

World Heritage Sites

Protected Areas and World Heritage



GREAT SMOKY MOUNTAINS NATIONAL PARK UNITED STATES OF AMERICA

During the last Ice Age this deeply dissected landscape escaped glaciation, leaving a refuge for thousands of species, resulting in an exceptionally rich flora of more than 3,500 taxa. This large mist-wreathed range is also home to 130 species of trees, almost as many as in the whole of Europe, and to the greatest variety of salamanders in the world. Being relatively untouched, the Park shows a beauty and wealth of temperate flora lost elsewhere in North America since its conquest by man.

COUNTRY

United States of America

NAME

Great Smoky Mountains National Park

NATURAL WORLD HERITAGE SITE

1983: Inscribed on the World Heritage List under Natural Criteria vii, viii, ix and x.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]

The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Statement of Significance

The Great Smoky Mountains National Park is a major North American refuge of temperate zone flora and fauna that survived the Pleistocene glaciations. The park includes the largest remnant of the diverse Arcto-Tertiary geoflora era left in the world, and provides an indication of the appearance of late Pleistocene flora. It is large enough to allow the continuing biological evolution of this natural system, and its biological diversity exceeds that of other temperate-zone protected areas of comparable size. The park is of exceptional natural beauty with undisturbed, virgin forest including the largest block of virgin red spruce remaining on earth.

Criterion (vii): The site is of exceptional natural beauty with scenic vistas of characteristic mist-shrouded ("smoky") mountains, vast stretches of virgin timber, and clear running streams.

Criterion (viii): Great Smoky Mountains National Park is of world importance as the outstanding example of the diverse Arcto-Tertiary geoflora era, providing an indication of what the late Pleistocene flora looked like before recent human impacts.

Criterion (ix): The Great Smoky Mountains National Park is one of the largest remaining remnants of the diverse Arcto-Tertiary geoflora era in the world. It is large enough to be a significant example of continuing biological evolution of this natural system.

Criterion (x): The Great Smoky Mountains is of the one of the most ecologically rich and diverse temperate zone protected areas in the world. There are over 1300 native vascular plant species, including 105 native tree species, plus nearly 500 species of non-vascular plants - a level of floristic diversity that rivals or exceeds other temperate zone protected areas of similar size. The park is also home to the world's greatest diversity of salamander species (31) - an important indicator of overall ecosystem health - and is the center of diversity for lungless salamanders, with 24 species.

INTERNATIONAL DESIGNATION

1988: The Southern Appalachians designated a Biosphere Reserve under the UNESCO Man and Biosphere Programme (15,195,341 ha).

IUCN MANAGEMENT CATEGORY

II National Park

BIOGEOGRAPHICAL PROVINCE

Eastern Forest (1.5.5)

GEOGRAPHICAL LOCATION

At the southern end of the Appalachian Mountains in eastern Tennessee and western North Carolina, 35 km south of Knoxville and 45 km west of Ashville between 35°26' to 35°47'N and 83°05' to 84°00'W.

DATES AND HISTORY OF ESTABLISHMENT

1926: Gazetted a National Park under 44 Statute 616;

1976: Incorporated in the Southern Appalachians National Biosphere Reserve;

1988: Incorporated as one of six units into the much larger UNESCO MAB Reserve

LAND TENURE

Federal government; 47% in the counties of Cocke, Blount, and Sevier in Tennessee, and 53% in Swain and Haywood counties in North Carolina. Bordered by several national forests, an Indian reservation, a Tennessee Valley reservoir and numerous private holdings. Managed by the National Park Service (NPS) of the Department of the Interior.

AREA

209,000 ha

ALTITUDE

From 258m to 2,024m (Clingmans Dome).

PHYSICAL FEATURES

The Great Smoky Mountains Park lies along the crest of the Southern Appalachians which at Clingmans Dome rise to 2,024 metres, the third highest peak in the eastern States. The Park extends some 88 km long by an average of 28 km wide. The mountains are round-crested, steep-sided ridges dissected by deep V-shaped valleys, with many mountain ridges branching from the central ridgeline. These are carved into innumerable valleys in 45 watersheds with a total of 3,384 kilometres of clear fast-flowing streams. The water table is near the surface in nearly all parts of the Park, which is often shrouded in smoke-like mists. 30 km of the southwest margin is formed by the 29,000 ha Lake Fontana reservoir which lies behind the tallest dam in the eastern States (147.7m). Under the extensive forest the dominant rock types are the PreCambrian granitic gneisses, schists and metasedimentary rocks formed 800-545 million years ago of the Ocoee series such as the metasandstone of Clingmans Dome. During the Permian period 310-245 mya these were thrust up from deep in the crust by the slow collision of tectonic plates along the Great Smoky Fault over younger marine sediments formed on a shallow continental shelf in early Palaeozoic times 450-545 mya, all later reduced by weathering. The many waterfalls occur where streams flow over resistant layers of metasandstone. The pristine air, water and soil of these mountains is now sullied by pollution from the fallout of distant industry.

CLIMATE

The mean annual temperature for Gatlinburg just to the north is 13.7°C, but at higher altitudes the average temperature is 10°- 15°C cooler. Summers are warm and humid, and winters are relatively mild. The mean annual precipitation is 1,625mm, although differences in average annual precipitation of more than 600mm have been recorded between a peak and valley only 15 km apart. Annual precipitation on the peaks may reach 2,100mm and snow accumulation may reach 1,200mm at 1,500m (Newfound Gap road), but are negligible below 1,000m.

VEGETATION

During the last Ice Age this deeply dissected landscape escaped glaciation and became a refuge for thousands of temperate and boreal species lost elsewhere in North America, resulting in a rich diversity of vegetation today. An exhaustive inventory of life-forms begun in 1998 is still ongoing: the Park is claimed to hold 100,000 life forms of which only some 12,000 are known (NPS, 2007). There are approximately 1,600 species of flowering plants, including 100 native trees, 100 native shrubs and an estimated 2,200 cryptogamous taxa: the Park is a global center for non-flowering plants, including 450 bryophytes, some 50 ferns and fern relatives, mosses, liverworts, and a few hornworts. The vegetation changes continuously with elevation, rainfall, temperature, geology, slope and aspect. Deciduous broad-leaved hardwoods and, at height, evergreen coniferous forests predominate, but at mid to high

levels, treeless grasslands in the west and heath balds in the east, open wet meadows and cliff communities also occur. Areas which were farmed or logged have been recovering for varying periods of time and now illustrate a range of successional stages. Approximately 20% of the forest is virtually virgin (NPS, pers. comm., 1995). Many plants, and streams and soils as well, especially at high elevations, are suffering damage from high levels of acid rain and ozone.

Approximately 80% of the Park is deciduous forest. There are five major forest types: Cove Hardwood forest, Hemlock forest, Pine-Oak forest Northern Hardwood forest and Spruce-fir forest. The first is the most botanically diverse with 40-60 tree and shrub species growing in sheltered valleys with deep rich soils (coves). A cove hardwood site may contain over 20 different species, with a single tenth-hectare plot supporting more than 50 species throughout the year. Common species include tulip tree *Liriodendron tulipifera*, yellow buckeye *Aesculus octandra*, black cherry *Prunus serotina*, Carolina silverbell, *Halesia carolina*, basswood *Tilia americana*, dogwood *Cornus florida* and bullbay magnolia *Magnolia grandiflora*. On streamsides and moist shady slopes up to 1,200m eastern hemlock *Tsuga canadensis* trees form almost pure stands. On a gradient from mesic to xeric, the cove hardwoods are replaced by mixed oak, xeric oak, and oak-pine forests which dominate western exposed excessively well drained slopes and ridges where fire (and controlled burning) are a regular occurrence. Typical species include red, scarlet, black and chestnut oaks *Quercus rubra*, *Q. coccinea*, *Q. velutina* and *Q. montana*, along with table mountain, pitch, and white pines *Pinus pungens*, *P. rigida* and *P. strobus* with some hickory *Carya* spp. This forest produces the most brilliant autumn colours.

On mesic sites at low and mid-elevations these mixed mesophytic hardwood and hemlock-hardwood forests shade with increasing elevation into northern hardwoods between 1,100-1,550m, of American beech *Fraxinus grandifolia*, yellow birch *Betula alleghanensis* and maple *Acer saccharum* trees among many other species. Above 1,400m, these are succeeded by boreal forest dominated by Fraser fir *Abies fraseri* and red spruce *Picea rubens*. with yellow birch, mountain-ash *Sorbus americana* and hobble bush *Leucothoe fontanesiana*. About 75% of all southern Appalachian spruce-fir forest and the largest known block of virgin red spruce grows in the Park. Heath balds, which occur on the driest high slopes in the east are dominated by ericaceous shrubs such as Catawba and small-leaf rhododendrons *Rhododendron catawbiense*, and *R. minus*, mountain laurel *Kalmia latifolia* and mountain myrtle *Leiophyllum buxifolium*, blueberry *Vaccinium* spp. and huckleberry *Gaylussacia* spp. which form a brilliant display in mid-summer. Grassy balds, found mostly in the western end of the Park are dominated by grasses and, with bare ridges, cliffs and landslide scars, host some rare regionally endemic shade-intolerant plants.

Fifteen plants are listed for potential federal protection as threatened or endangered species; 120 species are rare enough to be of managerial concern. A similar number of bryophytes, lichens and fungi are also considered rare at regional, national, or global levels. The Park has to three federally listed threatened and endangered plant species: spreading avens *Geum radiatum*, Virginia spirea *Spirea virginiana* and rock gnome lichen *Gymnoderma lineare*, the latter being partly a fungus. Over 300 species of native vascular plants and nearly 200 non-vascular plants are considered rare, generally found in small populations or having five or fewer occurrences within the Park. 76 species are listed as threatened or endangered in the states of Tennessee and North Carolina. There are also over 380 non-native species in the Park. 35 of which spread aggressively, out-competing native plants for habitat, some of the worst being the kudzu vine *Pueraria montana*, mimosa *Albizia julibrissin*, multiflora rose *Rosa multiflora*, and Japanese grass *Microstegium vimineum*.

FAUNA

A diverse fauna of 66 native mammals reflects the richness of the flora. Smaller mammals include black-eared opossum *Didelphis marsupialis*, Indiana bat *Myotis sodalis*, eastern cottontail rabbit *Sylvilagus floridanus*, woodchuck *Marmota monax*, eastern chipmunk *Tamias striatus*, red squirrel *Tamiasciurus hudsonicus*, eastern grey squirrel *Sciurus carolinensis* and southern and Carolina flying squirrels *Glaucomys volans* and *G. sabrinus coloratus*, muskrat *Ondatra zibethicus*, beaver *Castor canadensis* which are beginning to reappear, long-tailed weasel *Mustela frenata*, mink *Neovison vison*, striped and eastern spotted skunks *Mephitis mephitis* and *Spilogale putorius*, and a number of bats, mice, mole and shrews. Larger mammals include red fox *Vulpes fulva*, grey fox *Urocyon cinereoargenteus*, coyote *Canis latrans* which recently migrated to the Park, American black bear *Ursus americanus* (~1,800 animals), racoon *Procyon lotor*, North American otter *Lontra canadensis*, puma *Puma concolor cougar*, bobcat *Lynx rufus*, wild boar *Sus scrofa* (an introduced pest) and white-tailed deer *Odocoileus virginianus*. There have been several recent but unconfirmed sightings of American bison *Bison bison* and elk *Cervus elaphus* which were extirpated in the early 19th century; the elk may

be reintroduced. Grey wolf *Canis lupus*, red wolf *Canis rufus* (CR) and fisher *Martes pennanti* also once occurred in the area (NPS, pers. comm., 1995).

240 species of birds have been recorded, 60 being permanent residents and 120 breeding species. These include many species of warblers, flycatchers and other migratory songbirds, also ruffed grouse *Bonasa umbellus* and wild turkey *Meleagris gallopavo* which are seen year round. Peregrine falcon *Falco peregrinus* has been reintroduced. Red-cockaded woodpecker *Picoides borealis* had been seen nesting, but not since the early 1980's and the species has probably become locally extinct due to fire suppression. Some habitats contain bird communities with an unusually high percentage of neo-tropical migrant species, a group that has lately declined significantly in North America. As this is the largest unfragmented forest left in the eastern U.S., its bird populations may be stable, in part due to the absence of the brown-headed cowbird *Molothrus ater*, a prolific nest parasite (NPS, pers. comm., 1995).

The herpetofauna totals over 80 species. Reptiles include 7 turtles, 8 lizards and 23 snakes. Heavy precipitation and numerous streams make the mountains ideal for a wide variety of amphibians: 2 toads, 10 frogs and over 30 species of salamander - the most diverse such population anywhere in the world, with a range of species from the endemic pigmy salamander *Desmognathus wrightii*, to the aquatic hellbender *Cryptobranchus alleganiensis* which can grow to 50cm. Over 50 species of native fish live in the streams, including eastern brook trout *Salvelinus fontinalis* which may be a separate and threatened subspecies (NPS, pers. comm., 1995). Other threatened fish are smoky madtom *Noturus baileyi* (CR), yellow-fin madtom *N. flavipinnis* (VU) and spotfin chub *Hybopsis nonacha*, which are being reintroduced into the Park.

The Park also hosts a diversity of invertebrates, a class that is not well known, and is thought to be a regional or continental centre of diversity for several groups especially land snails, spiders, insects and other arthropods. Over 100 species of caddisflies and stoneflies are found, including stonefly endemics such as *Megaloptera williamsi*, *Hansonoperla appalachia*, several *Capnia* species and *Acroneuria lycorias* - only in Sevier County. Over 800 Lepidoptera have been recorded. Most groups reveal a complex assortment of forms that often include species endemic to the Park and/or new to science.

CONSERVATION VALUE

The region was a Pleistocene refuge and includes remnants of a diverse Arcto-Tertiary geoflora, yielding a large surviving number of temperate species. The Park also contains the finest collection of log buildings in the USA, from the mid 19th century to 1920. It lies within a WWF Global 200 Freshwater Eco-region, and a UNESCO Biosphere Reserve.

CULTURAL HERITAGE

There is evidence that a hunter-gatherer people lived in the area 15,000 years ago. This was the territory of the relatively advanced Cherokee nation of whom a few still live locally, until their forcible removal in the 1830s. Settlers took the land over and in the early 1900s logged much of the forests. Present historical and cultural interpretation is based mainly on mills, churches, schoolhouses, barns and homesteads dating from the middle 19th century to 1920, which comprise the finest collection of log buildings in the country. The National Register of Historic Places includes three historic districts and 78 historic structures.

LOCAL HUMAN POPULATION

No-one lives permanently in the Park which was established by the compensated eviction of 1,200 mostly small landowners. There are three historic districts with open grass fields and Cades Cove supports a cattle operation. Subsistence farming and commercial logging have been practised in the past, and logging railroads were built. Within 50 km there are now some 40 small towns and two major cities with a total population of over one million between them.

VISITORS AND VISITOR FACILITIES

The Park recorded over 9 million recreational visits in 2006 and is the most visited national park in the country (NPS, 2007). To ease the congestion the use of camping grounds, trailer parks and hotels outside the Park is now encouraged. Facilities within the Park include three visitor centres, one lodge, ten front-country campgrounds with 1,000 sites, including 5 horse camps and 7 group camps, over 100 backcountry campsites including primitive shelters, 11 picnic areas and a marina. There are 614 km of roads, over 1,280 km of trails and 18 shelters along the Park's 112 km of the Appalachian Trail which runs through from Georgia to Maine, and on other backcountry trails. A great variety of other activities is

available: mountain biking, riding, fishing, boating and winter cross-country skiing. The Park authorities conduct an active visitor services programme interpreting the natural and cultural resources of the area and provide visitor information using six amphitheatres and one campfire circle. There are three main entrances, two main cross-mountain roads and 15 other road entry points. A wide variety of publications and interpretive literature about the Park is available from the Great Smoky Mountains Natural History Association. This organisation also operates the Great Smoky Mountains Institute, a live-in facility that accommodates 120 people and offers environmental education programmes for school groups, teacher workshops, adult programmes and elder hostels. The nearest airport is McGhee-Tyson, south of Knoxville.

SCIENTIFIC RESEARCH AND FACILITIES

As well as the ongoing inventory of all the Park's life forms, many scientific inventories are planned or underway. The Park has set up a long-term monitoring program for selected species and communities focusing on biodiversity. Numerous research projects are undertaken each year by academic institutions, and co-operating government agencies. A career research scientist from the National Biological Service is stationed in the Park to conduct and assist in the co-ordination of research (NPS, pers.comm.1995). An educational Appalachian Highlands Science Learning Center has been established to further Park-related research.

MANAGEMENT

The Park is particularly valued by visitors for the apparently endless vistas of forested mountains. A limited area contains visitor, maintenance and administrative facilities, and there are the three historic Districts of Cades Cove, Noah Ogle and Roaring Forks, and the Oconaluftee archaeological district. Past subsistence farms and commercially logged areas have been allowed to revert to forest through natural succession and much management effort is directed at keeping human impacts to a minimum. The Park has a General Management Plan and a Resource Management Plan supported by a variety of Natural Resource Action Plans developed to mitigate specific threats to its resources. The zoning system comprises a Natural zone (92%), Development zone (7%) and Historic zone (1%). Generally, the harvesting of natural resources is not permitted; exceptions are by scientific permit: fishing permit, (mostly for non-native species) and fruits, nuts, berries and certain mushrooms when picked by hand for personal use only (NPS, pers. comm., 1995).

MANAGEMENT CONSTRAINTS

Several road systems pass through the Park including two cross-mountain roads in addition to over 1,200 km of horse and foot trails which dissect the high country. Some of the Park's 1,200 historical structures have been destroyed, removed, or allowed to deteriorate. There are over 380 non-native plant and animal species. Non-native diseases and forest insects are devastating certain tree species, notably the balsam woolly adelgid *Adelges piceae* from East Asia that kills the once dominant Fraser fir *Abies fraseri* and the hemlock woolly adelgid *A.tsugae* from eastern Europe that kills the eastern hemlock. These alter natural communities and reduce formerly abundant species to rarity. Management strategies to deal with alien plants are vigorously applied. Rampant wild boar have been controlled since the mid-1950s and are regularly removed. To protect rapidly declining native brook trout populations, two competitive non-native species of trout are being controlled. Continuing problems include visitor abuse of backcountry resources: wildlife poaching, particularly of native brook trout, deer, black bear and American ginseng *Panax quinquefolius*. The past total suppression of wild fires led to an unnatural accumulation of fuels and changes in the forests unfavourable to fire-dependent plants and animals. This is now countered by a policy of controlling natural fires and setting prescribed burns to ensure natural regeneration of species requiring fire for propagation (NPS, 2007).

There is serious problem of pollution, clearly described in public statements from the National Park Service. Plants and animals, streams and soils, visibility, visitor enjoyment and health in the Park are threatened by airborne sulphur dioxide and nitrogen oxides carried on the prevailing winds from both nearby and distant power plants, industries and traffic. Between 1984 and 1999 sulphate concentrations in the region increased by 27%. The Park receives the highest sulphur and nitrogen deposits of any national park in the country; the resulting nitrogen saturation limits the availability of soil nutrients, especially calcium, and releases aluminium toxic to vegetation and aquatic life. Mountain streams and forest soils are so acidified that the Park's high elevation ecosystems are endangered. Nitrate levels in some streams are approaching the public health standard for drinking water. The average acidity of rainfall in the Park has a pH of 4.5, i.e. 5 to 10 times more acidic than the natural rainfall (pH 5.0-5.6). Clouds with acidity as low as 2.0 pH bathe the high elevation forests during part of the growing season. Ground-level ozone pollution carried on prevailing winds and ozone exposure in the Park, especially at

high elevations, are also twice as high as in nearby cities and are amongst the highest in the eastern States. This threatens human health as well as some 90 species of plants. In addition, annual average visibility - important to tourism - is 40 km, compared with an estimated natural visibility of 150 km. Permanent monitoring plots have been set up to track this damage. The imposition of Federal mandates for clean air such as the Clean Air Interstate Rule has begun to curb these threats, and more recent Park surveys show that air quality measured by visibility and fine particles is improving, or in the case of ozone concentration and acid deposition, is stable. (NPS, 2005).

STAFF

In 2005 there were approximately 250 permanent and over 100 seasonal employees plus 1,892 volunteers. There are 4 ranger stations, 4 campground offices, one environmental centre and 333 other structures within the Park (NPS, 2007).

BUDGET

The base budget for fiscal 2000 was \$16.9 million. The Park generates over \$1 billion a year for surrounding tourist communities (NPS, 2007).

LOCAL ADDRESSES

Superintendent, Great Smoky Mountains National Park, 107 Park Headquarters Road, Gatlinburg, Tennessee 37738.

REFERENCES

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DATE

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