sterling Gap. It then descended to Cataloochee Valley along the current road's alignment.

The Cataloochee Indian Trail is one of the best documented Native American routes in what is now the Park. It connected two major Native American trails outside the Park: the Rutherford War Trace along the French Broad and Big Pigeon River Valleys in North Carolina, and the Great Indian War Path along the Holston and Tennessee Rivers in Tennessee (Wilbum 1940a). Wilbum (1940a) refers to branch trails in the Cataloochee basin, including ones into Crying Creek and Indian Camp Creek, now known as Pretty Hollow Creek. Crying Creek no longer appears on maps under that name, although perhaps it became renamed Rough Fork or Caldwell Fork, two possible candidates.

The earliest reference Wilbum (1940a) found for the Cataloochee trail is dated 1799. John Strother, an early surveyor of the state line between North Carolina and Tennessee, described the trail even then as the Cataloochee Turnpike, a clear indication of the route's roll and dimensions. By that time, however, the trail may have been less traveled than it once had been because the Cherokees had largely abandoned many of their settlements. Several reasons may have contributed to that abandonment, including an Indian War of the 1760's, noted by Wilbum (1940a), and dislocation caused by the influx of European settlers.

The trail was adopted as a thoroughfare by settlers entering this area in larger numbers during the early 1800's (Wilbum 1940a). A treaty signed with the Cherokee and other tribes in 1791 began to open the area for settlement (Wilbum 1940a). Wilbum collected or compiled several maps showing deeds for land purchased by the middle 1790's. These maps currently are on file with the Park's Maintenance Division at Park Headquarters.

Balsam Mountain Indian Trail

Balsam Mountain Indian Trail extended from Ravensford, NC, to Cosby, TN, and may appear on a map of the Park completed by J.E. Thompson (1933). The route followed Raven Fork and Straight Fork creeks and then began ascending a shoulder of Balsam Mountain above Balsam

Corner Creek. It crossed Balsam Mountain near the head of Balsam Corner Creek. It probably then descended what is now Gunter Fork hiking trail, followed a short section of what is now Big Creek Trail, before ascending what is now Low Gap Trail and crossing into Tennessee. Likely, it then continued and descended along the current route of Low Gap Trail to the area of what is now Cosby campground and then exited the current Park boundary by following Cosby Creek, possibly with an alignment similar to that of the existing road.

Indian Gap Indian Trail

The Indian Gap Indian Trail is another well documented route (Wilbur-n 1940b). Like the Balsam Mountain Indian Trail, it also extended from the area around what is now Ravensford, NC, following the banks of the Oconaluftee River before ascending to the ridge near what is now called Luftee Gap. It then followed the ridge west for a short distance to Indian Gap before descending what is now called Road Prong Trail to the West Prong of the Little Pigeon River and on to the current vicinity of Gatlinburg where it exited the Park. An area along Road Prong is still known as Indian Grave Flats, although the incident that led to the naming occurred during the Civil War. Much of this route was adapted by settlers and converted to a roadway. It became a major trade route across the mountains and connected Sevierville, TN, and Cherokee, NC (NHA 1994).

Tuckaleechee and Southeastern Trail and Its Branches

A major trail entered what is now the Park from the area of Tuckaleechee Cove, now the home of Townsend, TN (Wilburn 1940b). The trail was called the Tuckaleechee and Southeastern Trail and served as a branch of the Great Indian War Path. It followed the Little River to Laurel Creek and ascended toward what is now Cades Cove. Several branches of the trail ascended to the ridge and then into what is now North Carolina. One of those branches went up Bote Mountain to what is now Spence Field before descending to Hazel Creek valley where a Native American settlement existed. This route is not well documented. Another branch passed through Ekaneetlee Gap descended the ridge to the Twentymile drainage. And, a third branch passed through the Cove toward today's Rabbit Creek, Happy Valley, and Chilhowee, TN.

The Ekaneetlee Gap branch has two descriptions associated with it. Wilburn and other's (1938) document called this route Ekaneetlee Indian Trail. Their description begins at the confluence of the Cheoah River and the Little Tennessee River in North Carolina. From there, the route followed the Little Tennessee River upstream to its confluence with Eagle Creek, an area now submerged by Fontana Lake. It then followed Eagle Creek upstream to Ekaneetlee Creek and ascended to Ekaneetlee Gap before descending to Forge Creek in Tennessee, probably traversing to Lonesome Brook and then following Ekaneetlee Brook to Forge Creek. It then descended along Forge Creek following what is now the lower section of Gregory Ridge Trail and Parsons Branch Road to Abrahms Creek. Evidently, there it joined numerous other routes and trails, some going to settled areas and others exiting what is now the Park.

The second and later description of the Ekaneetlee Gap branch has it ascending Twentymile drainage (Wilbur-n 1940b). From there, it followed the ridge to Ekaneetlee Gap before descending along much the same previously described route from that gap to Cades Cove.

Wilbum and others (1938) conjecture about two other routes that would have allowed Native Americans and others to avoid the gorge where the Little Tennessee River passes through the Smokies. One route might have crossed near what is now Deals Gap; the other through what is now Dalton Gap. The Dalton Gap route might have followed what are now abandoned roads and trails between Campsite #95 on the Wolf Ridge Trail in North Carolina and where Dalton Gap Branch crosses Tennessee highway #129 near the Parsons Branch Road intersection.

APPENDIX B

GREAT SMOKY MOUNTAINS NATIONAL PARK COMPENDIUM EXCERPTS

Compendium of Designations, Closures, Request Requirements and Other Restrictions imposed under the discretionary authority of the Superintendent[2]

In accordance with regulations and the delegated authority provided in Title 36, Code of Federal Regulations, Chapter 1, Parts 1 through 7, authorized by Title 16, United States Code, Section 3, the following regulatory provisions are established for the proper management, protection, government and public use of Great Smoky Mountains National Park under the jurisdiction of the National Park Service.

Unless otherwise stated, these regulatory provisions apply in addition to the requirements contained in 36 CFR, Chapter 1 and Section 7.14 Special Regulations.

Written determinations which explain the reasoning behind the Superintendent's use of discretionary authority are required by Section 1.5(c) and appear in this document *in italic print.*

[2] **Locations where sections were** deleted **are shown by a line of period dots across the page. Deleted sections address issues not related to backcountry visitors or their activities. Enclosed sections refer only to backcountry visitors, trail or campsite activities, or non-concession horse riding. italicized comments are from the original. All text is from the original edition signed July, 1994.**

Summary of changes[3]

The following items have been modified, added or deleted since the last approval:

1. The format of the text has been revised. Regulatory language is in standard text while the rationale for a specific action follows in italics.

2. Some explanatory language has been modified without affecting the regulatory intent. Specific changes are not listed.

2. Under Section 1.5, Closures and Public Use Limits, new language restricts visitation to the Mountain Farm Museum to daylight hours only. The manway descending the north side of the Chimney Tops has also been closed to public use.

3. Under section 2.10, Backcountry Camping, the definition of an Appalachian Trail thru-hiker is changed to read "whose trips begins and ends a minimum of fifty miles...". This change conforms to the Backcountry Management Plan and to the historical park definition.

4. Under section 2.10, Food Storage, regulatory language duplicating that in the CFR was omitted.

5. Appendix A, Closed and Excluded Waters: the waters of Mingus Creek and Lands Creek were added to correct a previous omission.

6. Appendix B, Designated Foot Trails: Trail names or location descriptions of the following trails were corrected to reflect current status or past errors:

Abrams Falls Trail
Albright Grove Loop Trail
Appalachian Trail: Sassafras Gap to Fontana Dam
Baskins Creek Trail
Baxter Creek Trail
Flat Creek Trail
Little Brier Gap
Little River Trail
Miry Ridge Trail
Rainbow Falls Trail
Ramsay Cascades Trail
Rough Creek Trail
Scott Mountain Trail
Spruce Mountain Trail
Three Forks Trail
Twentymile Loop Trail

7. Appendix C and Appendix D have been added to include maps defining areas listed in Section 2.51 and 2.52.

[3] Items related to changes numbered 5 and 7 are not enclosed in this abbreviated version.

TABLE OF CONTENTS:

[4] The official Compendium contains other sections not relevant to backcountry trails, camping, or non-concession horseback riding. Pagination reflects the current document, not the original Compendium.

. . . . . .

Section 1.6 PERMITS

(a) Pursuant to the provisions of 36 CFR 1.6(f) the following is a compilation of the activities for which a permit is required. . . .

. . . . . .

Backcountry Camping Permit 2.10(a)

. . . . . .

Stall Fee Permits for overnight stays in developed horse camps will be issued by making reservations through Great Smoky Mountains National Park's Backcountry Reservations Office located'in the headquarters building in Gatlinburg, TN.

(b) Backcountry permits will be available at the following locations:

Visitor Centers
- Sugarlands
- Oconaluftee

Ranger Stations
- Abrams Creek
- Cades Cove
- Greenbrier
- Big Creek
- Cataloochee
- Twentymile

Campgrounds
- Elkmont
- Smokemont
- Abrams Creek
- Deep Creek
- Cosby
- Look Rock

Appalachian Trail
- Hot Springs, NC (USFS)
- Fontana Dam, NC (TVA), Near the TVA's hikers shelter
- Fontana Boat Dock, NC (TVA), Near the restrooms

. . . . . .

Section 2.10 CAMPING AND FOOD STORAGE

(a) Camping is prohibited in areas being restored or revegetated and so posted, pursuant to 36 CFR 1.7(a).

Restoration efforts are compromised by camping activities.

Camping in any historic structure or building is prohibited.

Historic structures are fragile and need protection from any activity that could adversely impact the structure or degrade the historic scene. . . .

. . . . . .

DEVELOPED HORSE CAMPS:

Reservations through the Backcountry Reservations Office, located in the headquarters building in Gatlinburg, TN, are required for the use of developed horse camps. . . .

. . . . . .

Length of stay shall not exceed seven (7) consecutive nights.

Horses must be restrained or under physical control at all times. Horses shall not be tied to trees. A stall or hitch rack MUST be used.

BACKCOUNTRY CAMPING:

A backcountry permit is required for all overnight stays in the backcountry.

The permit must be in the camper's possession while in the backcountry and must be exhibited upon the demand of an authorized person.

Backcountry permits and the permit system aid the park in distributing and monitoring use and in locating lost/overdue persons.

Persons may not stay more than three (3) nights in a row at any backcountry campsite or more than one (1) night in a row at any backcountry designated shelter.

Groups camping in the Park backcountry are limited to a maximum of eight (8) persons per group and ten (10) riding or pack animals per group.

Reservations obtained from the Backcountry Reservations Office are required for backcountry shelters and campsites which are designated as "rationed". Rationed sites are limited to a specific number of persons and/or horses that may occupy a given site on a given night. The rationed campsites and shelters and their capacities are listed below:

RATIONED BACKCOUNTRY CAMPSITES AND SHELTERS

10	Ledbetter Ridge	(8, 8H)
13	Sheep Pen Gap	(15, 8H)
23	Camp Rock	(12)
24	Rough Creek	(15)
29	Otter Creek	(10)
36	Upr. Walnut Bottoms	(20, 20H)
37	Lwr. Walnut Bottoms	(20)
38	Mount Sterling	(12)
47	Enloe Creek	(8)
50	Lwr. Chasteen Creek	(15, 15H)
55	Pole Road	(15, 15H)
57	Bryson Place	(20, 12H)
61	Bald Creek	(12, 6H)

71	CCC Camp	(12, 12H)
83	Bone Valley	(20, 10H)

SHELTERS

Davenport Gap	(12, 12H)
Cosby Knob	(12, 12H)
Tricomer Knob	(12, 12H)
Pecks Comer	(12, 12H)
Icewater Spring	(12)
Mount Collins	(12)
Double Spring Gap	(12)
Silers Bald	(12, 12H)
Derrick Knob	(12)
Spence Field	(12, 12H)
Russell Field	(14, 14H)
Mollies Ridge	(12, 12H)
Birch Spring Gap	(12, 12H)
Mt. LeConte	(12)
Kephart	(14, 14H)
Laurel Gap	(14, 14H)
Rich Mountain'	(8, 8H)
Scott Gap	(8, 8H)

Reservations are required because of the high demand for the limited space available.

The use of tents at shelters is prohibited except by persons qualifying as thru-hikers on the Appalachian Trail (by definition an Appalachian thru-hiker is a backpacker who is using the Appalachian Trail exclusively while in the Park and whose trip begins and ends a minimum of fifty miles outside the Park). Thru-hikers may pitch tents outside shelters only when all bunks are otherwise occupied.

It is unrealistic to expect thru-hikers to obtain advance reservations when they do not know when they will be entering the Park.

Camping in the backcountry is permitted only at established backcountry sites, except as authorized by a cross-country permit. Cross-country permits must be issued by a Great Smoky Mountains National Park ranger and may not be issued under the self-registration system. Cross-country camping (at other than designated sites) is permitted under the following conditions:

a. The maximum party size is six persons and use of horses or other stock is prohibited.

[5] **Rich Mountain** and **Scott Gap shelters have been removed since this Compendium was last updated. Designated campsites are likely to replace the shelters in the future.**

b. The campsite must be at least one-half mile from any designated trail, one mile from any designated road and 100 feet from the nearest surface water.

c. Camping in spruce-fir, beech gaps or on grassy or heath balds is prohibited.

d. The duration of stay at each location cannot exceed one night and the same location cannot be used a second time on the same trip.

e. Wood fires are prohibited.

f. Campers are required to obliterate all traces of human presence upon leaving a cross-country camp.

g. Camping locations for each night should be as closely pinpointed as possible using natural landmarks or map coordinates, and trips are expected to follow the designated itinerary as closely as possible.

Cross-country hiking is a special use and requires special equipment, training and/or experience. These regulations are an attempt to permit this special use, while minimizing the potential impact on natural resources.

(b)(3) Camping within 100 feet of a flowing stream, river or body of water is permitted only at designated front and backcountry campsites.

Camping within 100 ft. of water normally increases erosion and sanitation problems in water sources.

FOOD STORAGE:

(d) Food storage requirements apply to all areas within the Park boundary.

In locations where wires, poles, ropes or food storage containers are provided for storage of food and garbage, such facilities must be used at night and when the camp is unattended.

Food scents attract animals. Animals which gain access to human food sources tend to return to those sources and may cause property damage or injury. Subsequent behavior problems often necessitate the removal or destruction of an animal. . . .

. . . . . .

Section 2.13 *FIRES*

(a)(1) The kindling of a fire in the fireplace of any historic building or structure is prohibited.

In frontcountry campgrounds and picnic areas fires must be kindled in provided grates, grills or within existing fire rings.

The use of portable stoves, including charcoal burners, is prohibited in frontcountry areas except in picnic areas and campgrounds.

In backcountry areas fires must be kindled within existing and established fire rings located at the designated backcountry campsites.

At backcountry shelters fires are permitted only in the fireplace inside the shelter and at the central fire ring in front of the shelter.

(c) The Superintendent may close all or part of the Park to fires, except stoves, when the conditions meet the guidelines identified in the "Wildland Fire Management Step-Up Plan for Great Smoky Mountains National Park" as staffing class four (4) or five (5). That plan is hereby adopted and made part of these orders. Closure notices will be posted at Trailheads, campgrounds, visitor centers and through media notification.

The use of open fires in the Park is regulated so as to protect structures and natural resources. During extreme weather conditions open-pit fires may be restricted to preclude the accidental ignition of wildfires.

Section 2.14 SANITATION AND REFUSE

In non-developed areas more than a quarter of a mile from restroom facilities, human body waste must be buried four (4) to six (6) inches deep in organic soil in an area not frequented by the public, not visible from trails, campsites or developed areas, and at least 100 feet from any water source.

During the winter when organic soil is not exposed, solid human body waste must be buried 100 yards from any campsite or established travel route to a depth of 12 inches in snow whenever possible.

These regulations minimize the contamination of water supplies, minimize the presence of unsanitary conditions and preserve site aesthetics.

Section 2.15 PETS

(a)(l) Dogs (except guide, search and hearing ear dogs), cats, and other pets, are prohibited on any Park land or trail except in those locations identified below:

All park roads, including those seasonally closed for public vehicular use, parking areas, established picnic areas, and frontcountry campgrounds including group and frontcountry horse campsites, as well as the two-mile trail from Park Headquarters to Gatlinburg and the two-mile trail between Cherokee and the Oconaluftee Visitor Center. Pets must be on a leash not to exceed 6 feet in length. . . .

. . . . . .

(a)(5) Pet excrement must be immediately collected by the pet handler and disposed of in the nearest trash receptacle.

These regulations are not intended to restrict pets from the Park but rather to enhance the natural experience of all visitors. Pets are natural predators and their scent alone will scare wild animals into hiding places. . . .

. . . . . .

Section 2.16 **HORSES AND PACK ANIMALS**

(a) Horses, mules, burros, and llamas are designated as pack animals [as opposed to pets or some other category].

(b) The use of saddle and pack animals on park trails is permitted except in the following areas:

Nature Trails
Handicapped Access Trails
Paved Trails
Designated foot trails as listed in Appendix B

Deep Creek Trail is closed to horse use from the Deep Creek Trailhead to the Indian Creek/Deep Creek Junction.

The following Smokemont riding stable trails, marked CONCESSION HORSES/HIKERS ONLY, are closed to private horse use during the open season.

1. Bradley Fork Trail from the Bradley Fork Road south to Becks Branch Trail.

2. Hughes Ridge Trail between the Bradley Fork Trail (Smokemont Church area) and the New Smokemont Bypass Trail.

. . . . . .

(g) The tying of horses and pack animals is not permitted within 100 feet of established backcountry campsites, fire rings, shelter, or sleeping areas in the backcountry, or within 100 feet from any stream or water source.

Horses are not permitted within one hundred feet of frontcountry campsites.

At designated backcountry sites where stock are permitted, the number of animals in any one party SHALL NOT EXCEED 10 ANIMALS.

In an area without hitch posts or stalls, pack animals MUST be tied on a cross-tie system. If picket stakes for the cross-tie system are not available, a tree of no less than eight (8) inches in diameter should be utilized. Animals that remain "camped" in an area longer than 12 hours on a cross-tie system should be rotated to a new picket site and any manure at the old site scattered no less than 100 feet from any campsite area or water source.

In backcountry areas with hitch racks or stalls, any manure shall be scattered no less than 100 feet from any campsite area before departing the area.

Stock are hereby restricted from stopping, standing, or travelling across or adjacent to any water spring.

Stock are restricted from water springs to prevent contamination. Springs do not normally have the water volume necessary to cleanse themselves. It is recommended that pack animals be watered with the use of a container.

In developed horse camps, all manure shall be moved from the stall and hitch rack areas to a designated collection area.

At trailheads, any manure spilled from the trailering unit or fresh excrement MUST be replaced in the trailering unit or scattered in the woods at least 100 feet from the trailhead and any existing water source. . . .

. . . . . .

In the backcountry the use of loose hay or grain containing viable seeds is prohibited. Stock users are required to carry supplemental feed such as pellets or rolled grains on all trips. . . .

. . . . . .

Section **4.30 BICYCLE**[6]

(a) The following routes are designated for non-motorized bicycle use.

Park Headquarters

The 2-mile trail between the Park headquarters building and Gatlinburg.

Oconaluftee

The trail between the Oconaluftee Visitor Center and the town of Cherokee.

Deep Creek Area

[6] **CFR, volume 36, section 4.30, states that bicycles are prohibited except on park** roads, **parking areas, or areas** designated as **appropriate, unless the Superintendent exerts discretionary authority to prohibit bicycles in a location where riding is judged inappropriate.**

That portion of the graveled road now existing from the trailhead to the end of the gravel:

1. Indian Creek Trail
2. Deep Creek Trail

Foothills Parkway-West

Uncompleted sections of the Foothills Parkway-West that are not yet open to motor vehicle traffic may be used by bicyclists; except that, when construction work is underway, access gates will be closed and all public entry will be prohibited to ensure public safety.

Non-motorized bicycles may travel year-round on the following seasonally closed roads:

Balsam Mountain Road
Clingmans Dome Road
Forge Creek Road
Heintooga-Roundbottom Road
Little Greenbrier Road
Parson Branch Road
Rich Mountain Road
Upper Tremont Road

Designated Foot Trails (Closed to Horse Use)

Trail Name	Location: From - To
ABRAMS FALLS TRAIL	Abrams Falls Parking Area - Hannah Mtn. Trail
ALBRIGHT GROVE LOOP TR.	Loop off Maddron Bald Trail
ALUM CAVE TRAIL	Newfound Gap Road - Rainbow Falls Trail near Mt. LeConte
APPALACHIAN TRAIL	Miry Ridge Trail - Eagle Creek Trail
APPALACHIAN TRAIL	Pecks Comer - False Gap
APPALACHIAN TRAIL	False Gap - Icewater Spring
APPALACHIAN TRAIL	Icewater Spring - Newfound Gap
APPALACHIAN TRAIL	Newfound Gap - Clingmans Dome
APPALACHIAN TRAIL	Clingmans Dome - Silers Bald
APPALACHIAN TRAIL	Sassafras Gap - Fontana Dam
BASKINS CREEK TRAIL	Trill Gap Trail - Roaring Fork Motor Nature Trail
BAXTER CREEK TRAIL	Big Creek Picnic Area - Mt. Sterling Tower
BOOGERMAN TRAIL	Loop from Caldwell Fork Trail
BOULEVARD TRAIL, THE	Mt. LeConte - Appalachian Trail near Mt. Kephart
BULL HEAD TRAIL	Old Sugar Trail - Rainbow Falls Trail near Mt. LeConte
CHESNUT BRANCH TRAIL	Big Creek Road - Appalachian Trail
CHESTNUT TOP TRAIL	Schoolhouse Gap Trail - Townsend Wye
CHIMNEY TOPS TRAIL	Newfound Gap Road - Chimney Tops
CLINGMANS DOME BYPASS TR.	Fomey Ridge Trail - Appalachian Trail
COVE MOUNTAIN TRAIL	Park Headquarters - Cove Mountain Tower
CUCUMBER GAP TRAIL	Little River Trail - Jakes Creek Trail
CURRY MT TRAIL	Little River Road - Meigs Mountain Trail
DEEP CREEK TRAIL	Campsite 55 - Newfound Gap Road
EAGLE CREEK TRAIL	Lakeshr. Trail - Appalachian Trail at Spence Field
FLAT CREEK TRAIL	Heintooga Ridge Road - Heintooga Picnic Area
FORK RIDGE TRAIL	Clingmans Dome Road - Deep Creek Trail
FORNEY CREEK TRAIL	Jonas Creek Trail Junction - Fomey Ridge Trail
FORNEY RIDGE TRAIL	Clingmans Dome Park Area - Sprhse Branch Trail
GABES MT TRAIL	Maddron Bald Trail - Cosby Picnic Area
GOSHEN PRONG - #25	Goshen Prong Trail - #25
GOSHEN PRONG TRAIL	Little River Tr.-Appalach. Tr. at Double Spr. Gap
GRAPEYARD RIDGE TRAIL	Greenbrier Road - Big Dud Trail
GREENBRIER RIDGE TRAIL	Middle Prong Tr.-Appalachian Trail at Sams Gap
GREGORY RIDGE TRAIL	Forge Creek Road - Greg Bald Trail at Rich Gap
GUNTHER FORK TRAIL	Camel Gap Trail - Balsam Mountain Trail
HAZEL CREEK TRAIL	Proctor Creek - Welch Ridge Trail
HDQTRS.-GATLINBURG TRAIL	Sugarlands Vis. Center - Boundary at Gatlinburg

[7] **Appendix B of the Compendium that comprises the current report's Appendix B.**

HUSKEY GAP TRAIL	Newfound Gap Road - Little River Trail
KANATI FORK TRAIL	Newfound Gap Road - Thomas Divide Trail
LAUREL FALLS TRAIL	Fighting Creek Gap - Cove Mountain Trail
LITTLE BOTTOMS TRAIL	Cooper Road Trail - Hatcher Mountain Trail
LITTLE BRIER GAP	Little Greenbrier Schoolhouse-L. Greenbrier Trail
LITTLE GREENBRIER TRAIL	Wear Cove Gap Road - Laurel Falls Trail
LITTLE RIVER TRAIL	Barricade - #30
MADDRON BALD TRAIL	Barricade at Boundary - Snake Den Ridge Trail
MEIGS CREEK TRAIL	Laurel Creek Road at Sinks - Meigs Mtn. Trail
METCALF BOTTOMS TRAIL	Metcalf Bottoms Picnic Area-L. Greenbrier School
MIRY RIDGE TRAIL	Buckeye Gap - Lynn Camp Prong Trail
OCONALUFTEE RIVER TRAIL	Oconaluftee Visitor Center - Park Boundary at Cherokee
OLD SETTLERS TRAIL	Ramsay Cascades Road - Maddron Bald Trail
PORTERS CREEK TRAIL	Barricade - Vic. of #31 on Porters Creek
RAINBOW FALLS TRAIL	Rainbow Falls Parking Area at Cherokee Orchard Mt. LeConte
RAMSAY CASCADES TRAIL	Barricade - Ramsay Cascades
ROAD PRONG TRAIL	Chimney Tops Trail - Indian Gap
ROUGH CREEK TRAIL	Little River Trail - Sugarland Mountain Trail
ROUNDTOP TRAIL	Wear Cove Gap Road - Townsend Wye
SCOTT MOUNTAIN TRAIL	Indian Grave Gap Trail - Schoolhouse Gap Trail
SMOKEMONT LOOP TRAIL	Smokemont Campground - Bradley Fork Trail
SPRUCE MOUNTAIN TRAIL	Balsam Mountain Road - Campsite 42
SUGARLAND MOUNTAIN TR.	Fighting Crk. Gap-Appalachian Tr. at Mt. Collins
SWEAT HEIFER CREEK TRAIL	Kephart Prong Trail - Appalachian Trail near Mt. Kephart
THOMAS DIVIDE TRAIL	Newfound Gap Road- Junction w/ Sunkota Ridge Trail
TWENTYMILE LOOP TRAIL	Wolf Ridge Trail - Long Hungry Ridge Trail

Appendix C

ORGANIZATIONS WHO WERE APPROACHED OR WHO PARTICIPATED DURING THE COURSE OF THIS PROJECT

Federal Agencies

National Park Service, Denver Service Center
———, Kings Canyon National Park
———, Washington Legislative Office
United States Forest Service, Alaska Regional Office
———, Mt. Hood National Forest
———, Northwest Regional Office
——— Technology and Development Program

National Organizations

American Hiking Society
Appalachian Mountain Club, Trails Program
Appalachian Trail Conference
Backcountry Horseman of America
California Conservation Corps
National Outdoor Leadership School
National Parks and Conservation Association, Southeast Regional Office
——— Washington Office
Student Conservation Association
The Wilderness Society, Southeast Regional Office
The Trail Riders

Local Organizations

Asheville Citizen-Times
Backcountry Horsemen of North Carolina
Big Creek Trail Riders
Blue Ridge Trail Riders
Cades Cove Riding Stables, Ince
Carolina Mountain Club
Cataloochee Ranch
Deep Creek Riding Stables, Inc.
Euchella Sport Lodge
Foothill Striders
Friends of Great Smoky Mountains National Park
Gatlinburg Hiking Club
Governor of North Carolina, Western Office
Knoxville News Sentinel
LeConte Lodge, Inc.
Natural History Association, Great Smoky Mountains National Park
Haywood Trail Riders
Izaak Walton League
Nantahala Outdoor Center
Natahala Hiking Club
North Carolina Dept. of Nat. Res. and Community Devel., Div. of Parks and Recr., Asheville Office
North Carolina National Park, Parkway, and Forest Commission
Sierra Club, East Tennessee
———, North Carolina
Smokemont Riding Stables, Inc.
Smoky Mountain Stables, Inc.
Smoky Mountain Field School
Smoky Mountain Hiking Club
Smoky Mountain Trail Riders
Tennesse-Great Smoky Mountain Park Commission
Tennessee Citizens for Wilderness Planning
Tennessee Department of Environment and Conservation
The Happy Hiker
Trout Unlimited, Little River Chapter
———, Tennessee Council
Waynesville Mountaineer
Western Carolina Spotted Horse Club

Appendix D

ARTICLE BY WILLIAMS AND MARION (1992) DESCRIBING AND COMPARING PRESCRIPTIVE WORKLOGS AND OTHER TRAIL ASSESSMENT TECHNIQUES

TRAIL INVENTORY AND ASSESSMENT APPROACHES APPLIED TO TRAIL SYSTEM PLANNING AT DELAWARE WATER GAP NATIONAL RECREATION AREA

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Trail system planning and management require accurate assessments of existing trail resources and their condition. A standardized and efficient process for surveying, inventorying, and assessing trail systems was developed and applied in the Delaware Water Gap National Recreation Area. Two approaches employed were (1) a Trail System Inventory, and (2) Prescriptive Work LOPS. These complementary approaches provide resource managers with valuable information regarding the location and length of individual trails, their current condition and needed maintenance work, and material and labor estimates necessary to conduct such work.

This paper describes two trail inventory and assessment approaches developed and applied at Delaware Water Gap National Recreation Area (DWGNRA) in support of a comprehensive trail planning effort. The trail surveys and final report were developed by the Appalachian Mountain Club (AMC) Trails Program under cooperative agreement with the National Park Service (NPS)[1]. Here, we review the criteria used to select the specific trail survey approaches, discuss our application of these approaches, and critique the capabilities and limitations of the approaches. We believe the standardized, yet flexible, techniques applied in DWGNRA offer significant advancement over earlier, less structured approaches.

Trail System Planning in DWGNRA

The objective of natural resource management planning is to translate legislation, regulations, and policies into objectives, programs, and specific actions (Hendee and von Koch 1990). The trail system planning strategy for DWGNRA mirrored this process by translating DWGNRA General Management Plan (GMP) goals into specific trail resource recreation alternatives for visitors. To meet the needs of resource visitors and resource managers, the strategy for DWGNRA included:
(1) identification of recreation interests,
(2) identification of management objectives,
(3) documentation of trail resources, and
(4) prescriptions for correcting resource problems in light of recreation interest and management concerns. To be effective, this plan had to be flexible by design in order to address both current and future trail resource needs.

Approaches to trail system planning are selected according to management objectives, often derived with cooperative involvement of interested and involved individuals and organizations. The process adopted here is marked by the cooperation of an external organization in analyzing the suitability of trails to address recreation demands and concerns. The results of this effort are intended to feed a public review process.

Project Background

DWGNRA is managed by the NPS and is located in the states of Pennsylvania and New Jersey. Established along a 35 mile stretch of the Delaware River by an Act of Congress in 1965 as part of the Tocks Island hydroelectric project, DWGNRA today embraces some 54,000 acres of the nearly 70,000 acres originally circumscribed. Congress, as part of the Tocks Island Dam legislation, directed the Army Corp of Engineers to assemble a detailed set of maps for the area within the congressionally mandated boundaries. These cartographic documents provided a rich resource for this project.

The 1987 DWGNRA GMP called for the enhancement of day and overnight hiking opportunities, to be accomplished with the provision of an expanded trails network. The GMP specifically obligated DWGNRA to work with trail clubs and organizations in planning for expanding and maintaining the trail system. The AMC, though headquartered in Boston, met the NPS needs as a conservation and recreation organization with an organizational chapter located in the DWGNRA region. In 1975, the AMC had performed a study under cooperative agreement with DWGNRA (Appalachian Mountain Club). More significantly, in 1988 the AMC had completed a park-wide trail

study for Acadia National Park in Maine*. In 1989 DWGNRA invited the AMC to complete a similar' study of their trails.

Primary Goals of the Project

DWGNRA faced a situation common to many parks and forests: how to upgrade an existing, partially informal trail system in an organized manner when both the current conditions and viable options for improving the system are incompletely documented. DWGNRA intended to offer a trail system with a diversity of dispersed recreation opportunities, but required information to direct the necessary efforts in a cost-effective manner.

The primary goals of this project, then, were to:

1. Emphasize the protection of the existing and proposed trail system resources by identifying deficiencies, alternative engineering solutions, and visitor management actions.

2. Produce a report for DWGNRA containing documentation of the trail system's current status, options for future alignment, and estimated costs required to realize potential alignments. This report was intended to provide a preliminary set of recommendations for the comprehensive trail planning process.

3. Incorporate the objectives of the DWGNRA GMP wherever possible, especially those to: (a) provide a quality trail system that emphasizes a minimal disruption of natural processes while servicing a broad range of **visitors,** and (b) employ existing dirt roads, trails, and woods roads to the greatest advantage.

Selection of Inventory and Assessment Approaches

The cooperative agreement between DWGNRA and the AMC addressed the need to document existing conditions through a comprehensive trail resource inventory and assessment. The purpose for the report was to fuel a public review period, to provide a starting point for comments by managers and interested members of the public. To achieve these ends, two state-of-the-knowledge techniques for trail inventory and assessment were applied: (1) a *Trail System Inventory* and *(2) Prescriptive Trail Work Log* **assessments.**

Four techniques were considered (Table 1). Each approach has its own unique capabilities. Of the techniques applied in DWGNRA, a *Trail System Inventory* approach provides a broad description of the system as a whole, including the location, classification, and general features of individual trails. *The Prescriptive Work Log* approach, in

Table I Four trail inventory and assessment techniques.

Techniaue	Purpose
Trail (System) Inventory	identify and catalog the trail system's physical resources including surface type, location, or access opportunities. Often incorporates non-physical classifications such as ownership, type of use, or maintenance level.
Prescriptive Trail work logs	Identify trail tread deficiencies and prescribe tread engineering solutions. Adaptable to resource and visitor management purposes. Provides basis for cost and staff estimates and recommendations.
Research level Measurements	Studies designed to understand processes such as relationships between visitation and resource degradation.
Monitoring Level Measurements	Monitoring resource conditions over time. Oriented toward measuring parameters documenting resource impacts rather than resource maintenance and management.

contrast, catalogs specific features of a trail. Groups of trails may then be reviewed according to their features or deficiencies (e.g.: drainage needed in a local area, district, park, or forest). Originally, prescriptive work logs served trail maintenance purposes. The location of existing trail engineering features were catalogued along with any work needed to maintain those features. A modem prescriptive work log, however, fulfills management, as well as maintenance, objectives. Contents of prescriptive work logs completed in DWGNRA consist of observations oriented toward maintenance and management of the trail resource, oftentimes coupled with references to selected visitor management and recreation features (e.g.: viewsheds, camping potential, general parking availability). Such techniques can be modified according to a manager's need to obtain information for a variety of purposes, including maintenance, visitor interpretation, natural resource protection, or any combination. The information gathered by each of the two techniques selected for application in DWGNRA, then, was intended to complement the information gathered by the other.

Monitoring and Work Log Approaches Compared

Of the four approaches outlined in Table 1, heaviest debate focused on whether to apply monitoring or prescriptive work log techniques to support the anticipated report's recommendations. Monitoring is done to measure physical changes to the environment resulting from an influential factor, typically recreational use. For example, soil loss occurring over a period of time may be measured. While monitoring might provide objective assessments of trail resource conditions, such measurements do not provide the information necessary to estimate the cost for repairing the effects or mitigating the cause of resource degradation. Yet, estimating these costs was an important management objective for the project. Further, monitoring is not intended to prescribe recommendations for addressing concerns about the resource or visitors, a primary goal of the cooperative agreement.

For this project, a monitoring effort would have yielded a description of the changes occurring as a result of recreation. A prescriptive work log approach, however, would yield a description of the recommended solutions to such physical changes. One final factor was considered: trail maintenance recommendations will vary according to the type and amount of existing or anticipated recreational use. In many ways, trail work is discretionary by its very nature; those who work on trails must make judgements concerning how best to remedy a perceived problem. The need for flexibility in describing trail maintenance recommendations became the crucial criteria for selecting an approach. Because prescriptive work logs originally were devised to document recommendations based on direct field observations, they are most easily adapted to provide information necessary for estimating costs.

Trail System Inventory: Methodology

Three objectives of equal priority guided the trail system inventory. First, the twenty-five year old Army Corps of Engineers maps required ground verification of all trails and roads features. Second, an inventory of the basic features of the trail system was to be completed. And, third, the cartographic data would be prepared for transfer to DWGNRA's Geographic Information System (GIS). Using the Corps' maps (1:400 scale) as a baseline, two surveyors were directed to hike all roads and trails appearing on the maps, confirm the existence and location of these features, and accurately locate any roads or trails not appearing on the maps. While hiking the system, the inventoried roads and trails were categorized according to NPS management classifications, access, ownership, surface, average width, and maintenance level. Scenic features, water courses, major maintenance needs, and vehicle barriers also were noted on the maps.

Trail System Inventory: Applications

The trail system inventory painted a broad overview of the entire system of roads and trails found in DWGNRA. From this baseline information, a preliminary trail system was selected during a consultation period involving NPS and AMC staff. This period of *intermediate evaluation* was built into the field schedule of the project. The prescriptive work log technique for assessing trails was applied to the trails comprising this preliminary system.

The GIS applications of the inventory data are perhaps the most beneficial. Access to high quality maps during the trail planning review process will encourage constructive criticism of the preliminary trail system's layout. Not all roads and trails inventoried in DWGNRA were selected for the proposed system. Only those that appealed to the perceived visitation demands and the indicated management objectives were selected. However, access to an accurate set of trail resource maps will

better communicate the AMC's rationale for recommending the particular system found in their report. Also, computer generated maps will likely facilitate interpretive efforts, maintenance efforts, resource protection efforts, and resource management efforts, as well as search and rescue, and fire fighting operations.

A well formulated trail system inventory should remain applicable for many years. However, a new inventory of specific trails or areas, possibly with new parameters, may be necessary following the onset of natural disasters (extensive flooding or heavy snow-melt), introduction of a new form of recreation (mountain bike or horse use), or inauguration of new management directives (managementzoning).

Prescriptive Work Logs: Methodology

Various forms of prescriptive work logs have been applied by agencies and organizations in diffuse regions of the country. Hooper (1988) describes a trail log format employed by the NPS, though this particular approach is considered to be a physical inventory separate from what Hooper refers to as a condition/ corrective survey. Prescriptive work logs have traditionally blended a detailed physical inventory with a series of corrective prescriptions intended to remedy any trail tread and alignment deficiencies observed along a trail. The AMC Trails Program has applied such assessments extensively for some fifteen to twenty years. Proudman and Rajala (198 1) describe several methods for conducting prescriptive work logs. Recent incorporation of the capabilities of personal computer technology to store, analyze, and present information has made the prescriptive work log format even more useful than in the past.

For a prescriptive work log to be a reasonable estimate of a trail's condition, the individual conducting the survey must be accomplished in trail construction and design. Prescriptive work logs completed in the DWGNRA were compiled by an individual proficient with a wide range of trail work techniques and the many options for mitigating trail resource damage. In general, prescriptions for trail work actions should be the minimal necessary to stabilize the trail tread, should emphasize protection of natural resources, and should exhibit a clear understanding of the trail's role within the locally available recreational opportunities. Further, those who are compiling the surveys should be given clear understanding and directions regarding the intentions for the trail.

In DWGNRA, a format for prescriptive work logs was selected that relied upon pocket dictation device to record comments. These comments were organized by verbal reference to distances indicated by a five foot circumference trail-measuring wheel pushed along each trail. The wheel's counter displayed the distance from a starting point within six (6) inches by tallying five foot intervals to the nearest tenth of an interval. The location of permanent reference features such as stream crossings or conspicuous rocks was noted to facilitate accurate future location of sites requiring work.

The dictation notes were later transcribed and formatted on a computer word-processor. A standard format has evolved at the AMC (Example 1). The work logs can then be printed and placed in a ring-binder for simple access. A well-documented prescriptive work log done in the Northeast will remain a good gauge of a trail's condition for roughly five to ten years, depending on the amount of recreation use, the form of that recreation, and any severe weather.

The dictation method of recording prescriptive work logs has advantages and disadvantages. Occasional errors in handling the tape recordings do occur, and clear enunciation of concise comments is imperative. Furthermore, the dictation tapes must be transcribed, introducing another potential source of error. However, compared to the alternative of recording comments on paper forms, dictation devices have several advantages. The devices are more efficient in the field since they require only one hand to operate, as compared to taking notes on a clipboard. Further, notes on paper are more time-consuming to write and there is a tendency to be too brief. If a prescriptive work log is to be used as a document in a trail work labor contract, or is to be used by a field crew who is unfamiliar with an area, detailed descriptions of work locations are very important. Finally, dictation devices work well in plastic bags under wet conditions, allowing assessment of trail drainage problems at times when those problems are most obvious.

Prescriptive Work Logs: Applications

By following standardized procedures for recording comments, managers and their staff can assemble information in a format that facilitates field efforts and trail work planning. Managers concerned with allocating budgets and staff, and staff concerned with completing field projects, benefit from the information in prescriptive work logs, originally

developed for specifically these purposes. In DWGNRA prescriptive work logs facilitated planning efforts by providing information about the proposed trail system's strengths and limitations. Prescriptive work log trail maintenance assessment figures for each trail were entered into a computer database and printed in a catalog format (Example 2). A database also permits managers to calculate labor and materials necessary to complete the estimated work needed on a trail. Data from the prescriptive work logs completed in DWGNRA can effectively summarize the trail maintenance work required for a single trail or any selected grouping of trails. Additionally, prescriptive work logs are commonly used as a field guide for trail work contractors and cooperators.

Discussion

Trail inventories and prescriptive trail work logs offer managers a standardized, yet flexible, method for inventorying and assessing individual trails or entire trail systems. A consistent methodology for compiling information about trails enhances the capacity of an agency or other organization to manage those trail resources. This paper illustrates the application of two separate but complementary trail surveys which provided information vital to the DWGNIU comprehensive trail system planning process. The trail survey information formed the basis for AMC recommendations regarding the proposed DWGNRA trails system, including the type, extent, and cost estimates of the trail work required to fully establish the proposed system.

Trail surveys provide objective information about trail resource conditions and the capabilities of the trail resource to sustain various forms of recreation. Such information should be integrated with expressed public needs and views when formulating a final trail system plan. It is recommended that the results provided by trail surveys be presented to the public as background information supporting public involvement and review. Such input is viewed as critical to the design and implementation of a broadly accepted network of trails appealing to recreationists of all interests, whether hikers, walkers, horse-riders, or bicyclers.

Literature Cited

Appalachian Mountain Club. 1975. A proposal for dispersed recreation in the Delaware Water Gap National Recreation Area. Boston, MA: Appalachian Mountain Club. 62 p.

Project Title (if appropriate)

Trail: ADAM'S CREEK TRAIL
file name: "ADAMCRK.LOG"
pages: 12
Area: West of Rt. 209, north of Dingman's.
Date: Aug. 26, 1989
Synopsis: Containing a summary of the work log's highlights. Appropriate comments include trailhead information (signs, parking, access, etc.), safety concerns, natural features, basic geology (helpful for work crews), and major issues or problems associated with the trail.

1=5ft	Comments	Work
006	[EX: information that a work crew would use to orient themselves or to find a work site, suggestions for installing the work, or dimensions of existing trail work.]	6' Water Bar, Right; install 20' ditch parallel to tread [in gully adjacent to road].
012	**ref.** trail traverses section of old road w/stone wall **Left;** terrain drops off down to creek, **Right;** no work needed.	
173	**ref.** remains of old jeep road joins from Left; 2 large red pines on ground	Install **5 Rock Steps** to harden 3 foot deep gully.

Example 1 Format of an AMC Prescriptive Work Log.

Cole, David N. 1983. Assessing and monitoring backcountry trail conditions. Research Paper INT-303. Ogden, UT: U.S. Department of Agriculture, Forest Service, Inter-mountain Research Station. 10 p.

Hendee, John C.; von Koch, R. 1990. "Wilderness management planning." in: Wilderness management. John C. Hendee, George H. Stankey, and Robert C. Lucas., eds. Golden, CO: North American Press: 195-213.

Hooper, Lennon 1988. NPS trails management handbook. Denver, CO: U.S. Department of the Interior, National Park Service, Denver Service Center. GPO, 1988-576-279/85200. 53 p.

Proudman, Robert D.; Rajala, R.R. 1981. Trail Building and Maintenance, 2nd Edition. Boston, MA: Appalachian Mountain Club. 286 p.

Footnotes

1/ Williams, Peter B.; Marion, J.L.; Rajala, R.R. 1992. A comprehensive trail inventory and preliminary recommendations for development and maintenance of a trail system in Delaware Water Gap National Recreation Area. Gorham, NH: Appalachian Mountain Club, Trails Program. 93 p. [unpublished].

2/ Williams, Peter B.; Rajala, R.R.; Martin, B.H. 1988. Acadia National Park trail system assessment. Gorham, NH: Appalachian Mountain Club, Trails Program. 69 p. [unpublished].

Trail name: **Adam's Creek** **Filename:** *adamcrk.log*
Length: 0.93
stage to Incorporate into Trail System: 2
Local Park Area: Adams **Creek**

General Characteristics		Maintenance Figures			Estimated Days of Labor	
		Item	Totai Feet	Units	Low	High
Difficulty:	**moderate**	**Rocksteps**	**n/a**	**43**	10.75	143
Existing **Use:**	**hiking**	**Log Steps**	**n/a**	**0**	**0.00**	**0.00**
Level of Use:	**moderate**	**Step-stones**	**n/a**	**32**	**6.40**	**8.00**
Recommended Use:	**hiking**	Ditching	**6**	1	**0.12**	**0.15**
Expected Level of Maintenance:	moderate	Wood Water **Bar**	16	**2**	0.40	**0.53**
Sensitive Areas?:	**Yes**	**Rock** Water Bar	0	0	**0.00**	**0.00**
Potential Safety Concerns?:	**Yes**	Cribbing	**75**	1	**3.75**	**7.50**
		stream **Bridge**	0	0	0.00	**0.00**
		Bog Bridge	0	0	**0.00**	**0.00**
		Sidehilling	0	**n/a**	**0.00**	**0.00**
		'Estimates of **Total** Labor **Required:**			21.42	**30.51**

Comment:
Adam's Creek has several stream crossings. These will be difficult to bridge because of width. The streams are shallow, except in flood. **SS** or **nothing should** be sufficient Beyond the upper **falls** is a **mill.** A number of options **are** present for **connecting the current trail with** the **mill area.** Additional **field** trips **will** be **necessary** to determine **the preferred route. It is recommended that the south bank be used for accessing the mill. The north is steep and has** more **obstacles.** Management decisions **concerning** *use,* **type** of **use, local** loop hikes, etc. should be made prior to the **installation** of this route.

Example 2 Catalog Entry for a Prescriptive Maintenance Worklog.