

## WORLD HERITAGE NOMINATION

### IUCN TECHNICAL REVIEW

1. IDENTIFICATION NUMBER AND NAME    259    GREAT SMOKY MOUNTAINS NATIONAL PARK
2. LOCATION:            Situated between latitudes 35° 26' 15"N and 35° 47' N, and longitudes 83° 45' and 84° 0' W.
3. NOMINATED BY: Department of the Interior, United States Government
4. DOCUMENTATION:
  - (i) Nomination form, maps and plans
  - (ii) Supplementary documentation (IUCN)
    - a) Consultations: Tom Thomas; Robert Milne; Sue Wells; Brian Groombridge.
    - b) Southern Appalachian Research/Resources Management Cooperative. 1982. Great Smoky Mountains Biosphere Reserve: A bibliography of scientific study. US MAB Rep. No. 4. Washington, D.C. 51 pp.
    - c) Southern Appalachian Research/Resources Management Cooperative. 1982. Great Smoky Mountains Biosphere Reserve: History of Scientific Study. US MAB Rep. No. 5. Washington, D.C. 276 pp.
    - c) General Management Plan - Great Smoky Mountains National Park, North Carolina-Tennessee. 1982. US Dept. of the Interior, National Park Service, Denver Service Center, Denver, CO. 70 p.

### 5. BACKGROUND AND SUMMARY

Great Smoky Mountains National Park (209,000 ha) is the most important natural area in the eastern US, and is of world importance as an example of temperate deciduous hardwood forest. It was the major North American Pleistocene refuge for temperate flora and fauna, so has a large number of endemic species as well as an extremely rich species composition. With over 3,500 plant species, its floristic diversity is unmatched in any other protected area of its size in the temperate world; with 130 natural species of trees, it has almost as many trees as all of Europe. It harbours many endangered species of animals, and has possibly the greatest diversity of salamanders in the world; it is a centre of endemism for North American molluscs. (See attached data sheet for further details).

### 6. INTEGRITY

The area is large enough to ensure the ecological viability of the species found in the site; it may be serving as a modern counterpart of a "Pleistocene refuge." As the premier protected area in the eastern US, the site is visited by millions of visitors each year, so over-exploitation on behalf of tourists is a matter of some concern; however, the US National Park Service has addressed this problem explicitly by encouraging camping grounds, trailer parks, hotels, and other tourist infrastructure to be constructed outside the park, thus reducing pressure on the park itself while also bringing economic benefits to surrounding people. The park has a general management plan and a series of sectoral management plans.

The site is a Biosphere Reserve, and a considerable amount of research has been conducted in the site; the Bibliography of Scientific Studies published in 1982 listed over 600 items. However, relatively little of this research is specifically oriented toward management issues, and a monitoring system would help ensure the continuing integrity of the area.

#### 7. COMPARISON WITH OTHER AREAS

The Eastern Forest biogeographic province contains 37 protected areas, covering over 1.1 million ha; Great Smoky comprises about 25 percent of the total area protected. Two other sites of particular importance occur in this biogeographic province. Shenandoah National Park (84,921 ha) is less than a third as large as Great Smoky, has received considerably more human impact in the past, and has much lower species diversity. The Upper Mississippi National Wildlife Refuge (78,975 ha) is also much smaller and less diverse than Great Smoky; as a Wildlife Refuge, it has a lesser degree of legal protection than a National Park.

#### 8. EVALUATION

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 (criteria i). It is large enough to be a significant example of continuing biological evolution of this natural system (criteria ii). The site is also of exceptional natural beauty, with scenic forests, clear running streams, and well-maintained trails (criteria iii), and a number of world-record tree species (criteria iv).

#### 9. RECOMMENDATION

Great Smoky Mountains National Park meets all four criteria so it should be inscribed on the World Heritage List.

International Union for Conservation of  
Nature and Natural Resources

15 April 1983

NAME Great Smoky Mountains National Park

MANAGEMENT CATEGORY II & IX (National Park and Biosphere Reserve)  
Proposed World Heritage Site (Criteria: i, ii)

BIOGEOGRAPHICAL PROVINCE 1.5.5 (Eastern Forest)

LEGAL PROTECTION Total. No removal of natural resources permitted except for certain fish excluding brook trout.

DATE ESTABLISHED 22 May 1926 as a National Park (44 Stat. 616) and June 1976 as a Biosphere Reserve

GEOGRAPHICAL LOCATION Southern end of the Appalachian Mountains in eastern Tennessee and western North Carolina, bounded by the Little Tennessee River in the south, the French Broad River to the north and the Pigeon River in the east. Surrounded by parts of several National Forests, an Indian reservation, and a Tennessee Valley Authority lake. Gatlinburg (Tennessee) lies close to the north entrance and Cherokee (North Carolina) the south entrance. 35°26'-47'N, 83°45'-84°00'W.

ALTITUDE 260-2,025m

AREA 209,000ha. The Park comprises about 25% of the total area protected in the Eastern Forest biogeographic province.

LAND TENURE Federal government

PHYSICAL FEATURES The dominant topographic feature of the Park is the range of the Great Smoky Mountains with 16 peaks over 1,829m. Lesser ridges form radiating spurs from the central ridgeline. In broad aspect, the topography of the Park consists of moderately sharp-crested, steep-sided ridges separated by deep V-shaped valleys. Many of the mountain ridges branch and subdivide creating a complex of drainage systems with many fast-flowing clear mountain streams. The Park contains 22 major watersheds and the water table is near the surface in almost all sections. Precambrian metamorphic rocks consisting of gneisses and schists, and sedimentary rocks of the Precambrian OCOEE series are predominant, while sedimentary rocks in the Appalachian Valley are the youngest. Mean annual temperature for Gatlinburg is 13.7°C, but the average temperature is 5-10° cooler higher up. Warm humid summers and relatively mild winters. Precipitation averages 1,626mm annually, but differences in average annual precipitation of more than 635mm have been recorded between a peak and valley only 16km apart. Snow accumulations may reach 1.2m at 1,500m, but are negligible below 1,000m.

VEGETATION The area is a pleistocene refuge and thus an outstanding example of the diverse Arcto-Tertiary geoflora era, having a high number of temperate species (1,450 species of flowering plants and 2,200 others including 130 trees) with some rich mixed stands. Some 30% of the Park is virgin forest and areas previously logged have been recovering for varied periods of time presenting a range of successional stages. Deciduous broad-leaved and needle-leaved evergreen conifer forests predominate with smaller areas of treeless grass and heath balds, open wet meadows and cliffs. The vegetation changes continuously with elevation, slope aspect and soil moisture patterns, notable types being: cove hardwood and hemlock forests dominated by 25-30

diverse tree species including Liriodendron tulipifera, Halesia carolina var. monticola, Tilia heterophylla, Quercus rubra, Fraxinus americana, Acer saccharum, Betula lutea, and Tsuga canadensis, 6-12 species being co-dominant at any one site, with diverse herbaceous understoreys with vernal peak flowering; a one-tenth hectare plot may support 40-50 species through the year. Forest areas include northern hardwood forest Fagus grandifolia, B. lutea, Acer saccharum, Aesculus octandra; spruce-fir forest of Picea rubens, Abies fraseri, B. lutea, Sorbus americana (the block of virgin red spruce is the largest left on earth, and over 40% of southern Appalachian spruce-fir occurs in the Park); mixed oak forest of Quercus alba, Q. rubra, Q. prinus and formerly Castanea dentata; and pine-oak forest of Pinus rigida, P. pungens, P. virginiana, Quercus coccinea, Nyssa sylvatica and Oxydendrum arboreum. On mesic sites, cove forest grades with elevation into northern hardwoods and finally spruce-fir forest, the transition occurring at ca. 1,700m. At mid and lower elevations, along a gradient from mesic to xeric sites, cove forest is replaced by mixed oak and then by pine-oak. Heath balds represent the xeric extreme at higher elevations and evergreen broadleaved shrubs dominate including Rhododendron minus, R. catawbiense, Kalmia latifolia, Leiophyllum buxifolium. Grass balds, cliffs, landslide scars and upper elevation forests support the growth of rare southern Appalachian endemics. 5 species are officially listed as endangered on the Fish and Wildlife Service List of Candidate Endangered Plants (Federal Register 45: 82480, 1980): Smoky Mountains manna grass Glyceria nubigena, spreading avens Geum radiatum, Cain's reedgrass Calamagrostis cainii, mountain rush Juncus trifidus var. Monathos and Rugel's ragwort Cacelia rugelia, but an additional 120 threatened species occur.

#### NOTEWORTHY FAUNA

A diverse fauna occurs including at least 50 native animals, reflecting the richness of the flora. With the exception of the black bear Ursus americanus and white-tailed deer Odocoileus virginianus, large mammals are seldom seen though red fox Vulpes fulva, gray fox Urocyon cinereoargenteus, raccoon Procyon lotor, opossum Didelphis marsupialis, woodchuck Marmota monax and bobcat Lynx rufus range throughout the Park. Other mammals include the red squirrel Tamiasciurus hudsonicus, grey squirrel Sciurus carolinensis, muskrat Ondatra zibethicus, cottontail rabbit Sylvilagus floridanus, several species of mice, moles and shrews, long-tailed weasel Mustela frenata, mink M. vison, and skunks. Several species of bats inhabit the park. The threatened Indiana bat Myotis sodalis (V) is known to use at least one of the Park's caves as a winter roost. There have been several recent, but unconfirmed, sightings of mountain lions Felis concolor. Beaver Castor canadensis, apparently once common here, are reappearing in several valleys. Bison Bison bison, wapiti Cervus elaphus, timber wolf Canis lupus (V), fisher Martes pennanti and otter Lutra canadensis once occurred here and could possibly be reintroduced. Over 200 species of birds have been observed with over 60 permanent residents including robin Turdus migratorius, cardinal Cardinalis cardinalis, song sparrow Melospiza melodia and wild turkey Meleagris gallopavo, and some 100 species have been observed in the Park and immediate vicinity during the winter. The peregrine falcon Falco peregrinus (V) once nested, but this species is rarely seen here now; the red-cockaded woodpecker Picoides borealis (V) has also been observed nesting, but the population is sparse and the species seldom seen. Reptile species include 7 turtle, 8 lizard and 23 snake. Heavy precipitation and numerous streams make the mountains ideal for a wide variety of amphibian species including about 27 salamander (the red-cheeked salamander Plethodon jordani appears to be endemic to the Park), 2 toads and at least 10 frogs. Over 70 species of native fish inhabit the streams including the eastern brook trout Salvelinus fontinalis (the Park's population may be a separate and threatened subspecies). Other threatened fish species reported include the smoky madtom Noturus baileyi, yellow-fin madtom N. flavipinnis (V) and stonecat N. flavus (though some of

these may no longer exist in Park waters). Over 20 minnow species and several kinds of darter, sucker, sunfish, bass, bullhead and catfish are also found. The Park also contains a diversity of invertebrates, especially land snails, spiders, insects and other arthropods, that is not well known. 105 species of stonefly including endemics such as Magaloptera williams, Hansonoterla appalachia, several Capnia spp. and Acroneura lycorias (found only in Sevier County). Most groups reveal a complex assortment of forms that often include species endemic to the Park and/or new to science.

CULTURAL HERITAGE Archaeological sites support the theory that prehistoric people (15,000 years ago) were hunters and gatherers. Present historical and cultural interpretation in the Park is based mainly on the structures dating from the middle 1800's to 1920 including the finest collection of log buildings in the U.S.A. The National Register of Historic Places includes 3 historic districts, 8 structures and 28 buildings.

ZONING Natural zone 92%; Historic zone 1%; Development zone 7%.

CONSERVATION MANAGERMENTS A limited area contains visitor, maintenance and administrative facilities and the Park also contains the historic district of Cades Cove. The remaining area has been allowed to revert to a forest state through natural plant succession processes and much management effort is directed at keeping human impact to a minimum. The Park has a general management plan and a series of sectoral management plans.

DISTURBANCES OR DEFICIENCIES Several road systems pass through the Park as well as over 1,280km of horse and foot trails which dissect the high country. The 3 historical zones have open fields of grass and Cades Cove supports a cattle operation. Subsistence farming and commercial logging have been practised in the past, and logging railroads were built. Some of the 1,200 structures in the Park when it was established have been removed, destroyed or allowed to deteriorate. Exotic species of plant and animal in particular wild boar Sus scrofa and 2 trout species are a disturbance and are removed regularly. Other threats include plant pests such as balsam woolly aphid, air pollution and visitor impact.

TOURISM 680,000 visitors each year. Camping grounds, trailer parks, hotels and other infrastructure are now encouraged outside the Park. Facilities within the Park include 9 campgrounds (3 primitive), 2 visitor centres and 18 shelters along the Appalachian Trail and other back country trails (668km)

SCIENTIFIC RESEARCH Research funded by the NPS is mainly directed at monitoring impacts and developing methods for reducing, eliminating, or compensating for them. Much effort is being made to conduct and coordinate research under the guidance of scientists based at the Uplands Field Research Laboratory. The laboratory maintains comprehensive monitoring programmes on a variety of chemical pollutants and biological communities.

SPECIAL SCIENTIFIC FACILITIES Uplands Field Research Laboratory offering both research and accomodation facilities.

PRINCIPAL REFERENCE MATERIAL The Park library and Uplands laboratory have numerous reference documents, and there are about 600 publications relating to the Park. A full bibliography of scientific study has been published by the Southern Appalachian Research/Resources Management Cooperative and Western Carolina University (1982, US MAB Report No. 4, Washington DC) who also published a history of scientific study in the area (1982, US MAB Report No. 5, Washington, DC).

Carlos C. Campbell Birth of a National park in the Great Smoky Mountains.

General Management Plan - Great Smoky Mountains National Park, North Carolina-Tennessee. (1982) US Department of the Interior, National Park Service, Denver Service Center, Denver, CO. 70p

Maps: 1:125,000 Great Smoky Mountains National Park and Vicinity, US Geological Survey.

Biosphere Reserve nomination submitted to Unesco

STAFF 105 permanent and 200 temporary and full-time employees

BUDGET The financial statement for 1982 totalled US\$5,613,000

LOCAL PARK OR RESERVE ADMINISTRATION Superintendent, Great Smoky Mountains National Park, Gatlinburg, Tennessee 37738, U.S.A.

DATE August 1982

UNITED STATES OF AMERICA-Great Smoky Mountains National Park

UNITED STATES OF AMERICA - Tennessee

NAME Great Smoky Mountains National Park

MANAGEMENT CATEGORY II (National Park)  
IX (Biosphere Reserve)  
X (World Heritage Site - Criteria: i, ii)

BIOGEOGRAPHICAL PROVINCE 1.05.05 (Eastern Forest)

GEOGRAPHICAL LOCATION Southern end of the Appalachian Mountains in eastern Tennessee and western North Carolina, bounded by the Little Tennessee River in the south, the French Broad River to the north and the Pigeon River in the east. Surrounded by parts of several national forests, an Indian reservation, a Tennessee Valley Authority lake and numerous private holdings. Gatlinburg (Tennessee) lies close to the north entrance and Cherokee (North Carolina), the south entrance. 35°26'-35°47'N, 83°45'-84°00'W

DATE AND HISTORY OF ESTABLISHMENT 22 May 1926 as a national park (44 Stat. 616) and June 1976 as a biosphere reserve

AREA The biosphere reserve covers an area of 209,000ha. The park comprises about 25% of the total area protected in the Eastern Forest biogeographic province.

LAND TENURE Federal government

ALTITUDE 259m-2,025m

PHYSICAL FEATURES The dominant topographic feature of the park is the range of the Great Smoky Mountains with peaks over 1,818m. Lesser ridges form radiating spurs from the central ridgeline. In broad aspect, the topography of the park consists of moderately sharp-crested, steep-sided ridges separated by deep V-shaped valleys. Many of the mountain ridges branch and subdivide creating a complex of drainage systems with 3,057km of fast-flowing clear mountain streams. The park contains 45 watersheds and the water table is near the surface in almost all sections. Precambrian metamorphic rocks consisting of gneisses and schists, and sedimentary rocks of the Precambrian Ocoee series are predominant, while sedimentary rocks in the Appalachian Valley are the youngest.

CLIMATE Mean annual temperature for Gatlinburg is 13.7°C, but the average temperature is 5°-10° cooler at higher altitudes, with warm humid summers and relatively mild winters. Precipitation averages 1625mm annually, but differences in average annual precipitation of more than 600mm have been recorded between a peak and valley only 15km apart. Snow accumulations may reach 1.2m at 1,500m, but are negligible below 1,000m.

VEGETATION The deeply dissected landscape present at the southern end of

Infobase produced by WCMC, January 1992

the Appalachian chain provided a refuge for a host of temperate and boreal species during Pleistocene glaciation. This has resulted in a rich vegetation mosaic comprising approximately 1,500 species of flowering plants, including 130 trees, and an estimated 2,200 cryptogamous taxa.

Some 30% of the park's forest is high in 'virgin' attributes. Areas which were farmed or logged have been recovering for varying periods of time and therefore present a range of successional stages. Deciduous broad-leaved and evergreen coniferous forests predominate but treeless grass and heath balds, open wet meadows and cliffs communities also occur. Vegetation changes continuously with elevation, slope, aspect and topographic position. Fourteen major forest types are currently recognised within the park. On mesic sites, low and mid-elevation cove hardwood (mixed mesophytic) and hemlock-hardwood forest grade, with increasing elevation, into northern hardwoods and finally, at about 1,500m, into spruce-fir. On a gradient from mesic to xeric, the cove hardwoods are replaced by mixed oak, xeric oak, and oak-pine. Heath balds represent the xeric extreme at the upper elevations and are dominated by ericaceous shrubs such as Rhododendron catawbiense, R. minus, Kalmia latifolia and Leiophyllum buxifolium. Perhaps the most notable are the cove hardwood and spruce-fir. Cove hardwoods may contain upwards of 20 different species in the canopy at any one site. Dominants often include Liriodendron tulipifera, Halesia carolina, Acer saccharum, Aesculus octandra and Prunus serotina. A single tenth-hectare plot may support in excess of 50 species throughout the year. The spruce-fir forest type occurs only at the highest elevations and contains the largest contiguous block of virgin Picea rubens on earth. Fully 75% of all Southern Appalachian spruce-fir occurs within the park. Additionally, grass balds, ridges, cliffs and landslide scars within these high elevation forest support the growth of rare regional endemics. Fifteen plants are listed as candidates for federal protection as threatened or endangered species. Moreover, 120 species are recognised as rare enough to be of managerial concern. A similar number of bryophytes, lichens and fungi are also considered rare at the regional, national, or global level.

**FAUNA** Reflecting the richness of the flora, the diverse fauna includes at least 50 native animals. With the exception of black bear Ursus americanus and white-tailed deer Odocoileus virginianus, large mammals are not encountered. However, ranging throughout the park are many medium sized mammals including red fox Vulpes fulva (sometimes considered as one species, Vulpes vulpes, along with old world red fox), grey fox Urocyon cinereoargenteus, racoon Procyon lotor, opossum Didelphis marsupialis, woodchuck Marmota monax and bobcat Lynx rufus. Several squirrels are seen including eastern chipmunk Tamias striatus, red squirrel Tamiasciurus hudsonicus, grey squirrel Sciurus carolinensis and two types of flying squirrel, the southern Glaucomys volans and the northern endangered subspecies Glaucomys sabrinus coloratus. Other smaller mammals include muskrat Ondatra zibethicus, cottontail rabbit Sylvilagus floridanus, several species of mice, moles and shrews. Beaver Castor canadensis, apparently once common here, are beginning to reappear in several valleys. Mustelids include long-tailed weasel Mustela frenata, mink M. vison, and skunks. River otter Lutra canadensis has been successfully reintroduced.

Infobase produced by WCMC, January 1992



Several species of bats inhabit the park. The threatened Indiana bat Myotis sodalis (V) is known to use at least three of the park's caves as a winter roost. There have been several recent, but unconfirmed, sightings of puma Felis concolor. Bison Bison bison and wapiti Cervus elaphus show little promise of reintroduction due to disease problems and visitor safety. Wolf Canis lupus (V), and possibly Canis rufus, and fisher Martes pennanti have occurred here and possibly may be reintroduced. Since the 1950s, control efforts have been exercised against the exotic European wild boar Sus scrofa. Recently coyote Canis latrans has migrated naturally to the park.

Over 200 species of birds have been observed, including many species of warblers, flycatchers and other migratory songbirds. Over 60 permanent residents including ruffed grouse Bonasa umbellus and wild turkey Meleagris gallopavo, can be seen year round. Peregrine falcon Falco peregrinus (V) has been reintroduced. Red-cockaded woodpecker Picoides borealis has been observed nesting, but none has been seen recently.

Reptile species include seven turtles, eight lizards and 23 snakes. Heavy precipitation and numerous streams make the mountains ideal for a wide variety of amphibian species including about 27 salamander (red-cheeked salamander Plethodon jordani appears to be endemic to the park), two toads and at least ten frogs. Over 40 species of native fish inhabit the streams, including eastern brook trout Salvelinus fontinalis (the park's population may be a separate and threatened subspecies). Other threatened fish species include smoky madtom Noturus baileyi, yellow-fin madtom N. flavipinnis (V) and spotfin chub Hybopsis nonacha, which are currently being reintroduced into the park.

The park also contains a diversity of invertebrates, especially land snails, spiders, insects and other arthropods, that is not well known. Over 100 species of caddisflies and stoneflies are found in the park, including stonefly endemics such as Megaloptera williamsi, Hansonoperla appalachia, several Capnia species and Acroneuria lycorias (found only in Sevier County). Over 800 Lepidopteran species have been recorded. Most groups reveal a complex assortment of forms that often include species endemic to the park and/or new to science.

CULTURAL HERITAGE Archaeological sites support the theory that prehistoric people (15,000 years ago) were hunters and gatherers. Present historical and cultural interpretation in the park is based mainly on structures dating from the middle 1800s to 1920, including the finest collection of log buildings in the United States. The National Register of Historic Places includes three historic districts, eight structures and 28 buildings.

LOCAL HUMAN POPULATION No information

VISITORS AND VISITOR FACILITIES The park records about 8.8 million recreational visits each year and is the most visited national park in the country. Use of camping grounds, trailer parks, hotels and other infrastructure are now encouraged outside the park. Facilities within the

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park include three visitor centres, 10 campgrounds (three primitive), and 18 shelters along the Appalachian Trail and other back country trails (668km), 10 picnic areas, numerous backcountry campsites and over 1,448km of trails. The parks conducts an active visitor services programme which primarily interprets the natural and cultural resources of the area and provides visitor information. There are six amphitheatres and one campfire circle. A wide variety of publications and interpretive literature about the park is made available by the Great Smoky Mountains Natural History Association. This association also operates the Great Smoky Mountains Institute, which is a live-in facility that accommodates 120 people and offers environmental education programmes for school groups, teacher workshops, adult programmes, elderhostels etc.

SCIENTIFIC RESEARCH AND FACILITIES Research funded by the NPS is mainly directed at monitoring impacts and developing methods for reducing, eliminating, or compensating for them. Research is conducted and coordinated under the guidance of scientists based at Uplands Field Research Laboratory. A wide range of research projects is conducted in the general topics of sociology, wildlife surveys, fisheries, stream chemistry and watersheds, air quality monitoring and biological effects of pollution, geography, rare species and natural heritage, introduced, exotic and disease species, and long term ecological research.

CONSERVATION MANAGEMENT The park is particularly valued by visitors for the seemingly endless vistas of forested mountains. A limited area contains visitor, maintenance and administrative facilities and the park also contains Cades Cove, Noah Ogle and Roaring Forks historic districts and Oconaluftee archaeological district. The remaining area has been allowed to revert to a forest state through natural plant succession processes and much management effort is directed at keeping human impact 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 the park's resources. The system of zoning comprises natural zone (92%), historic zone (1%) and development zone (7%). No removal of natural resources is permitted except for certain fish excluding brook trout.

MANAGEMENT PROBLEMS Several road systems pass through the park as well as over 1,280km of horse and foot trails which dissect the high country. The three historical zones have open fields of grass and Cades Cove supports a cattle operation. Subsistence farming and commercial logging have been practised in the past, and logging railroads were built. Some of the 1,200 structures in the park when it was established have been removed, destroyed or allowed to deteriorate. Several non-native plant and animal species are known to cause significant impacts to natural resources. Management strategies for exotic plants have been applied, in some instances dating from the early 1940s, while strategies are currently being developed for several other non-native species. Wild boar Sus scrofa, has been recognised as needing control efforts since the mid-1950s and is removed regularly. In order to protect and perpetuate rapidly declining native brook trout populations, control efforts have been conducted against two

competitive non-native trout species. Continuing problems include visitor abuse of backcountry resources; poaching of wildlife, particularly native brook trout, deer and black bear; and woodland arson. Vandalism and wilful destruction of historic structure are common. Other threats include air pollution and several forest pests and diseases, such as balsam woolly adelgid, southern pine beetle, dogwood anthracnose, butternut canker, and chestnut blight. Since inception of park management, total suppression of all wild fires has accounted for unnatural accumulation of fuels and changes in the forest mosaic that do not favour fire-dependent plant species.

STAFF 255 (214 full-time, and part-time employees and 41 temporary employess)

BUDGET The financial statement for 1989 was approximately US\$6.7 million.

LOCAL ADMINISTRATION Superintendent, Great Smoky Mountains National Park, Gatlinburg, Tennessee 37738

REFERENCES

The park library and Uplands laboratory have numerous reference documents, and there are numerous publications relating to the park. A full bibliography of scientific study has been published by the Southern Appalachian Research/ Resources Management Cooperative and Western Carolina University (1982, US MAB Report No. 4, Washington DC) which also published a history of scientific study in the area (1982, US MAB Report No. 5, Washington, DC).

Campbell, C.C. (1960). Birth of a National park in the Great Smoky Mountains.

General Management Plan - Great Smoky Mountains National Park, North Carolina-Tennessee. (1982) US Department of the Interior, National Park Service, Denver Service Center, Denver, CO. 70pp.

Maps: 1:125,000 Great Smoky Mountains National Park and Vicinity, US Geological Survey.

National Park Service (1977 to present). Research/Resource Management Report Series. National Park Service, Southeast Region, US Department of the Interior.

DATE August 1982, revised August 1986 and May 1990  
0097U

UNITED STATES OF AMERICA-Mammoth Cave

UNITED STATES OF AMERICA - Kentucky

NAME Mammoth Cave Area Biosphere Reserve

IUCN MANAGEMENT CATEGORY II (National Park)  
X (World Heritage Site: Criteria i, ii, iii, iv)  
IX (Biosphere Reserve)

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BIOGEOGRAPHICAL PROVINCE 1.05.05 (Eastern Forest)

GEOGRAPHICAL LOCATION Situated in Barren, Edmonson and Hart counties, South Central Kentucky near Park City, which lies within the transition area. 37°07'-37°17'N, 86°00'-86°17'W

DATE AND HISTORY OF ESTABLISHMENT The area was declared a national park on 1 July 1941, under enabling legislation of US Congress (44 Statute 635) of 25 May 1926. Kentucky ceded exclusive jurisdiction over park lands by an act of legislature approved on 22 March 1930 and this was accepted by the Secretary of the Interior on 1 May 1944 by authority of the act of 5 June 1942 (56 Statute 317). Exclusive jurisdiction over the remainder of the land was accepted on 1 May 1965. Certain roads through the park are legally open to the public under Deed No.262 of 18 June 1945. Part of the area is endorsed by the Barren River Area Development District resolution of 24 October 1988. Big Woods Old-growth Forest is designated a state natural area by the state of Kentucky. Green River is designated a wild and scenic river and Green River and Mammoth Cave subsurface streams are designated outstanding resource waters by this state. Accepted as a World Heritage site in 1981 and as a biosphere reserve in 1990.

AREA National park 21,191ha; the area included in the biosphere reserve is 21,217ha, comprising a core area of 20,917ha and buffer zones of 300ha; an additional transition zone covers 62,160ha.

LAND TENURE The national park (core area) is federally owned

ALTITUDE 180-231m

PHYSICAL FEATURES The park is situated in an area known as the Mammoth Cave Plateau and contains an internationally important karst area. The core area is a dissected plateau known as the Chester Upland, formed of sandstone-capped ridges separated by karstified valleys containing sinkholes. It also contains the longest cave system in the world, with known passages extending for over 532km. Most types of limestone cave formation are found here, including long passages with huge chambers, vertical shafts, stalagmites, stalactites and gypsum 'flowers' and 'needles'. On the surface there is a superb karst topography with largely subsurface drainage, sinkholes, cracks, fissures and springs. Groundwater flows from the extensive recharge areas on the plateaux to the southwest through the park's cave system to springs that discharge into the Green River. The erosion by the Green River and its tributaries which formed this system began over 25 million years ago and these rivers are now meandering and deeply incised. The limestone rocks of Upper Mississippian age are highly soluble and include contain fossils throughout, including brachiopods, crinoids and corals. The main series in which the cave systems and karst landscape have developed are the St Louis, St Genevieve and Paoli limestones of the Meramecian. The Chester Upland is capped by sandstones of the Upper Mississippian-Lower Pennsylvania periods. Structural dip in the north-west is about 5m/km. The major soil types are those developed from limestone residuum and are either alfisols or

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ultisols. To the east, south and west of the park (included in the transition zone) is the Pennyroyal Plateau which is separated from the Chester Upland by an escarpment.

CLIMATE Conditions are humid temperate. Mean annual precipitation is 1118mm at an altitude of 205m and practically all of it is in the form of rain as temperatures are generally above freezing during the day. Mean annual temperature is 13.6°C with a summer mean of 26.6°C and a winter mean of 1.7°C.

VEGETATION There is a luxuriant surface vegetation, including 84 tree species, 28 shrubs and vines, 29 species of fern, 209 flower species, 67 species of algae, 27 species of fungi and seven species of mosses. An inventory of the flora is included in the biosphere reserve nomination. Big Woods is reputed to be one of the largest and best remaining examples of the ancient forest of eastern North America that once covered Kentucky. This is temperate deciduous oak-hickory forest dominated by oaks including Quercus alba, Q. velutina, Q. prinus and hickories including Carya glabra and C. tomentosa with some beech Fagus sp., maples Acer spp. poplar Liriodendron sp., ash Fraxinus sp. and cedar Juniperus virginiana.

FAUNA Over 200 species are indigenous to the cave system. On the surface are 41 species of mammals, 203 species of birds, 18 species of reptiles and 15 species of amphibians. A faunal list is included in the biosphere reserve nomination. The age of the geological formations has contributed to species richness in the cave fauna, the cave system being old enough to have communities from three karst regions and covering an area large enough for speciation to have occurred. Nowhere else do blind fish Amblyopsis spelaea (V), Typhlichthus subterraneus and their spring cave-dwelling relative Chologaster agassizi co-exist. Resident animal species listed as federally endangered include freshwater mussels Obovaria retusa (I), Hemistena lata (E), Pleurobema plenum (E) and Lampsilis orbiculata (E), Indiana bat Myotis sodalis (V), grey bat M. grisescens and Kentucky cave shrimp Plaeomonias ganteri. There have been successful reintroductions of wild turkey, beaver and deer.

CULTURAL HERITAGE The park contains evidence of four pre-Columbian Indian cultures: Mississippian, Woodland, Archaic and Paleo-Indian. The early Woodland culture period is of special archaeological importance because it shows the first evidence of organised horticulture in North America, with primitive agriculture on river floodplains. These Indians used the caves for shelters and chipped gypsum and mirabilite off the walls; more than 150 archaeological sites have been identified within the national park. Saltpetre deposits were discovered on the cave walls and this valuable nitrate was removed and sent to be processed in gunpowder factories between 1809 and 1819. After the 1812-1815 war Mammoth Cave became a national and international tourist attraction. Three churches and fourteen cemeteries still exist in the park and are used by the public.

LOCAL HUMAN POPULATION There are no permanent inhabitants in the core area. About 240 people live in the buffer zones with a further 1500 in the transition area, including about 600 in Park City. Population density in

the region surrounding the park is low (30 per sq.km) and has remained stable for the past 20 years. Only 25% of the population is considered urban and no significant increase in urbanisation is expected in the near future. Most people are engaged in agriculture, tourism or service industries.

VISITORS AND VISITOR FACILITIES Since a peak in 1979 of 1.6 million visitors, numbers remained stable near this level into the 1980s with an increase occurring in recent years to about 2 million per annum. The summer months of June, July and August account for over 60% of the annual total. Park headquarters are located at the historic entrance to Mammoth Cave and there is a visitors' centre here, but this is very small. Guided tours are offered of the underground portion of the park and there are commercial boat trips on Green River. There are 155km of roads within the park and many hiking trails including over 45 miles in the remote section of the park but there are only two small ferries across the Green River so that resources in much of the remoter hilly areas of the park remain untapped. Access is good and it is estimated that a third of all visitors do no more than drive through the park. There are about 110 rooms in a hotel, lodge and various cottages and restaurant and shopping facilities in the buffer zone but a further 2,000 motel rooms and over 7,500 campsite places are located within easy distance of the park.

SCIENTIFIC RESEARCH AND FACILITIES Long-term hydrological and ecological research into karst systems is being carried out in the Mammoth Cave area, including the effects of water quality on the cave's biota. In particular, research into groundwater flow-pulse rates and modelling has been applied to the development of instrumentation packages for monitoring the physical and chemical properties of groundwater. Preliminary discussions of the international applications of this have been initiated. Much research into a variety of aspects has already been carried out. A research facility and laboratory are available to visiting researchers. The US Geological Survey plans to further delineate groundwater basins in the area and the Agricultural Stabilisation and Conservation Service will be studying the effects of agriculture on groundwater in the transition zone. There are cooperative agreements with Western Kentucky University, Eastern Kentucky University, the Cave Research Foundation and the American Cave Conservation Association for research and education or training opportunities.

CONSERVATION VALUE The Mammoth Cave area is an internationally important karst area. It contains the longest cave system in the world, with known passages extending for over 532km. Most types of limestone cave formation occur here. Over 200 species of animal are indigenous to the cave system including several endangered species of blind fish, shrimp, bat and freshwater mussel. Surface features are also important and Big Woods, a temperate deciduous oak-hickory dominated forest, is reputed to be one of the largest and best remaining examples of the ancient forest of eastern North America that once covered Kentucky. Archaeological sites in the area show evidence of four pre-Columbian Indian cultures.

CONSERVATION MANAGEMENT The core area (Mammoth Cave National Park) is

Infobase produced by WCMC, January 1992

managed by the National Park Service. The transition zone falls within Barren River Development District of which three counties are within the Mammoth Cave system recharge area. The Biosphere Reserve Cooperative Subcommittee of the Natural Resources Council of the Barren River Area Development District will coordinate biosphere reserve functions. The general management plan for the national park (1983) states that the management aims at Mammoth Cave National Park are to perpetuate the integrity and diversity of geological features and life systems associated with the caves and preserve aquatic and terrestrial environments for their aesthetic, recreational, educational and scientific values. Within the core the management plan identifies separate natural zones and historic zones and it classifies caves into six types according to the access approved. A resource management plan has been compiled (Anon., 1988), which includes natural and cultural resource management programmes. The oak-hickory woods of the national park are being allowed to return to their natural state. Some of the oak and poplar forests are currently managed but there are no plantations. As well as public recreation, authorised fishing and hunting is permitted in the core area. Narrow corridors along roads within the core zone have been designated as zones of managed use and concentrate tourist developments, administrative and recreational facilities. A transition zone for the biosphere reserve has also been designated to the south and east of the core area to curtail groundwater pollution as this is where much of the rainwater which flows through the cave systems of the park falls. Federal, state and local authorities have cooperated to develop a regional sewer system in this area, surrounding Park City, to stop pollutants reaching the groundwater.

MANAGEMENT CONSTRAINTS Damage to irreplaceable cave features occurred during the early periods of cave use, including smoke deposits from torches and fires and graffiti. The use of electric lighting for cave tours has also led to the introduction and growth of mosses, fungi and algae in the caves and may eventually spoil the natural beauty of some of the unique formations. At least 130 cave entrances have been identified as needing some level of monitoring for illegal entry. Several cave gates are in need of repair. Oil and gas wells were also drilled in this area and although those inside the park were abandoned when it was established they still pose a threat to human safety and environmental quality as many have been insufficiently plugged. In adjacent areas, oil and gas exploration has increased recently and with this, the risks of spillages into the park's groundwater system including that of injected dyes. About half of the Mammoth Cave system actually lies outside the national park boundaries but management of these areas should be improved by the designation of a transitional zone to the biosphere reserve. Commercial freshwater mussel fishing outside the park has destroyed the natural mussel beds there and illegal operations have expanded into the park, resulting in conviction of the operators.

A wide variety of arable and animal farming occurs in the transition zone and this area is now increasing its light industry. However, solution of the existing pollution problems should provide a basis for increased opportunities to attract sustainable economic development compatible with

the karst terrain. Of major environmental concern is the extensive sinkhole plain to the south and east of the Park. Run-off from this area flows via underground streams into the Green River and includes effluent from Park City. There has also been illegal dumping of wastes into sink holes in the transition zone. Any changes in quality or quantity of water would adversely affect the unique aquatic life in the underground streams and alter natural cave development but this problem is now being addressed (see previous section).

STAFF The biosphere reserve has a staff of 94. Of these, 20 are involved in administration, control and resource management within the core area and 17 are university educated. There are 12 staff for education and training purposes and three involved in research who have a technical support of up to ten personnel.

BUDGET US\$ 3,500,000 annually

LOCAL ADDRESSES Mammoth Cave National Park, Mammoth Cave, Kentucky 42259

REFERENCES

Anon. (1983). General management plan, Mammoth Cave National Park, Kentucky.

Denver Service Center.

Anon. (1988). Resource Management Plan for Mammoth Cave National Park. Draft.

MAB USA (1990). Mammoth Cave Area biosphere reserve. Biosphere Reserve nomination form.

DATE July 1981, revised October 1989 and September 1990

DOCUMENT 0359U



PATRIMOINE MONDIAL. CANDIDATURE

EXAMEN TECHNIQUE PAR L'UICN

1. NUMERO D'IDENTIFICATION ET NOM: 259 PARC NATIONAL DES GREAT SMOKY MOUNTAINS

2. SITUATION GEOGRAPHIQUE: Entre 35°26'15" et 35°47' de latitude nord et 83°45' et 84° de longitude ouest.

3. CANDIDATURE PROPOSEE PAR: Ministère de l'intérieur, Gouvernement des Etats-Unis.

4. DOCUMENTATION:

- (i) Formulaire de candidature, cartes et plans
- (ii) Documentation supplémentaire (UICN)

a) Consultants: Tom Thomas, Robert Milne, Sue Wells, Brian Groombridge.

b) Southern Appalachian Research/Resources, Management Cooperative. 1982. Great Smoky Mountains Biosphere Reserve: A bibliography of scientific study. US MAB Rep. No. 4. Washington, D.C. 51 p.

c) Southern Appalachian Research/Resources, Management Cooperative. 1982. Great Smoky Mountains Biosphere Reserve: History of scientific study. US MAB Rep. No. 5. Washington, D.C. 276 p.

d) Plan général de gestion - Parc national des Great Smoky Mountains, Caroline du Nord - Tennessee. 1982. US Dept. of the Interior, National Park Service, Denver Service Center, Denver, CO. 70 p.

5. DESCRIPTION ET RESUME

Le Parc national des Great Smoky Mountains (209 000 ha) est la région naturelle la plus vaste de l'est des Etats-Unis. Il joue un rôle important sur le plan mondial dans la mesure où il constitue un exemple de forêt tempérée à feuilles caduques. Au pléistocène, il fut le principal refuge de la flore et de la faune tempérées et c'est pourquoi il contient un grand nombre d'espèces endémiques ainsi qu'un ensemble d'espèces extrêmement riche. Avec plus de 3 500 espèces végétales, il a une diversité floristique qui n'existe dans aucune autre région protégée à climat tempéré de même superficie. En outre, il y pousse presque autant d'arbres que dans toute l'Europe (130 espèces naturelles). Il abrite de nombreuses espèces animales en danger et l'on y trouve probablement la plus grande variété de salamandres au monde. Il constitue également un centre d'endémicité pour certains mollusques d'Amérique du Nord. (Pour plus de détails, voir la fiche descriptive ci-jointe)

6. INTEGRITE

La région est suffisamment vaste pour garantir la viabilité écologique des espèces qui y vivent. Elle peut constituer l'équivalent moderne d'un "refuge du pléistocène". En tant que première zone protégée de l'est des Etats-Unis, le site est visité chaque année par des millions de touristes et il fait ainsi l'objet d'une surexploitation qui suscite une certaine inquiétude. Toutefois, le National Park Service des Etats-Unis a cherché à résoudre directement le problème en encourageant la création, hors du parc, de terrains de camping, de camps de caravanage, d'hôtels et d'autres infrastructures touristiques de

manière à réduire les contraintes qui pèsent sur le Parc, tout en permettant à la population environnante d'en tirer les avantages économiques. En matière de gestion, le Parc est soumis à un plan général ainsi qu'à un ensemble de plans sectoriels.

Le site est une réserve de la biosphère, et l'on y a mené un très grand nombre de recherches. La Bibliography of Scientific Studies publiée en 1982 compte plus de 600 articles. Toutefois, une partie relativement limitée de ces recherches est spécifiquement orientée vers les questions de gestion, et l'on estime qu'un système de contrôle contribuerait à garantir, à l'avenir, l'intégrité de la région.

#### 7. COMPARAISON AVEC D'AUTRES REGIONS

Le domaine biogéographique de la forêt orientale comporte 37 régions protégées qui couvrent plus de 1,1 million d'hectares. Les Great Smoky Mountains s'étendent sur quelque 25% de l'ensemble de la zone protégée. Deux autres sites présentant un intérêt particulier se trouvent également dans ce domaine biogéographique. Le Parc national de Shenandoah (84 921 ha), dont la superficie est égale à moins d'un tiers de celle du Parc national des Great Smoky Mountains, a subi, dans le passé, l'influence de l'homme de façon nettement plus prononcée, et il abrite beaucoup moins d'espèces. Le refuge national de la flore et de la faune sauvages de la région du Mississippi supérieur (78 975 ha) est également beaucoup plus petit et moins diversifié que le Parc des Great Smoky Mountains. En tant que refuge de la flore et de la faune sauvages, il est juridiquement moins protégé qu'un parc national.

#### 8. EVALUATION

Le Parc national des Great Smoky Mountains joue un rôle important sur le plan mondial en ce sens qu'il constitue un témoignage exceptionnel des diverses manifestations de la flore arcto-tertiaire. Il donne en effet une indication de ce que pouvait être la flore à la fin du pléistocène, avant l'influence récente de l'homme (critère i). Il est suffisamment vaste pour constituer un exemple important de la poursuite de l'évolution biologique de ce système naturel (critère ii). Le site est également d'une beauté exceptionnelle, avec ses forêts pittoresques, ses courants limpides, ses sentiers bien entretenus (critère iii) et un certain nombre d'espèces d'arbres détenteurs de records mondiaux (critère iv).

#### 9. RECOMMANDATION

Le Parc national des Great Smoky Mountains satisfait aux quatre critères et devrait être inscrit sur la Liste du patrimoine mondial.

Union internationale pour la conservation  
de la nature et de ses ressources

15 juin 1983

NAME Great Smoky Mountains National Park

MANAGEMENT CATEGORY II & IX (National Park and Biosphere Reserve)

Proposed World Heritage Site (Criteria: i, ii)

BIOGEOGRAPHICAL PROVINCE 1.5.5 (Eastern Forest)

LEGAL PROTECTION Total. No removal of natural resources permitted except for certain fish excluding brook trout.

DATE ESTABLISHED 22 May 1926 as a National Park (44 Stat. 616) and June 1976 as a Biosphere Reserve

GEOGRAPHICAL LOCATION Southern end of the Appalachian Mountains in eastern Tennessee and western North Carolina, bounded by the Little Tennessee River in the south, the French Broad River to the north and the Pigeon River in the east. Surrounded by parts of several National Forests, an Indian reservation, and a Tennessee Valley Authority lake. Gatlinburg (Tennessee) lies close to the north entrance and Cherokee (North Carolina) the south entrance. 35°26'-47'N, 83°45'-84°00'W.

ALTITUDE 260-2,025m

AREA 209,000ha. The Park comprises about 25% of the total area protected in the Eastern Forest biogeographic province.

LAND TENURE Federal government

PHYSICAL FEATURES The dominant topographic feature of the Park is the range of the Great Smoky Mountains with 16 peaks over 1,829m. Lesser ridges form radiating spurs from the central ridgeline. In broad aspect, the topography of the Park consists of moderately sharp-crested, steep-sided ridges separated by deep V-shaped valleys. Many of the mountain ridges branch and subdivide creating a complex of drainage systems with many fast-flowing clear mountain streams. The Park contains 22 major watersheds and the water table is near the surface in almost all sections. Precambrian metamorphic rocks consisting of gneisses and schists, and sedimentary rocks of the Precambrian OCOEE series are predominant, while sedimentary rocks in the Appalachian Valley are the youngest. Mean annual temperature for Gatlinburg is 13.7°C, but the average temperature is 5-10° cooler higher up. Warm humid summers and relatively mild winters. Precipitation averages 1,626mm annually, but differences in average annual precipitation of more than 635mm have been recorded between a peak and valley only 16km apart. Snow accumulations may reach 1.2m at 1,500m, but are negligible below 1,000m.

VEGETATION The area is a pleistocene refuge and thus an outstanding example of the diverse Arcto-Tertiary geoflora era, having a high number of temperate species (1,450 species of flowering plants and 2,200 others including 130 trees) with some rich mixed stands. Some 30% of the Park is virgin forest and areas previously logged have been recovering for varied periods of time presenting a range of successional stages. Deciduous broad-leaved and needle-leaved evergreen conifer forests predominate with smaller areas of treeless grass and heath balds, open wet meadows and cliffs. The vegetation changes continuously with elevation, slope aspect and soil moisture patterns, notable types being: cove hardwood and hemlock forests dominated by 25-30

diverse tree species including Liriodendron tulipifera, Halesia carolina var. monticola, Tilia heterophylla, Quercus rubra, Fraxinus americana, Acer saccharum, Betula lutea, and Tsuga canadensis, 6-12 species being co-dominant at any one site, with diverse herbaceous understoreys with vernal peak flowering; a one-tenth hectare plot may support 40-50 species through the year. Forest areas include northern hardwood forest Fagus grandifolia, B. lutea, Acer saccharum, Aesculus octandra; spruce-fir forest of Picea rubens, Abies fraseri, B. lutea, Sorbus americana (the block of virgin red spruce is the largest left on earth, and over 40% of southern Appalachian spruce-fir occurs in the Park); mixed oak forest of Quercus alba, Q. rubra, Q. prinus and formerly Castanea dentata; and pine-oak forest of Pinus rigida, P. pungens, P. virginiana, Quercus coccinea, Nyssa sylvatica and Oxydendrum arboreum. On mesic sites, cove forest grades with elevation into northern hardwoods and finally spruce-fir forest, the transition occurring at ca. 1,700m. At mid and lower elevations, along a gradient from mesic to xeric sites, cove forest is replaced by mixed oak and then by pine-oak. Heath balds represent the xeric extreme at higher elevations and evergreen broadleaved shrubs dominate including Rhododendron minus, R. catawbiense, Kalmia latifolia, Leiophyllum buxifolium. Grass balds, cliffs, landslide scars and upper elevation forests support the growth of rare southern Appalachian endemics. 5 species are officially listed as endangered on the Fish and Wildlife Service List of Candidate Endangered Plants (Federal Register 45: 82480, 1980): Smoky Mountains manna grass Glyceria nubigena, spreading avens Geum radiatum, Cain's reedgrass Calamagrostis cainii, mountain rush Juncus trifidus var. Monathos and Rugel's ragwort Cacelia rugelia, but an additional 120 threatened species occur.

#### NOTEWORTHY FAUNA

A diverse fauna occurs including at least 50 native animals, reflecting the richness of the flora. With the exception of the black bear Ursus americanus and white-tailed deer Odocoileus virginianus, large mammals are seldom seen though red fox Vulpes fulva, gray fox Urocyon cinereoargenteus, racoon Procyon lotor, opossum Didelphis marsupialis, woodchuck Marmota monax and bobcat Lynx rufus range throughout the Park. Other mammals include the red squirrel Tamiasciurus hudsonicus, grey squirrel Sciurus carolinensis, muskrat Ondatra zibethicus, cottontail rabbit Sylvilagus floridanus, several species of mice, moles and shrews, long-tailed weasel Mustela frenata, mink M. vison, and skunks. Several species of bats inhabit the park. The threatened Indiana bat Myotis sodalis (V) is known to use at least one of the Park's caves as a winter roost. There have been several recent, but unconfirmed, sightings of mountain lions Felis concolor. Beaver Castor canadensis, apparently once common here, are reappearing in several valleys. Bison Bison bison, wapiti Cervus elaphus, timber wolf Canis lupus (V), fisher Martes pennanti and otter Lutra canadensis once occurred here and could possibly be reintroduced. Over 200 species of birds have been observed with over 60 permanent residents including robin Turdus migratorius, cardinal Cardinalis cardinalis, song sparrow Melospiza melodia and wild turkey Meleagris gallopavo, and some 100 species have been observed in the Park and immediate vicinity during the winter. The peregrine falcon Falco peregrinus (V) once nested, but this species is rarely seen here now; the red-cockaded woodpecker Picoides borealis (V) has also been observed nesting, but the population is sparse and the species seldom seen. Reptile species include 7 turtle, 8 lizard and 23 snake. Heavy precipitation and numerous streams make the mountains ideal for a wide variety of amphibian species including about 27 salamander (the red-cheeked salamander Plethodon jordani appears to be endemic to the Park), 2 toads and at least 10 frogs. Over 70 species of native fish inhabit the streams including the eastern brook trout Salvelinus fontinalis (the Park's population may be a separate and threatened subspecies). Other threatened fish species reported include the smoky madtom Noturus baileyi, yellow-fin madtom N. flavipinnis (V) and stonecat N. flavus (though some of

these may no longer exist in Park waters). Over 20 minnow species and several kinds of darter, sucker, sunfish, bass, bullhead and catfish are also found. The Park also contains a diversity of invertebrates, especially land snails, spiders, insects and other arthropods, that is not well known. 105 species of stonefly including endemics such as Magaloptera williams, Hansonoterla appalachia, several Capnia spp. and Acronoura lycorias (found only in Sevier County). Most groups reveal a complex assortment of forms that often include species endemic to the Park and/or new to science.

CULTURAL HERITAGE Archaeological sites support the theory that prehistoric people (15,000 years ago) were hunters and gatherers. Present historical and cultural interpretation in the Park is based mainly on the structures dating from the middle 1800's to 1920 including the finest collection of log buildings in the U.S.A. The National Register of Historic Places includes 3 historic districts, 8 structures and 28 buildings.

ZONING Natural zone 92%; Historic zone 1%; Development zone 7%.

CONSERVATION MANAGERMENTS A limited area contains visitor, maintenance and administrative facilities and the Park also contains the historic district of Cades Cove. The remaining area has been allowed to revert to a forest state through natural plant succession processes and much management effort is directed at keeping human impact to a minimum. The Park has a general management plan and a series of sectoral management plans.

DISTURBANCES OR DEFICIENCIES Several road systems pass through the Park as well as over 1,280km of horse and foot trails which dissect the high country. The 3 historical zones have open fields of grass and Cades Cove supports a cattle operation. Subsistence farming and commercial logging have been practised in the past, and logging railroads were built. Some of the 1,200 structures in the Park when it was established have been removed, destroyed or allowed to deteriorate. Exotic species of plant and animal in particular wild boar Sus scrofa and 2 trout species are a disturbance and are removed regularly. Other threats include plant pests such as balsam woolly aphid, air pollution and visitor impact.

TOURISM 680,000 visitors each year. Camping grounds, trailer parks, hotels and other infrastructure are now encouraged outside the Park. Facilities within the Park include 9 campgrounds (3 primitive), 2 visitor centres and 18 shelters along the Appalachian Trail and other back country trails (668km)

SCIENTIFIC RESEARCH Research funded by the NPS is mainly directed at monitoring impacts and developing methods for reducing, eliminating, or compensating for them. Much effort is being made to conduct and coordinate research under the guidance of scientists based at the Uplands Field Research Laboratory. The laboratory maintains comprehensive monitoring programmes on a variety of chemical pollutants and biological communities.

SPECIAL SCIENTIFIC FACILITIES Uplands Field Research Laboratory offering both research and accomodation facilities.

PRINCIPAL REFERENCE MATERIAL The Park library and Uplands laboratory have numerous reference documents, and there are about 600 publications relating to the Park. A full bibliography of scientific study has been published by the Southern Appalachian Research/ Resources Management Cooperative and Western Carolina University (1982, US MAB Report No. 4, Washington DC) who also published a history of scientific study in the area (1982, US MAB Report No. 5, Washington, DC).

Carlos C. Campbell Birth of a National park in the Great Smoky Mountains.

General Management Plan - Great Smoky Mountains National Park, North Carolina-Tennessee. (1982) US Department of the Interior, National Park Service, Denver Service Center, Denver, CO. 70p

Maps: 1:125,000 Great Smoky Mountains National Park and Vicinity, US Geological Survey.

Biosphere Reserve nomination submitted to Unesco

STAFF 105 permanent and 200 temporary and full-time employees

BUDGET The financial statement for 1982 totalled US\$5,613,000

LOCAL PARK OR RESERVE ADMINISTRATION Superintendent, Great Smoky Mountains National Park, Gatlinburg, Tennessee 37738, U.S.A.

DATE August 1982