



NATIONAL PARKS CONSERVATION ASSOCIATION
Protecting Parks for Future Generations®

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STATE
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PARKS®

april 2004

GREAT SMOKY MOUNTAINS
NATIONAL PARK

A Resource Assessment



NATIONAL PARKS CONSERVATION ASSOCIATION



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STATE OF THE PARKS® Program

More than a century ago, Congress established Yellowstone as the world's first national park. That single act was the beginning of a remarkable and ongoing effort to protect this nation's natural, historical, and cultural heritage.

Today, Americans are learning that national park designation alone cannot provide full resource protection. Many parks are compromised by development of adjacent lands, air and water pollution, invasive plants and animals, and rapid increases in motorized recreation. Park officials often lack adequate information on the status of and trends in conditions of critical resources. Only 10 percent of the National Park Service's (NPS) budget is earmarked for natural resources management, and less than 6 percent is targeted for cultural resources management. In most years, only about 7 percent of permanent park employees work in jobs directly related to park resource preservation. One consequence of the funding challenges: two-thirds of historic structures across the National Park System are in serious need of repair and maintenance.

The National Parks Conservation Association initiated the State of the Parks® program in 2000 to assess the condition of natural and cultural resources in the parks, and determine how well equipped the National Park Service is to protect the parks—its stewardship capacity. The goal is to provide information that will help policy-makers, the public, and the National Park Service improve conditions in national parks, celebrate successes as models for other parks, and ensure a lasting legacy for future generations.

For more information about the methodology and research used in preparing this report and to learn more about the State of the Parks® program, visit www.npca.org/stateoftheparks or contact: NPCA, State of the Parks® program, P.O. Box 737, Fort Collins, CO 80522; Phone: 970.493.2545; E-mail: stateoftheparks@npca.org.

The National Parks Conservation Association, established in 1919, is America's only private, nonprofit advocacy organization dedicated solely to protecting, preserving, and enhancing the U.S. National Park System for present and future generations by identifying problems and generating support to resolve them.

- * Nearly 300,000 members
- * 7 regional offices
- * 32,000 activists



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REPORT SUMMARY



POPULAR PARK FACES CHALLENGES

Great Smoky Mountains National Park was established in 1934 to protect some of the last remaining old growth forests in the eastern United States from intense logging and to ensure the survival of the thousands of species that take refuge in these forested mountains. More than 10,000 species have been documented so far, but scientists estimate that as many as

100,000 may actually live in the park. The park is also known for its 19th and early 20th century log houses, mills, churches, and archaeological sites that tell the story of earlier residents.

The Great Smoky Mountains' proximity to major population centers makes it a popular recreation destination—more than nine million visitors enter the park each year to hike, camp, fish, and learn about

Autumn is a favorite time of year to visit Great Smoky Mountains National Park.

GREAT SMOKY MOUNTAINS NATIONAL PARK AT A GLANCE

- Encompasses approximately 521,490 acres and is visited by more than nine million people each year, making it one of the largest parks in the eastern United States and the most visited national park.
- Protects approximately half of the remaining old growth forest in the eastern United States.
- Renowned for its spectacular natural and cultural resources, Great Smoky Mountains National Park was established in 1934, was named an International Biosphere Reserve in 1976, and became a World Heritage Site in 1983.
- Contains the largest collection of historic log homes in the United States.
- As many as 100,000 species may inhabit the park, making it one of the most biodiverse parks in the United States.



NATIONAL PARK SERVICE

Park staff use backpack sprayers to apply treatments to combat hemlock woolly adelgids. These control methods are costly and labor intensive, but hemlocks could disappear without such treatments.

the park's history and enjoy its cultural landscapes. What these visitors may not realize is that the park is under assault from a host of threats.

Although Great Smoky Mountains National Park is one of the most natural and unaltered settings in the southern Appalachians, it lies within a developed area. Major roads surround and converge on the park, linking medium and large-sized metropolitan areas. It is easy to get to and is within a day's drive of two-thirds of the U.S. population. Increasing development in surrounding communities and possible road development within the park itself could lead to habitat fragmentation with resulting detrimental effects on sensitive forest species.

Non-native pests and diseases are damaging many tree species in the Great Smoky Mountains, several of which face extirpation if infestations and infection continue. Non-native plants and animals and a history of fire suppression have also interfered with healthy ecosystem processes.

Pollution from coal-fired power plants and other sources degrades air quality at the park—ozone often reaches levels harmful to humans, animals, and vegetation, and acid deposition affects both the land and water. Small particle pollution forms an unnatural haze that obscures popular scenic vistas.

The park contains more than 200 historic structures, including the most extensive collection of historic log houses in the nation, but some of the most popular structures have been vandalized, and many are deteriorating because of insufficient maintenance. Most of the park's cultural and historical museum objects are stored in a Department of Energy facility more than two hours away. This facility meets museum storage standards, but reliable long-term funding is needed to secure its use past 2004.

Inadequate funding and staffing present a major challenge to the Great Smoky Mountains. The park has an annual operating budget shortfall of \$11.5 million and needs an additional 108 full-time equivalent employees to supplement the current staff of fewer than 300. Without increased funds and more staff, the park will not be able to properly protect its resources to ensure their enjoyment into the future.

STATE OF THE PARKS® ASSESSMENT

In this report, the National Parks Conservation Association (NPCA) summarizes findings from an assessment by its State of the Parks® program to describe the current condition of Great Smoky Mountains National Park's resources and the stewardship challenges ahead.

In the chart on the following page, up arrows indicate conditions will likely improve over the next ten years, down arrows indicate conditions will likely deteriorate during that time, and flat arrows indicate no change is likely.

The findings in this report do not necessarily reflect past or current park management. Many factors that affect resource conditions are a result of both human and natural influences over long periods of time, in many cases before a park was established. The intent of the State of the Parks® program is to document the present status of park resources and determine which actions can be taken to protect them into the future.

RATINGS

Current overall conditions of known **natural resources** rated 62 out of 100, indicating they are "endangered." Ratings were assigned through an evaluation of park research and monitoring data (see Appendix). Challenges include air pollution and associated acid deposition, non-native pests and diseases, historic fire suppression, and urban encroachment.

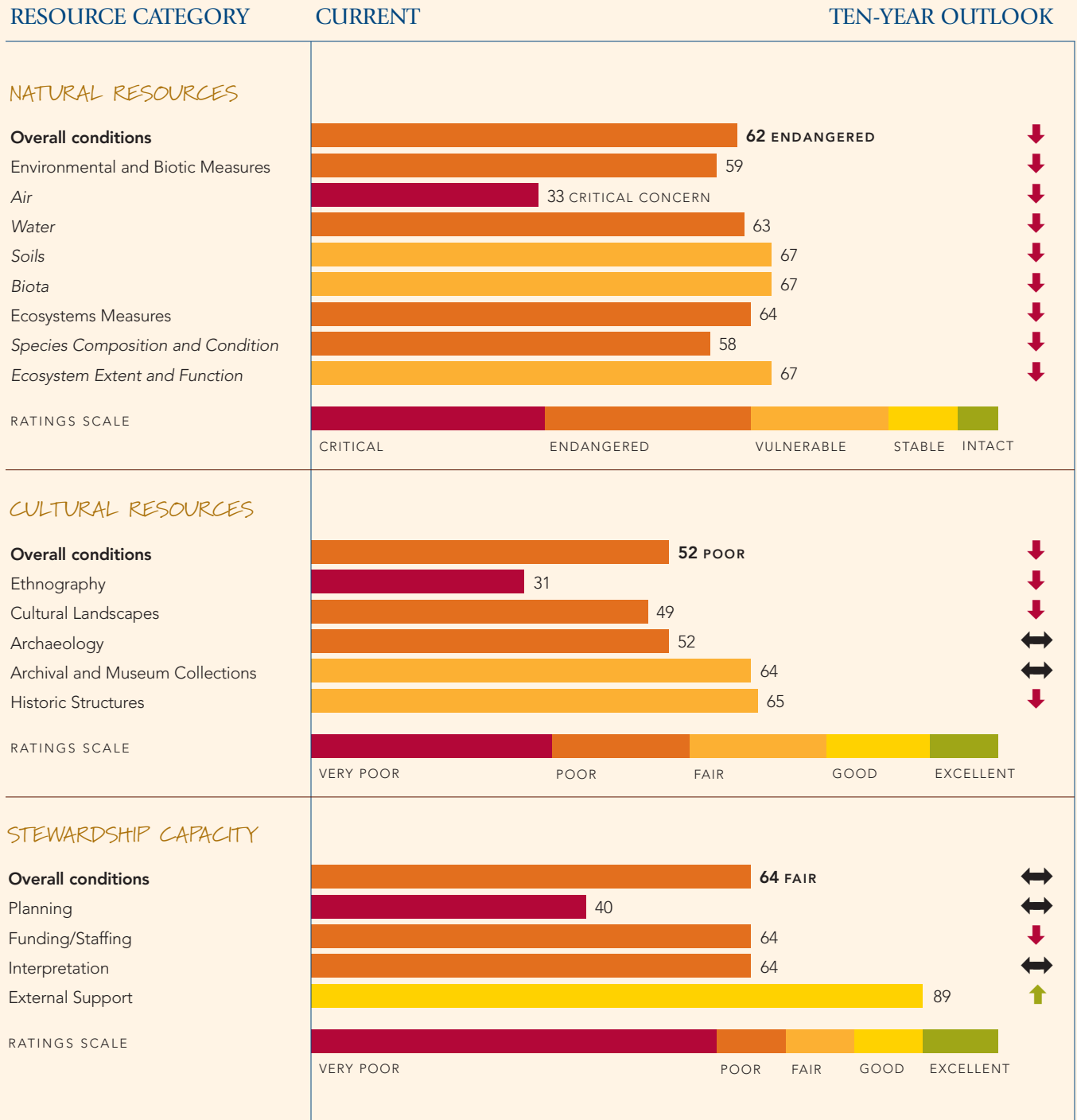
Cultural resources at the park rated 52 out of 100, indicating they are generally in "poor" condition. Insufficient staff and funding, the park's lack of an ethnography program, and inadequate funding for long-term museum and archive storage facilities contribute to this score.

The current overall **stewardship capacity**—the Park Service's ability to protect park resources—rated a "fair" score of 64 out of 100. This score reflects the park's large budget shortfall, outdated General Management and Resource Management plans, and the absence of several key cultural resources plans.

KEY CHALLENGES

- Air pollution, primarily from regional coal-fired power plants, industry, and motor vehicles, has greatly reduced visibility from an average of 113 miles (under natural conditions) to an annual average of 25 miles. In addition, ground-level ozone and acid deposition threaten the health of park visitors, staff, vegetation, soils, and streams.
- An \$11.5 million annual budget shortfall and the need for an additional 108 full-time staff positions hinder the park's ability to protect resources. The largest staff shortfalls are in the Resource and Visitor Protection, Resource Management and Science, and Maintenance and Operation of Facilities programs. Many historic structures are at risk because of limited funds for critical repairs and monitoring programs.
- Non-native pests and diseases are killing Fraser firs, hemlocks, dogwoods, butternuts, and beech trees in the park's forests. Fraser firs and hemlocks may disappear if infestations continue.
- Historic fire suppression threatens the park's ecosystems. Some plant communities require regular fires to persist, and without them, diversity is lost. The park needs additional funds and staff to fully implement the existing fire management program and conduct the burns necessary for preserving park ecosystems.
- Each year more than two million visitors tour popular Cades Cove, creating traffic congestion and causing damage to both natural and cultural resources.
- A proposal to build a road across the southwestern portion of the park, the largest unfragmented tract of mountain terrain in the eastern United States, could be potentially devastating to terrestrial wildlife, especially bears.

Note: When interpreting the scores for natural resource conditions it should be recognized that critical information upon which the ratings are based is not always available. The extent to which data requirements for the assessment methodology are met is called information adequacy and provides a basis for interpreting the ratings. In this assessment, a relatively high 68 percent of the information requirements associated with the methods were met. This reflects the park's dedication to science and the exceptional research and monitoring programs in place.

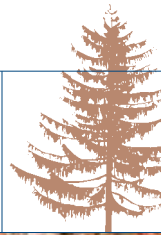


TOP TEN KEY RECOMMENDATIONS

NPCA believes it is essential that the National Park Service, Great Smoky Mountains partners, and local supporters join with decision-makers and legislators to overcome funding and staffing shortfalls at the park, as well as address specific resource protection issues. Efforts must be directed at the following priorities:

- The current Clean Air Act must be maintained by Congress and enforced by the Environmental Protection Agency to reduce the air pollution that harms staff, visitors, and wildlife in the park.
- Congress and the administration should allocate the funds necessary to eliminate the park's \$11.5 million shortfall. These funds will ensure that the Park Service can continue to control non-native species; maintain existing exemplary air quality monitoring programs; initiate new research; and hire additional resource protection staff. These funds could also be used to support improvements to visitor centers and new interpretive staff positions.
- The Park Service should fully investigate and implement alternative transportation plans to reduce traffic in the park, particularly in Cades Cove, and engage gateway communities to develop a comprehensive plan to both reduce congestion in the park and satisfy the future transportation needs of the region.
- The park staff should balance their time between reactive archaeological work done when sites are discovered incidentally with proactive research conducted according to defined management goals.
- The Park Service should not build the proposed North Shore Road. Construction and maintenance of this road would be technically very difficult, extremely expensive, and environmentally devastating.
- The Park Service should update both the General Management and Resource Management plans to reflect current needs. The Park Service should also fund the printing of the Cataloochee Cultural Landscape Report, which has been complete for more than two years, and use this report as a management tool.
- Congress and the administration should provide additional funding to support cultural resources management staff. Funds could be used to hire a cultural landscape expert to further protect the park's cultural landscapes, a cultural anthropologist to complete an Ethnographic Overview and Assessment and start collaboration proceedings with associated peoples, and a permanent museum curator to care for the park's cultural resource collection.
- Congress and the administration should provide funds to adequately support the on-going elk re-establishment and fire management programs. Both programs require additional funds and staff. Support is also needed to allow the park to investigate episodic acidification and evaluate long-term effects of soil acidification and nitrogen-loading changes on geochemical processes and soil organisms.
- Congress and the administration should provide additional funds to support an annual monitoring program to prevent graffiti and looting at historic structures and archaeological sites and to prevent bats and other animals from damaging these resources. Funds are also needed to carry out legislative mandates relevant to historic preservation.
- The Park Service should implement research and educational programs about all peoples that inhabited the Great Smoky Mountains. In addition, the park should enlist the aid of university museum management and archival programs to help reduce the catalog backlog and organize the collections so researchers can more easily access them and integrate them into interpretive programs.

IT IS ESSENTIAL TO OVERCOME
FUNDING AND STAFFING SHORTFALLS
AT THE PARK, AS WELL AS
ADDRESS SPECIFIC RESOURCE
PROTECTION ISSUES.



TREASURE OF THE SOUTHERN APPALACHIANS



The densely forested mountains, clear streams, abundant species, and its profound connection to the human inhabitants made the piece of land straddling the southern Appalachian Mountains in North Carolina and Tennessee the obvious choice for a new national park. This was the logic advanced in 1923 by Mrs. Anne Davis, a Tennessee native who advocated for park establishment with her husband, Willis P. Davis. Through the dedicated efforts of countless citizens and activists such as the Davises, Horace Kephart, and Colonel David Chapman, the park was authorized in 1926.

Congress selected the 521,490 acres encompassed by Great Smoky Mountains National Park above 60 other proposed national park sites, but land had to be acquired before the park could become a reality. Much of the desired area was divided into 6,600 separate tracts owned or occupied by settlers, American Indians, logging companies, and mining interests. Through enormous fund-raising efforts, the nearly \$12 million needed to buy the land was acquired from Tennessee and North Carolina state governments, the federal government, and private donors—including a \$5 million gift from John D. Rockefeller,

Jr. In 1934, eight years after its authorization, Great Smoky Mountains National Park was established.

The park protects approximately 521,490 acres of land, including about half of the last remaining patches of old growth forest in the eastern United States. A wealth of species takes refuge in the park. Scientists estimate that as many as 100,000 species, many unknown to science, may live in the park. An All Taxa Biodiversity Inventory is underway to identify all species residing in Great Smoky Mountains National Park.

The park also preserves evidence of the cultures that have shaped and been shaped by the Great Smoky Mountains for thousands of years. Various groups of people have had a longtime affiliation with the land, its flora, and its fauna. This complex history

President Franklin D. Roosevelt dedicated the park from this podium in 1940.



RICHARD WEISSER/SMOKYPHOTOS.COM

GREAT SMOKY MOUNTAINS NATIONAL PARK



MATT KANIA

RESOURCE MANAGEMENT HIGHLIGHTS

- An All Taxa Biodiversity Inventory, the first of its kind, is being conducted to document all species in the park. The information gained will be available for use in resource planning and education to ensure the preservation of the park's natural heritage for future generations.
- As a result of a partnership among the National Park Foundation, Log Cabin Syrup of Aurora Foods, Inc. and the Friends of Great Smoky Mountains National Park, the Daniel Cook cabin was recently restored to its original foundation in the Little Cataloochee Valley. The log home had been dismantled and put into storage in the 1970s because of vandalism.
- The park hosts long-term monitoring stations that have been collecting extensive air quality data since 1980, serving as models both within and beyond the park system. The information gathered informs Park Service officials, decision makers, and the public of the status and trends in conditions in Great Smoky Mountains National Park. The park is also a U.S. Geological Survey reference watershed site with more than ten years' worth of valuable water resources data.
- The park has a four-person historic preservation crew to care for historic structures. Few parks are fortunate enough to have such a relatively large crew to address historic preservation.
- Education is a top priority at the park. It is estimated that the Park Service interpretive staff and other non-park groups reach more than 20,000 children each year.

More than 400 species that are new to science have been discovered in Great Smoky Mountains National Park as a result of the All Taxa Biodiversity Inventory. Many of these new species are insects, plants, and fungi.

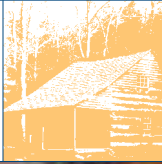
connects these people with the landscape and provides a foundation for how the land that is now the park is cared for, used, and perceived today, and has led to many significant challenges for park managers. An understanding of this history from multiple perspectives is the first step to understanding why the park is worthy of protection.

Cherokee Indians lived, farmed, and hunted in the Great Smoky Mountains for centuries before settlers of European descent arrived. In 1838-39, to make way for these new settlers, President Andrew Jackson supported a policy, contrary to a Supreme Court ruling, that forced many of the Cherokees to leave the Great Smoky Mountains. More than 16,000 Cherokees left their traditional lands and traveled the route to Oklahoma that became known as the "Trail of Tears." Fewer than 10,000 people survived the journey.

A small population of Cherokees successfully remained on their ancestral lands. The descendants of these people are the Eastern Band of Cherokee Indians, and today more than 10,500 of them live on the Qualla Boundary, adjacent to the park. Archaeological sites, historic structures, and other special places bear witness to the Cherokees who inhabited the region and to the settlers who farmed, logged, and mined the area before it became a national park.



NATIONAL PARK SERVICE



THE GREAT SMOKY MOUNTAINS ASSESSMENT



NATURAL RESOURCES— DIVERSE FOREST ECOSYSTEMS THREATENED

The assessment rated the overall condition of natural resources at Great Smoky Mountains National Park a 62 out of 100, which ranks the park as “endangered” with poor estimated viability of the park’s ecosystems. The park’s low natural resource score reflects historical land use impacts and wide-ranging threats, including critical levels of

air pollution, non-native pests and diseases, effects of historical fire suppression, and increased development of adjacent lands.

EXOTIC SPECIES—NON-NATIVE PESTS AND DISEASES THREATEN FOREST ECOSYSTEMS

Non-native pests and diseases have changed and continue to change the structure of forest ecosystems in the Great Smoky Mountains. The American chestnut, once a prominent tree in the Appalachians, has virtu-

The park contains about 2,115 miles of streams that are home to a variety of fish. Most streams also feature waterfalls, many of which are popular hiking destinations.

ADELGIDS WREAK HAVOC ON EASTERN HEMLOCKS

Since the early 1980s, the hemlock woolly adelgid, an aphid-like insect that originated in Japan and was first observed in Virginia in the 1950s, has caused widespread hemlock mortality in the Virginia portion of the Blue Ridge Parkway and in Shenandoah National Park. Infestations of the pest in the Great Smoky Mountains were first confirmed in 2002. Armed with information from Blue Ridge and Shenandoah, park officials are working hard to stem the spread of the hemlock woolly adelgid in the Smokies. Affected sites have been treated, but control methods are costly and labor-intensive.

Hemlocks provide valuable shade along streams, cover for neotropical migrant birds, and food for birds and small mammals. The stately trees also lend aesthetic value to the park's forests. Some old growth hemlocks tower more than 170 feet and have been standing longer than the United States has been a country. Loss of these trees would forever alter the forest, affecting the many species that use the tree for cover and food as well as the landscape that visitors enjoy. To preserve the hemlock in the Great Smoky Mountains, additional funding is needed immediately to continue control measures. Cooperation with managers of adjacent federal lands containing hemlock stands is also crucial.



ally disappeared from the park, wiped out by chestnut blight, a non-native disease that killed three and a half billion chestnuts in the eastern United States by 1940. The destruction of these trees meant animals lost a food source, the forest structure changed dramatically, and the community lost a source of income through the chestnut trade. A few chestnut trees remain in the park, and researchers are studying them to discover how they survived the blight.

Another non-native pest, the balsam woolly adelgid (*Adelges piceae*) has effectively killed more than 90 percent of the park's mature Fraser firs (*Abies fraseri*), placing the survival of these trees and the species that depend on them in doubt. Park officials also are concerned about the effects that the non-native hemlock woolly adelgid (*Adelges tsugae*) is having on hemlocks (*Tsuga canadensis*) and the species that use them for food and cover.

Beech bark disease caused by the fungus *Nectria galligena* has killed many of the high elevation beech trees in the park and a startling number along the Appalachian Trail. The loss of beech trees will deprive wildlife of an important food source. Two other diseases, dogwood anthracnose and butternut canker, have reduced dogwoods and butternuts, respectively. In the last 30 years, dogwood density has declined by more than 90 percent. Pests and diseases are having an enormous effect on the park's forest ecosystem, altering its structure and compromising habitat. The loss of these trees also affects visitors who have come to enjoy the beauty of the southern Appalachian forests.

A wide array of invasive non-native plants such as multiflora rose (*Rosa multiflora*), kudzu (*Pueraria montana*), mimosa (*Albizia julibrissin*), Japanese honeysuckle (*Lonicera japonica*), oriental bittersweet (*Celastrus orbiculata*), privet (*Ligustrum vulgare*), and paulownia (*Paulownia tomentosa*) are also found throughout the park, often displacing native species. Controlling or eradicating these non-natives is a high priority for park staff, but doing so is a drain both financially and in terms of personnel time. In 2003, the park expended 1,096 work hours to treat 291 of 820 identified non-native plant sites. With base annual funding for non-native plant control of only about \$60,000, the park relies heavily on volunteers to treat problem areas.



Park staff use electroshockers to collect native brook trout to restock in streams being restored. Brook trout declined as a result of logging activities before the park was established and were also affected by non-native rainbow and brown trout.

Wild or feral hogs (*Sus scrofa*) are another non-native species that threaten overall forest health. Their extensive rooting and wallowing alters habitat, and they compete for food with native animals such as black bears. The hogs have inhabited the park for decades, but park staff have trapped and transported the hogs away from the park since 1959. Since then, more than 10,000 have been removed.

Park staff, as well as state and federal departments of agriculture, are concerned about the illegal movement and release of feral swine near the park from other areas. These illegal releases could result in the importation of diseases such as swine brucellosis and pseudorabies that are currently not found in North Carolina and Tennessee.

NATIVE SPECIES—RICH MIXTURE OF BIOLOGICAL SPECIES AND COMMUNITIES

The Great Smoky Mountains harbor a wide array of species, in part, because of their geographic location, geologic history, and varied topography. The movement of glaciers during the last ice age forced many northern plant and animal species to find refuge farther south, and when the glaciers retreated some of these species remained on the highest peaks of the southern Appalachians. The presence of these typically northern species helps to make the Great Smoky Mountains a highly diverse area.

Great Smoky Mountains National Park is composed of at least 20 ecological systems—from spruce-

POACHERS THREATEN PARK'S GINSENG POPULATIONS

Ginseng (*Panax quinquefolius*) is a plant whose root is prized for its medicinal value. It is thought to increase mental efficiency, relieve stress, regulate metabolism, and boost the immune system. The slow-growing plants take several years to reach maturity and are found in most eastern states, although populations are thought to be in decline throughout much of the plant's range.

Harvest is allowed with a permit on private lands and some U.S. Forest Service and state lands in the East, but is strictly prohibited in national parks such as Great Smoky Mountains, Shenandoah, and the Blue Ridge Parkway. Illegal collection does occur, however, and park staff are concerned about effects on resident ginseng populations. In the last ten years, NPS officials have seized nearly 11,000 illegally harvested ginseng roots. These recovered roots are then replanted and monitored, but staff have found that many of the replanted areas are raided again by poachers.

The high market value—\$200 to \$500 per dry pound—of ginseng makes illegal collection potentially very profitable. Park officials estimate that millions of dollars' worth of ginseng has been taken from the Smokies in the last decade. Most roots are harvested and exported to China because Asian ginseng populations were decimated hundreds of years ago by over-exploitation. Increasing demand for the root in the United States has resource managers working to ensure the same fate does not befall American ginseng. Many roots are marked with a harmless dye to indicate that they are from the park. This helps park officials prove that confiscated roots were illegally harvested.

It is difficult for park officials to strictly enforce ginseng harvesting bans, in part, because Great Smoky Mountains and other national parks are adjacent to Forest Service and other lands that allow harvests. Increased funds for additional law enforcement personnel, steeper fines for those caught poaching, and cooperation among the NPS, Forest Service, and local, state, and federal law enforcement would go far to limit the amount of illegal collection occurring on Park Service lands.



Black bears, one of the few native large predators still found in the park, are commonly seen in Cades Cove. Although the bears may seem tame, it is critical for the bears' survival that visitors treat them as wild animals.

SPECIES IN GREAT SMOKY MOUNTAINS NATIONAL PARK

Estimated Total Species	~100,000
Native Species	10,440
Species New to Park Inventory	3,022
Species New to Science	427
Locally Rare Species	945
Globally Rare Species	53
Endangered Species	7
Threatened Species	8
Extirpated Species	16
Non-native Species	381

SOURCES: NATURESERVE AND ALL TAXA BIODIVERSITY INVENTORY

fir forests at the upper elevations to small stream and riparian forests along creeks and rivers. Montane pine forests, hemlock-hardwood forests, and grass and shrub balds are a few of the other ecological systems in the park, each with its own distinct plant assemblage, and each with a complement of wildlife species that depend on it for food and shelter.

Since 1998, teams of biologists working on the All Taxa Biodiversity Inventory have discovered more than 2,700 species not previously known to inhabit the park. More than 400 of these are insects, plants, and fungi that are new to science. To date, more than 10,000 species have been inventoried, including approximately 1,300 vascular plants, 2,250 fungi, 4,000 insects, and 240 birds. Of particular note, the park is recognized as a global hotspot of salamander diversity. Thirty distinct species have been identified, including the impressive two-and-one-half-foot long hellbender (*Cryptobranchus alleganiensis alleganiensis*).

Although predators such as wolves (*Canis lupus* and *C. rufus*) and fishers (*Martes pennanti*—members of the weasel family) were extirpated from the Great Smoky Mountains by the time the park was established, black bears (*Ursus americanus*) remain in the region. The park has developed a comprehensive long-term monitoring program for black bear populations that incorporates winter den visits, air and ground telemetry, food availability surveys, and bait station surveys. In 2003, the population was estimated to be approximately 1,350 bears.

Inside the park, adult black bears have no natural predators except man, but those that wander outside park boundaries may be hunted legally during certain seasons. Poachers also kill some bears for their claws, teeth, and gallbladders. Bears that regularly obtain human food and garbage have been shown to have life spans up to 50 percent shorter than wild bears. These bears have an increased chance of being hit by cars or lured by poachers, and because they have lost their fear of humans they may become unpredictable and dangerous. Black bear activity is reported at many locations throughout the park each year. Visitors approaching and harassing wildlife is a concern, particularly in Cades Cove.



Visibility at the park is severely compromised by human-caused pollution. On bad days, scenic views are reduced by 60 to 80 percent.

AIR POLLUTION—DEGRADES VISITOR EXPERIENCE AND THREATENS ECOSYSTEM AND HUMAN HEALTH

Early inhabitants and visitors to the Great Smoky Mountains marveled at the bluish haze that hangs over the landscape, shrouding the forests and peaks with a cloak of mystery. The Cherokee Indians named the region Shaconage—“place of blue smoke.”

Different from the pollution-related smog that plagues many cities, the natural haze that gives the Great Smoky Mountains their name forms when volatile organic compounds released from trees react with gases in the atmosphere. But the natural haze that has hung over these mountains since their creation today combines with pollution from human sources, reducing visibility and degrading air quality.

In recent reports of air quality in the national parks, ozone concentrations, acid deposition, and visibility impairment in the Great Smoky Mountains were among the highest recorded in the National Park System. In 2002, Great Smoky Mountains also ranked in the top 10 percent of all monitored United States sites for mercury deposition.

Sulfur dioxide, nitrogen oxides, ozone and particulate matter are mainly responsible for the unnaturally hazy skies and other air pollution impacts at the park. Power plants both nearby and hundreds of miles away are the major sources of sulfur dioxide, a component of acid rain. Pollution from motor vehicles (mostly from outside the park) is the primary source of nitrogen oxides, key ingredients in the formation of ground level ozone and a precursor of acid rain.

While ozone in the upper atmosphere (stratosphere) provides protection from the sun’s ultraviolet rays, when pollution from automobiles and other sources causes elevated levels to form at ground level (troposphere), ozone can damage plants and cause respiratory distress in humans. According to the Environmental Protection Agency, ozone is regarded as one of the most pervasive and damaging pollutants to both humans and other species. Thirty plant species in the Great Smoky Mountains have shown foliar damage as a result of heightened ozone exposure—an early warning sign of stress to the natural systems.

OZONE POLLUTION AT GREAT SMOKY MOUNTAINS IS SOME OF THE WORST IN THE ENTIRE NATIONAL PARK SYSTEM, AND IN 2002 GREAT SMOKY MOUNTAINS RANKED IN THE TOP 10 PERCENT OF ALL MONITORED U.S. SITES FOR MERCURY DEPOSITION.

The park regularly issues warnings to inform visitors when ozone levels exceed national air quality standards. In 1999, the park recorded 52 “unhealthy” days. High levels of ground level ozone can cause shortness of breath, wheezing, coughing, and other respiratory distress in some people, especially those with respiratory ailments such as asthma and emphysema.

In addition to health problems, air pollution clouds the scenic vistas that draw many people to the park. According to the 2002 NPS report, “Air Quality in the National Parks,” 84 percent of the visitors surveyed said that clear scenic views were “extremely important.” Unfortunately, visibility is severely compromised by air pollution composed of increased particulates—primarily sulfates—that are suspended in the air and form a gray or white haze. The current average visibility range of 25 miles is much less than the estimated natural (pre-industrial) range of 113 miles. The visibility range during the humid months of summer is even worse, averaging only 15 miles, while summer visibility under natural conditions is estimated to be 77 miles. This means that air pollution reduces park views by 60 to 80 percent.

In addition to affecting ozone formation and visibility, nitrates and sulfates alter soil and water acidity when they are deposited on the landscape. Annual deposition of nitrogen and sulfur in the park are more than 60 and 80 times, respectively, that occurring under natural conditions. High elevation spruce-fir ecosystems are particularly hard-hit by acid deposition. Because of their higher elevation and the associated climatic factors such as increased clouds and pre-

cipitation, these systems tend to receive higher levels of nitrates and sulfates. These pollutants lower pH in soils that are already naturally acidic, often leading to the release of inorganic aluminum, with subsequent effects on nutrient uptake in trees. Soils quickly become saturated with nitrates, and excess nitrogen, along with aluminum, can readily be leached into aquatic systems. The result is increased stream acidity and detrimental effects on acid-sensitive species.

LAND USE—RESULTS OF PAST ACTIVITIES STILL FELT IN PARK

Settlers of the Great Smoky Mountains found a land rich in natural resources. Old growth forests gave shelter to myriad wildlife species and provided settlers with the resources needed to carve a living from the land. Now, more than 70 years after the area became a park, the land still reflects the logging, agriculture, grazing, mining, and homesteading that took place prior to park establishment. Non-native species, extirpated native species, heavily logged forests, and disturbed landscapes are results of such activities.

While concentrated settlement occupied only 9 percent of the land area of the present day park, many of the effects of this land use are still felt. Populations of large fauna were decimated by hunting and persecution, and top predators and large herbivores such as wolves, mountain lions (*Felis concolor*), fishers, bison (*Bos bison*), and elk (*Cervus canadensis*) were virtually gone from the area prior to park establishment. Although recent attempts to reintroduce wolves were not successful, the park is currently working to restore elk populations. In 2001 and 2002, 52 elk were released into the park as part of a five-year experimental reintroduction program. The program has met with success—the elk population has increased to approximately 65 animals—but additional funds and staff are needed to continue the project.

Eastern forests were heavily affected by the timber industry in the late 19th and early 20th centuries, and the Great Smoky Mountains region was no exception. Between 1900 and 1920, an estimated 2 billion board feet of lumber was extracted from 60 percent of the total land area of what is now the

The overlapping roots of towering trees line the Chimney Tops Trail. Hikers to the top are rewarded with a spectacular 360-degree view of the park.

RICHARD WEISSER / SMOKYPHOTOS.COM



park. Protection for the remaining old growth forest was a primary impetus for national park designation. Great Smoky Mountains National Park now protects about half of all remaining old growth forest in the eastern United States.

Although the park afforded the forests protection from logging, historic fire suppression now threatens montane pine forests in the Great Smoky Mountains. Two of the trees that dominate these systems, Table Mountain pine (*Pinus pungens*) and pitch pine (*Pinus rigida*), require regular fires to persist, and without fire, these pines begin to be replaced by other tree species. Lack of regular fires also exacerbates the damage done by southern pine beetles. Damaged trees readily burn, and fires create conditions that encourage the growth of new pine seedlings. Because fires have been suppressed, other species are replacing the dead pines. This leads to changes in both plant and animal communities, and resource managers are concerned about the loss of these diverse pine forests.

Recent studies have shown that montane pine forests have decreased in size in the park because of fire suppression and that continued lack of fire could lead to the loss of this community type. In an effort to restore the natural fire regime in western areas of the park, staff burned approximately 2,000 acres in 2002, much of it in areas where pine forests exist. However, the park does not have the funds or staff needed to conduct enough prescribed burns to maintain the level of diversity that exists in the forests today.

The land surrounding the Great Smoky Mountains is largely forested or under agricultural uses, but increasing development in border communities and on adjacent private lands could lead to forest fragmentation, new corridors for invasive species, and detrimental effects on sensitive forest interior species such as wood thrushes and other songbirds. The park is nestled between the metropolitan areas of Knoxville, Tennessee, and Asheville, North Carolina, and populations in the six counties bordering the park have grown an average of 23 percent from 1990 to 2000. The growing population in the region is leading to plans for transportation corridors surrounding and converging on the park.

LOCAL COMMUNITIES PUSH TO SETTLE CONTROVERSIAL ROAD ISSUE

Proposed road construction both inside and outside Great Smoky Mountains National Park ranks among the most serious threats to its integrity. One such project threatening the Smokies since 1943 is the North Shore Road that would run through the park north of Fontana Lake in Swain County, North Carolina. The National Park Service halted construction of the road in the early 1970s after studies revealed that construction and maintenance would be technically very difficult, extremely expensive, and environmentally devastating. All of those factors are equally true today. It is also true that the time has come to settle this issue.

In early 2003, the people of Swain County spoke through both the Swain County Board of Commissioners and the Bryson City Board of Aldermen as they passed resolutions in support of a settlement in lieu of the road. The governor of North Carolina, Sen. Elizabeth Dole (R-N.C.), and Sen. John Edwards (D-N.C.) have also expressed support for a settlement.

Many groups, including NPCA, recognize a cash settlement for Swain County as a fair and reasonable, win-win solution to this issue. NPCA and others are working with all the signatories of the 1943 agreement, namely Tennessee Valley Authority, the National Park Service, North Carolina, and Swain County, urging all to support a settlement in lieu of the road.

Meanwhile, North Carolina Rep. Charles Taylor (R) was able to get \$16 million appropriated to resume construction, forcing NPS to begin to study the environmental and economic costs of constructing this road. Studies will cost American taxpayers at least \$4 million. Environmental costs include exposure of highly acidic Anakeesta rock and the construction of a road through the largest roadless tract of mountain terrain in the eastern United States, destroying the integrity of this remarkable resource.

For more information about the ongoing study and to comment on the North Shore Road, visit <http://www.northshoreroad.info/>.



RICHARD WEISSER/SMOKYPHOTOS.COM

Nineteenth and early 20th century log houses, mills, churches, and archaeological sites tell the story of earlier residents. Visitors to Mingus Mill can learn how a turbine powered gristmill works.

CULTURAL RESOURCES—RICH SOUTHERN APPALACHIAN HISTORY AND DEEP CULTURAL CONNECTIONS

Great Smoky Mountains National Park received an overall “poor” score of 52 out of 100 for cultural resource conditions, including archaeology, cultural landscapes, historic structures, archival and museum collections, and peoples and cultures (ethnography). The scores for cultural resources are based on the results of indicator questions that reflect the National Park Service’s own Cultural Resource Management Guideline, federal legislative mandates, and other Park Service policies.

The park contains a wealth of cultural resources and holds the promise of additional discoveries with more extensive surveys. The park houses the largest collection

of log homes in the country, in addition to historic mills, churches, and more than 150 cemeteries. Despite the rich cultural history of the area, the cultural resources program at the Great Smoky Mountains suffers from insufficient funding and staffing.

PEOPLES AND CULTURES (ETHNOGRAPHY)—COLLABORATION NEEDED BETWEEN PARK AND PEOPLE ASSOCIATED WITH THE PARK

The Great Smoky Mountains has no formal ethnography program, which has hindered the Park Service’s ability to collaborate on resource management issues with the Eastern Band of Cherokee Indians and descendants of Anglo-American pioneers, timber company employees, and other people who once lived within current park borders.

Despite no formal ethnography program, the park often incorporates local music and oral histories into its education programs that outline the importance of some of the historic structures in the park, including log cabins and gristmills. Most educational programs excluded Cherokee culture until recently, but now the park is considering installing wayside exhibits to increase interpretation of the Cherokee people's deep association with the land. Collaboration with the Eastern Band of Cherokee Indians to identify places that are important to their culture and development of methods to protect these resources would benefit both the park and surrounding communities. It would also strengthen the relationship between the park and the tribe.

Archaeological evidence near some of the historic structures in the park indicates that slavery existed in the Great Smoky Mountains, but little is known about the enslaved people. The park also lacks an Ethnographic Overview and Assessment, a key management tool that should be completed by a cultural anthropologist, which the park currently does not have.

ARCHIVAL AND MUSEUM COLLECTIONS—INADEQUATE STORAGE A PRESSING CONCERN

The Great Smoky Mountains' archival and museum collections contain more than 357,000 items, including tools, equipment, clothing, and household furnishings that belonged to the people who once lived in the region. Biological and geological specimens, as well as documents that detail park development, land use practices, and family histories of former inhabitants, are also included in the collections.

This year approximately 99 percent of the park's cultural and historical museum objects were moved into a storage facility at a Department of Energy complex more than two hour's drive from park headquarters. This facility meets National Park Service museum standards for security, temperature, and humidity control, but a long-term reliable funding source to support rental costs for the storage space has not been identified. The park has requested funds to build a new museum storage facility within the park boundaries,

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AND GRISTMILLS.

Many people lived in the area that is now the park. Interpretation of the area's former residents often incorporates local music and oral histories.



CULTURAL LANDSCAPES—LINKING PEOPLES AND CULTURES TO THE NATURAL WORLD

Cultural landscapes illustrate how peoples and cultures affect and are affected by natural landscapes and ecosystems. The Great Smoky Mountains has 37 identified cultural landscapes. The park recently lost its temporary landscape architect, and funding shortages have kept the park from realizing the full benefits of the work that has been done. For example, the cultural landscape report for Cataloochee, which could be informing management decisions, has been complete for two years, but it cannot be printed for lack of funds.

Cades Cove Historic District is the best known and most visited cultural landscape in the park. More than two million people each year visit this picturesque 6,800-acre district that includes fields, woodlots, pastures, streams, and historic cabins. Visitors tour the cove on an 11-mile one-way loop, a drive that can take four hours on busy days as many visitors stop their vehicles to take photos of wildlife and historic structures. Park officials are developing the Cades Cove Opportunity Plan to address transportation and visitor experience in the cove. Several alternatives to relieve traffic congestion, including a shuttle system, are outlined in the plan. Important added benefits of a shuttle system include reduced vehicle emissions, fewer detrimental wildlife interactions, and an improved visitor experience.

Mist softens the view of this picturesque church in Cades Cove.



but Congress has not yet approved this request. This new facility would also store the park's archival collections. These are now stored in three separate locations, including an attic infested with insects and mice. The collections are also not available to researchers and difficult to access by NPS staff.

Biological museum objects, primarily specimens, fare better than cultural resource collections. The natural resource collections, about 13 percent of the park's total, are housed in a single location within the park, have a dedicated curator, and are continually being expanded as the All Taxa Biodiversity Inventory documents new species. Less than 1 percent of the biological collection is backlogged. In contrast, one museum technician must care for the remaining 87 percent of the collection (more than 310,000 items), which has a 41-percent backlog. The existing museum technician position responsible for the park's historical and cultural collections is a term position that will be lost after 2004 if a reliable long-term funding source is not identified.

ARCHAEOLOGY—COMPLIANCE ACTIVITIES CONSUME STAFF TIME

Humans have lived in the Great Smoky Mountains region for thousands of years. Clues to their ways of life may be found in the archaeological resources contained within the park, but to date only 10 percent of the park has been surveyed for archaeological sites, and the condition of more than 90 percent of the park's identified archaeological sites is unknown.

Most archaeological work is done as a result of mandated compliance with the National Historic Preservation Act and the National Environmental Policy Act. These compliance activities often uncover archaeological resources, resulting in additional National Register of Historic Places listings.

Although adding sites to the National Register is worthwhile, the archaeology program at the park must make a shift away from reactive work done when sites are discovered incidentally as a result of compliance activity, to proactive research conducted according to defined management goals. This will ensure a strategic approach that is based on the most significant sites. An

Archaeological Overview and Assessment would help accomplish this by informing park staff of what archaeological resources exist, allowing them to set priorities and make informed management decisions. Looting may be occurring at archaeological sites in the backcountry, but park officials cannot confirm these activities without more complete knowledge of the locations and conditions of these sites.

HISTORIC STRUCTURES—ADDITIONAL RESEARCH AND INTERPRETATION NEEDED

Park visitors have the opportunity to step back in time by touring historic log homes, gristmills where corn was ground into meal and flour, community churches, and park buildings constructed by the Civilian Conservation Corps in the 1930s. More than 200 historic structures, dating from the 1830s through the 1930s, remain intact throughout the park. Historic structures are very popular with visitors, but many are at risk because of limited funds for critical repairs. Graffiti is also a problem at many highly visited sites because the park lacks the staff necessary to thoroughly monitor these places.

The park continues to grapple with its legacy as the former home to many people, and this sometimes leads to management challenges. Park staff are currently trying to develop a management strategy for the former resort community of Elkmont, located near the Little River in the northern part of the park. The area contains cabins of former residents as well as the once-grand Wonderland Hotel. When the park was established, residents were provided with leases. The last least expired in 2001.

Park staff must decide how to manage the area, which is now a historic district listed in the National Register of Historic Places. Some former residents of Elkmont want to see the area developed into a resort destination with a hotel and restaurant. Others advocate preserving a select number of representative structures to tell the story of the community.

To its credit, the park has a four-person historic preservation crew to accomplish high priority protection projects—a real asset not found in most parks—



but additional support is needed so proper attention can be given to all of the park's historic structures.

Interpretation is the key to educating visitors about the significance of the historic structures in the park, but with the exception of Cades Cove, there is little on-site interpretation. Research and planning are also instrumental to protecting historic structures, but the park lacks important documentation and historic context studies.

Great Smoky Mountains National Park contains the largest collection of historic log homes in the United States. John Oliver built this one in the 1820s in Cades Cove.



FUNDING AND STAFFING—INCREASING COSTS EXACERBATE SHORTFALLS

PROGRAMMATIC DIVISION	2001 FUNDING SHORTFALL
Maintenance and Operation of Facilities	\$5,220,000
Resource and Visitor Protection	\$4,097,000
Resource Management and Science	\$1,136,000
Resource Education and Visitor Experience	\$699,000
Management and Administration	\$357,000
Total	\$11,509,000

STEWARDSHIP CAPACITY—PARK FACES CHALLENGES

Overall, the park’s stewardship capacity rated a “fair” score of 64 out of 100. The rating was calculated by averaging the four component scores of stewardship capacity, then weighting funding and staffing at 40 percent of the overall score to reflect its importance. This relatively low score reflects a large budget shortfall and several outdated management plans.

Proper protection of park resources is contingent upon sufficient funding. The largest share of the park budget is composed of operating funds made available from Congress to support the basic day-to-day functioning of the park—resource protection, law enforcement, interpretation, management, administration,

and routine maintenance. Additional funds come from fee collection, donations, and special appropriations, but these amounts vary annually and are not guaranteed. Nearly all national parks earn money through entrance fees, but Great Smoky Mountains National Park is prohibited by deed restrictions from charging an entrance fee. As a result, the park is unable to fully benefit from its high visitation.

In 2001, the park had an operating budget shortfall of \$11.5 million. The funds needed for 22 high priority projects comprise this shortfall, including funds for the new Twin Creeks science center and associated programs, grounds and custodial services, resource and visitor protection services, building maintenance, and operation and maintenance of the Foothills Parkway Spur, a popular commuter road located outside the main park boundary. This shortfall remains essentially the same today.

The park's operating budget has increased sufficiently to keep up with inflation in the last 20 years, but higher salary and benefit expenditures caused by expanded federal personnel initiatives and new or expanded park program costs have consumed these increases. The result has been a decrease in the park's real purchasing power of \$1.1 million from 1984 to 2001.

In 2002, the park employed 245 permanent and 39 seasonal employees to serve more than nine million visitors. To fully comply with agency policies, the park estimates that an additional 108 staff positions are needed.

PARK PLANS—IMPORTANT ONES OUTDATED

Two principal management documents—the General Management Plan and the Resource Management Plan—are outdated. The General Management Plan is more than 20 years old. Updates to these plans are not scheduled, but park staff have been coordinating with the University of Tennessee to develop a list of long-term research needs to guide activities.

The park's low planning score reflects these outdated plans, as well as a general lack of important cultural resource management inventories. An Archaeological Overview and Assessment and an Ethnological Over-

PARK SERVICE HAS OPPORTUNITY TO SOLVE LONG-STANDING PROBLEMS IN CADES COVE

Cades Cove, a 6,800-acre valley near Townsend, Tennessee, provides a representative sample of Great Smoky Mountains National Park's natural and cultural history as well as its recreational opportunities. Cades Cove provides visitors with an opportunity to explore a variety of historic structures including cabins, cantilevered barns, and churches set in a rustic valley surrounded by mountain peaks. Excellent wildlife viewing is also offered in Cades Cove. The cove features an 11-mile, one-way loop that receives approximately two million visitors each year. Traffic problems have plagued Cades Cove for many years, affecting the quality of both visitor experience and natural and cultural resources. These impacts include visitor frustration, vandalism of cultural resources, air pollution, wildlife disturbance, and increased response time for law enforcement and other rangers. During peak season, it often takes visitors up to four hours to drive the 11-mile loop.

The park understands the need to simultaneously provide sustainable visitor access and an outstanding visitor experience while protecting park resources. NPS is developing the Cades Cove Opportunity Plan (CCOP) that will guide management decisions into the future. The transportation plan is the most critical component. Many groups, including NPCA, believe an Alternative Transportation System (ATS), such as one that uses low-emission buses, could alleviate congestion in the cove during peak season. NPS enjoys wonderful success with ATS in 96 other parks, including Zion and Acadia.

For more information about, or to comment on, the Cades Cove Opportunity Plan, visit <http://www.cadescoveopp.com/>. For more information about NPS success with implementation of ATS throughout the park system, visit <http://www.nps.gov/transportation/web/altnew/>.



WHAT YOU CAN DO TO HELP

- **Become a member of groups helping to protect the park.** These include Great Smoky Mountains Association (www.smokiesstore.org), Friends of Great Smoky Mountains National Park (www.friendsofthesmokies.org), NPCA, and regional organizations. (www.npca.org/support_npca)
- **Become an NPCA activist.** When you join our activist network, you will receive a biweekly electronic newsletter with the latest park news and ways you can help. Join by visiting www.npca.org/take_action.
- **Volunteer in the Parks.** Many parks are looking for dedicated people who can lend a helping hand. There are opportunities for people to maintain buildings and trails, do landscaping, provide technical web expertise, assist with welcoming visitors, and much more. Contact your local park for details.

view and Assessment would significantly advance staff knowledge and management of the park's archaeological and ethnographic resources, but limited funds constrain park efforts to complete these studies.

INTERPRETATION—THREE MILLION VISITORS SERVED

Great Smoky Mountains' high level of visitation presents both a major challenge and an unequalled opportunity to the park's resource education staff. They must strive to reach as many of the more than nine million visitors as possible and enrich their understanding of park resources. In 2002, the team of 20 permanent and six seasonal resource education employees reached 2.5 million people by means of personal services such as visitor center contacts, informal and formal interpretive programs, junior ranger programs, and other educational outreach activities. Nearly 500,000 visitor contacts were made through publications and audio/visual presentations, and approximately 18,000 contacts were made through community outreach activities.

Appreciation and stewardship of the Great Smoky Mountains region is fostered in students of all ages through natural resources education programs at the

Appalachian Highlands Science Learning Center at Purchase Knob. Two private education centers—the Smoky Mountain Field School and the Great Smoky Mountains Institute at Tremont—provide additional education opportunities. The park becomes a classroom for area students to learn about science and resource protection.

Visitor centers at the Great Smoky Mountains do not adequately serve the millions of people who travel to the park each year. In fact, there is only one true visitor center, the Sugarlands Visitor Center. The visitor centers at Oconaluftee and Cades Cove were not originally constructed for this purpose and are little more than information stops that become severely overcrowded during peak season.

The park's 2001 Business Plan reported a shortfall of about \$700,000 in the Resource Education and Visitor Experience Division, which is responsible for visitor education and information services, volunteer coordination, and collaboration with external support organizations. The 2003 budget for Resource Education and Visitor Experience has decreased slightly from 2001 funding levels, and the park's Chief of Interpretation has indicated that staffing levels are not adequate to keep pace with the park's high visitation and needs.

EXTERNAL SUPPORT—VOLUNTEERS AND PARK PARTNERS INVALUABLE

Natural resources, cultural resources, and visitor services at Great Smoky Mountains National Park benefit from the many volunteers and support groups that donate time, services, and money to the park. Without the assistance of these volunteers, park staff would not be able to keep up with increasing visitation and maintain the level of services that visitors have come to expect.

Volunteers regularly provide visitor services, research support, and resource protection assistance to park staff, often completing projects that would not get done otherwise. In 2002, 1,586 volunteers from the Volunteers in Parks (VIP) program and Student Conservation Association (SCA) contributed 89,077 hours at Great Smoky Mountains, making the VIP program at the park the fifth largest in the National Park



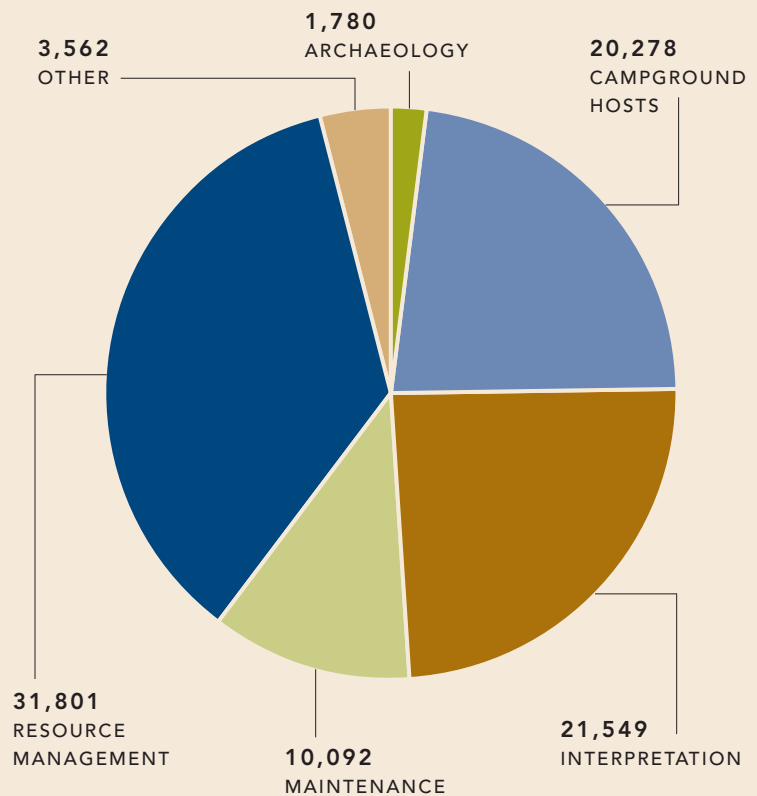
Students learn about pioneer life at the historic Walker House.

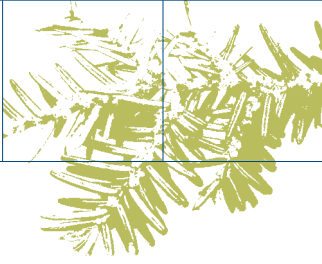
System. In 2003, the park hosted 45 SCA interns, the highest number at a site since the program was founded in 1957. The park's Resource Management and Science division depends largely upon SCA resource assistants to carry out its programs, and other activities such as campground clean-ups and trail patrols would be neglected if not for the efforts of volunteers.

A wide array of park partners assists Great Smoky Mountains National Park by supporting resource maintenance, interpretation and education, and natural and cultural resources research. The Great Smoky Mountains Association has provided \$9.5 million in aid to the park in the last 50 years, and the Friends of Great Smoky Mountains National Park has raised more than \$8 million from individual, corporate, and foundation contributions, and through special events, merchandise sales, and specialty license plate sales in Tennessee and North Carolina.

The National Park Service is also undertaking a large scale partnership with a wide range of scientists, universities and colleges, museums, other government agencies, and volunteers to complete the All Taxa Biodiversity Inventory—an inventory of all species within Great Smoky Mountains National Park. This is the first such project of its kind, and supporters hope it will be a model for similar projects in other national parks and protected areas.

VOLUNTEER HOURS BY CATEGORY





APPENDIX: METHODOLOGY

To determine the condition of known natural and cultural resources at national parks, the National Parks Conservation Association developed a resource assessment and ratings process. It examines current resource conditions, evaluates the park staff's capacity to fully care for the resources, and forecasts likely conditions over the next ten years.

Researchers gather available information from a variety of research, monitoring, and background sources in a number of critical categories. The Natural Resources rating reflects assessment of more than 120 discrete elements associated with environmental quality, biotic health, and ecosystem integrity. Environmental quality and biotic health measures (EBM) address air, water, soils, and climatic change conditions as well as their influences and human-related influences on plants and animals. Ecosystems Measures (ESM) address the extent, species composition, and interrelationships of organisms with each other and the physical environment for indicator, representative, or all terrestrial and freshwater communities. The ratings elements, their definitions and the methods employed in their scoring are described in full in the document entitled Natural Resources Assessment and Ratings Methodology that can be found on-line at NPCA's State of the Parks® web site (www.npca.org/stateoftheparks/). The scores for cultural resources are determined based on the results of indicator questions that reflect the National Park Service's own Cultural Resource Management Guideline and other Park Service resource management policies.

Stewardship capacity refers to the Park Service's ability to protect park resources. Information is col-

lected and circulated to park staff and peer reviewers for analysis. An overall average based on a 100-point scale is used to determine the ratings based on numerous benchmarks. An overall score is obtained by weighting the funding and staffing component at 40 percent, recognizing its critical importance, and the remaining three elements at 20 percent each.

For this report, researchers collected data and prepared a paper that summarized the results. The draft underwent peer review and was also reviewed by staff at Great Smoky Mountains National Park.

NPCA's State of the Parks program represents the first time that such assessments have been undertaken for units of the National Park System. Comments on the program's methods are welcome.



Native flame azaleas bloom in a riot of color throughout the Smokies.

ACKNOWLEDGMENT

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