

## Editorial

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### **Cities and protected areas: an oxymoron or a partnership?**

That the world is becoming increasingly urbanised is scarcely news. Today, half the world's population lives in cities. It is, nonetheless, worth considering present and possible future trends, especially their implications for protected areas. For most of human history, the vast majority of people lived in sparsely-settled rural areas, often quite isolated and even at war with neighbouring populations. Under such conditions, conserving biodiversity through protected areas was hardly an issue. But as people started moving to cities, as part of an inexorable economic process of globalisation, human populations began to expand and protected areas became necessary.

Urbanisation has led to the concentration of political power in cities, which has in turn tended to foster policies favouring urban over rural areas. Various forms of subsidies make food and other basic goods cheaper in the city, discourage agricultural investment, and attract rural people into urban areas. Most developing country governments have encouraged the growth of their large cities as a means of linking their domestic economy with the rest of the globe. Thus for many countries, the capital city controls the trade between urban areas and both rural and international markets, so cities like Manila, Sao Paolo and Bangkok may have more in common with Tokyo, London and Washington than with their rural hinterlands. What does all of this mean for protected areas?

The urban environment includes a great diversity of habitats and many cities support abundant wildlife. In some cases these habitats play a significant role in the conservation of rare species, and the modern urban planning ethic is placing more emphasis on the maintenance of biodiversity in the urban environment. Planned cities such as Canberra, Brasilia, and Shen Zhen, include substantial areas for biodiversity, some of which meet IUCN criteria for protected areas. The case study from India points out that informally protected areas, such as university campuses, can also make important contributions to protected area objectives. In addition, even such seemingly contra-conservation uses of land such as golf courses can contribute to important biodiversity objectives if they are managed appropriately.

While urban metropolises may seem, at first glance, to be burgeoning, crowded, over-stressed habitats with little room for nature, they in fact provide a mosaic of different types of habitats, including skyscrapers, city parks, riversides, railroad rights-of-way, graveyards, agricultural lands, zoos and botanic gardens, university lands, tree-lined streets and so forth. While land-use changes associated with urbanisation typically lead to a decline in biodiversity, economic development in urban and peri-urban habitats does not invariably lead to the loss of all of the original biodiversity, and new habitats such as urban parks, urban forests, urban wetlands, domestic gardens, and roadside plantings, often support a surprisingly rich flora and fauna. London, for example, has over 2,000 species of plants growing wild.

Given the great diversity of habitats found within cities, only some of which can be considered protected areas as defined by IUCN, how can urban lands make their best contribution to national efforts to conserve biodiversity? One important answer is to establish an appropriate coordinating mechanism. For example, in this issue's lead paper, Ted Trzyna describes the administrative and management complexity of urban protected areas in a modern industrial society with numerous competing interests. The establishment of new agencies to coordinate activities, such as the Santa Monica Mountain Conservancy and the San Francisco Bay

Conservation and Development Commission, demonstrates the utility of an institutional umbrella under which numerous interests can shelter to achieve common protected area objectives.

The main problem is fragmentation – isolated protected areas lose species and are subject to substantial human disturbance. As Ian Russell Brown, from the New South Wales National Parks and Wildlife Service, shows in this issue, Lane Cove River National Park, a long, narrow protected area that is very popular with the Sydney population, is also subject to substantial pressures from the surrounding lands – including everything from pollution, and invasive alien species to arson.

As the Brazil case has indicated, it sometimes takes a shock to learn a lesson about conserving nature; sadly, sometimes it is only after a habitat has been spoiled that we recognise its importance to us. But the Brazil case also has a positive message: that the resilient powers of nature are considerable, and if we can control our negative impacts, most ecosystems can rather quickly reach conditions of relatively high biodiversity. It is also worth remembering that human societies are dynamic, and that protected areas can help ensure productive responses to changing conditions be they ecological, demographic, climatic, or economic.

But urban protected areas also have another major advantage: being close to people makes it easier to earn public support. For example, the establishment of a local NGO, called Friends of the Lane Cove River National Park, has been an essential element in building a supportive relationship between the local people and the protected area, demonstrating the point that even (and perhaps especially) dense human populations value protected nature.

In helping us to think about urban protected areas, Adrian Phillips and Honor Gay present a very useful typology of these sites. Taking their ideas a step further, we might come up with a nomenclature something like the following:

- **Heirloom Urban Protected Areas.** These are relatively large protected areas that existed before the associated urban areas expanded to their current extent, serving as a reminder of the wild nature that once dominated the landscape. In their Case Study from India, Patwardhan and colleagues point out the critical importance of such urban protected areas as sources of biodiversity that can help populate other urban settings, such as home gardens or city parks.
- **Urban Refugia.** These are upland areas, such as the Delhi Ridge in India, Tijuca National Park in Rio, or Henri Pittier National Park near Caracas, which provide essential ecological services (especially watershed protection) to the urban area. For example, Stanley Park in Vancouver and Mount Royal in Montreal contain substantial remnants of the original ecosystems, and Kenya's Nairobi National Park still supports much of the area's original large mammals.
- **Urban Greenbelts.** These are areas that are usually semi-natural and have been specifically designated as part of regional land-use planning, such as Sidney's Lane Cove River National Park. Sometimes these can provide a substantial system of wildlife corridors, as in Washington DC and its Rock Creek Park; these can also perform a flood control function.
- **Designed Urban Natural Areas.** This label is intentionally ironic, because these protected areas represent a specific effort by people to mimic what nature can already provide more effectively if left alone; but given the realities of the world, many opportunities are likely to be available for designing specific types of nature that can serve many of the functions of other protected areas, including the conservation of biodiversity and the provision of various ecological services. In addition to the examples of latter type given by Phillips and Gay, the Lesley Street Spit in Toronto, Canada, is an artificial peninsula four km long made from construction debris which was home to 150 species of plants and was visited by 150 species of birds within 20 years of the start of construction, all within a few kilometres of the centre of Canada's largest city.

Of course, no typology is perfect, but most of the protected areas mentioned in this issue can fit into one of these types. These types also can fit into any the IUCN categories, and some may qualify as World Heritage Sites, Biosphere Reserves, Ramsar Sites, or other international designations; however, many may be too small to meet the size criteria of WCMC (1,000 ha), so the WCMC database undervalues urban protected areas (as pointed out by Trzyna). All of the types may serve important recreational and educational roles, which are particularly important in view of the political power of urban areas. This suggested typology may also help promote thinking about protected areas more broadly and their social and economic contributions to modern urbanised societies.

Perhaps the major requirement is that urban centres need to have an umbrella coordinating agency that recognises the many contributions made by numerous forms of land use, all contributing toward the major objectives of protected areas: conserving biodiversity; building a strong relationship between people and living environment; and ensuring a sustainable life for all.

In short, urban protected areas have been neglected by the protected area community for too long, and they need to be recognised for the many significant contributions they make to modern human societies and their conservation objectives. Pulling these papers together has given me the opportunity of corresponding with interested parties in various parts of the world. I am convinced that urban protected areas are an increasingly important part of national protected area programmes, and essential for building the necessary consensus for conservation in the 21st century. I will be seeking to ensure that this topic is well addressed as part of the World Parks Congress, to be held in Durban in September 2003, and I invite other interested parties to get in touch with me to discuss how issues surrounding urban protected areas might most productively be approached.

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# California's urban protected areas: progress despite daunting pressures

TED TRZYNA

In the US State of California, progress is being made in protecting natural areas in and around cities in spite of relentless urban sprawl. Although a confusing number of agencies are involved, partnerships are common. Non-governmental organisations have a pivotal role. Examples are provided from the two major cities of the state, Los Angeles and San Francisco. Almost all protected areas are managed for a range of benefits. Biodiversity is a primary goal, along with recreation, education, and in many places watershed protection. Economic benefits are varied and substantial. Management issues include administrative and physical fragmentation, invasive species, fire, and pollution. Agencies recognise a need to reach out to urban residents, but performance is mixed. A new "natural park" in a poor Los Angeles neighbourhood is a striking innovation. California has much to learn from other countries, and much to share.

**CALIFORNIA'S NATURAL TREASURES** and energetic society come together in many interesting ways in and around its two great metropolitan areas. Los Angeles, with 15.8 million people, is the sixth most populous urban agglomeration in the world and the second largest in the United States, after New York. The San Francisco Bay Area, 650 km to the north-west, has a population of 6.9 million, ranking fourth in the country, after Chicago. Both cities lie on the Pacific Ocean and have a Mediterranean-type climate of mild, wet winters and hot, dry summers that is found elsewhere only in parts of Australia, Chile, South Africa, and the Mediterranean Basin itself.

California is a land of diversity and extremes. In an area of 411,000 km<sup>2</sup>, about the size of Sweden or Zimbabwe, there are alpine peaks, deserts, temperate rain forests, vast agricultural valleys, and a 1,600-km coastline.

Diversity is also an apt description of California's society. No ethnic group has a majority. Just under half of California's residents are of European origin and a third are of Latin American origin, with the rest African, Asian-Pacific, Native American, or mixed heritage.

The central fact for both society and environment is a population growth unprecedented in world history: the number of people in California rose from 1.5 million in 1900 to 34 million in 2000 and is projected to increase to 50 million by 2025. Much of this growth comes from migration from other US states (about 32%) or other countries (22%).

Population growth, combined with an attachment to a spread-out, car-centred lifestyle, has led to urban sprawl unimaginable even a few years ago. Natural communities have suffered, but in uneven and often unpredictable ways.

## **Protected areas: a strong legacy, a patchwork of jurisdictions**

California has long been a leader in conservation and large parts of its territory have protected status. However, it has a confusing array of protected-area jurisdictions and categories because several levels of government are involved, and separate purposes have led to separate systems at each level.

### *National and state park systems*

Traditionally, the national and state park systems have had central roles in protecting natural areas in California. The first national parks in California were created in 1890, including Yosemite (308,273 ha, a World Heritage Site) and Sequoia (163,115 ha). The National Park Service now has 16 natural units in California covering about 8% of the territory. Of this, fully

79% is in wilderness, defined in law as “an area where the earth and its community of life are untrammelled by man.”

California’s state park system began in 1901 and has developed parallel to the national one. Unlike national parks, usually created on land already owned by the national government, most state parkland has to be bought from private landowners. Nevertheless, the system has grown steadily. The agency responsible is the California Department of Parks and Recreation, which has over 200 natural units covering 1.3% of the State’s territory. A strategic plan adopted in 2000 asserts that the state park system “will become more relevant” to major population centres.

When state policy-makers decided in the 1970s that more flexible tools were needed for nature protection, such as easements and alliances with non-governmental organisations, the department was seen as too conservative to adapt to new roles. As a result, several regional conservancies have been established within state government for this purpose. Still, the state park system has the most diverse habitats of any protected-area system in California.

Numerous other public protected-area programmes are administered by agencies such as the US Forest Service, the US Bureau of Land Management, the California Department of Fish and Game, the US Department of Defence, the University of California.

Certain kinds of regulatory regimes can result in de facto protected areas. Habitat Conservation Plans (HCPs) under the national Endangered Species Act allow habitats to be destroyed in one location in return for conservation commitments elsewhere; they are supervised by the US Fish and Wildlife Service. A similar state-level process, Natural Community Conservation Plans (NCCPs) is administered by the California Department of Fish and Game.

Some local governments have natural units in their park systems. There are no general-purpose regional authorities in these two metropolitan areas; each of them is divided into several counties and over 100 municipalities.

This description of agencies and management categories is greatly simplified. For example, a recent report identified 18 different classifications for marine managed areas at the state government level alone. Virtually all these agencies, categories, and programmes, and others not mentioned, are represented in California’s two major metropolitan areas, often combined in creative ways.

### ***Citizen actors***

Non-governmental organisations (NGOs) have led in creating and defending these publicly owned protected areas since the founding of the Sierra Club in San Francisco in 1892. While the club is still California’s pre-eminent conservation group, numerous other groups work on protected-area issues, often focusing on certain places, habitat types, species, or tools such as science or law.

A newer type of NGO acquires land or easements and either manages the land or conveys it to a public agency. The leading such groups are The Nature Conservancy, which has over 100 projects and preserves in California, and the Trust for Public Land, which specialises in financing, but there are also some 130 local or special-purpose land trusts (the Land Trust Alliance acts as a clearing house).

Opinion polls consistently show stronger support for environmental protection in California than in the US as a whole. In 2000, a measure to authorise \$2.1 billion in bonds for state and local parks passed with 63% of the vote in a state referendum; it was the largest state bond measure for any purpose in US history.

### **Los Angeles area**

Metropolitan Los Angeles stretches 200 km along the ocean and up to 100 km inland. It is framed by protected areas: state beaches on one side and mountainous national forests on the other.

Natural communities range from strand and salt marsh bordering the ocean to scrub and oak woodland in valleys and foothills. Most of the lower mountains are covered by chaparral, a dense growth of various species of evergreen, hard-leaved shrubs. Higher up are montane and sub-alpine forests. Riparian woodlands stand out in this semi-arid region and have their own distinctive flora and fauna.

The following examples illustrate the variety and complexity of managing protected areas in the Los Angeles area.

**Santa Monica Mountains National Recreation Area**

Billed as “the world’s largest urban national park” at 61,000 ha, the Santa Monica Mountains NRA protects natural and cultural landscapes in a mountain range that runs right through the city of Los Angeles. It includes expensive residential areas, as well as ranches and relatively wild tracts rising to 950 metres that are home for deer and mountain lions as well as 25 threatened or endangered animal and plant species.

Within a framework administered by the National Park Service, the NRA is a cooperative effort. The largest landowner is the state park system, followed by NPS and the Santa Monica Mountains Conservancy. Local agencies, NGOs, and private landowners are also involved, and when planned acquisitions are completed, some 20,000 ha will still be in private hands.

The Santa Monica Mountain Conservancy is an unusual state agency set up in 1979 and given special acquisition powers out of concern that the national government was acting too slowly to acquire private lands for the NRA in a fast-rising real estate market. It has become highly

**Figure 1.** Protected areas in the Los Angeles and San Francisco Bay areas. Based on maps supplied by the Redlands Institute, University of Redlands, California.



skilled and proactive at acquiring land and making it accessible by combining funding from different sources and forming partnerships with other agencies and NGOs. Having accomplished much that it set out to do in its core area, the conservancy has started working elsewhere in the region. Although much of its political support comes from wealthy residents of the mountains, it now has projects in some of the poorest areas of the city; some of these are described below.

### ***San Gabriel Mountains***

Towering over the northern edge of the Los Angeles area, the San Gabriel Mountains are almost entirely within the 262,000-ha Angeles National Forest, established in 1892 and administered by the US Forest Service. An extremely rugged range rising to over 3,000 m, its lower slopes are covered with chaparral; higher elevations have mixed conifer forest.

Since the Angeles National Forest was established in 1892, its main purpose has been protecting watershed for water supply and flood control. While lower elevations of these mountains receive as little as 12 cm of precipitation in some years, storm cells coming off the ocean have been known to drop as much as 66 cm of rain on them in 24 hours (McPhee 1989). US national forests generally are multiple-use areas, but almost all the Angeles National Forest is managed as a natural area and because of its ruggedness has a relatively high degree of ecological integrity for an area adjacent to a large city (Stephenson and Calcarone 1999).

Within the Angeles National Forest are wilderness areas totaling 32,500 ha and several strictly protected areas, including the 6,900-ha San Dimas Experimental Forest, a biosphere reserve managed for research and generally closed to the public; within it is the 555-ha Fern Canyon Research Natural Area, a prime example of oak woodland held as a control for studies on erosion, fire, and air quality.

### ***Santa Rosa Plateau Ecological Reserve***

This reserve on the far eastern edge of the metropolitan area illustrates how public agencies and NGOs often work together to create and manage protected areas in California. It covers 3,400 ha of grasslands, oak woodlands, tablelands, and narrow canyons. While the reserve has some 40,000 visitors each year, its main purpose is preserving exceptional natural communities that include 49 endangered, threatened, or rare animal and plant species. Of special importance are vernal pools, small seasonal ponds that dot California's grasslands and are found almost nowhere else in the world. In the rainy season, they attract many kinds of waterfowl. In the spring, they are surrounded by concentric rings of wildflowers that appear as the water gradually evaporates.

The Nature Conservancy of California (TNC), a major NGO, started purchasing land for the reserve in 1984. Even though it is 85 km from the centre of Los Angeles, the surrounding area is fast becoming suburbanised. The reserve more than doubled in size a few years later with funds from several state and local agencies. The result is a cooperative arrangement in which the participants retain ownership of their parcels of land but the reserve is treated as a biological unit for which responsibility is shared. To keep the reserve from becoming a biological island, TNC and others are working to protect a corridor between it and a nearby national forest (TNC 2001, Backstrand and Lathrop 1993).

### ***March Air Force Base***

This military installation 40 km north of the Santa Rosa Reserve protects a number of endangered species and natural communities. These include vernal pools, some of which even form between the runways, and a 400-ha preserve set up to protect the endangered Stephens' kangaroo rat (*Dipodomys stephansi*). Although the base is scheduled for conversion to civilian use, sensitive habitats will continue to be protected.

## San Francisco Bay area

The urbanised region around San Francisco extends in an irregular pattern over an area measuring 200 x 125 km. The range of natural communities is similar to that in the Los Angeles area, but without high mountain ecosystems. In addition, there are remnants of north coastal forest.

The following examples illustrate different approaches to protected areas in the Bay area:

### **Golden Gate National Recreation Area**

This 30,500-ha unit of the National Park Service was created starting in 1972 from surplus lands owned by the national government. The result of a citizen's movement, it was later expanded through land purchases. GGNRA consists of urban greenspace, nearby rural lands, and historic monuments. Relatively small parts of it are in a natural state; these include an old-growth forest of redwood (*Sequoia sempervirens*) and coastal ecosystems. However, GGNRA is the keystone of a much larger interconnected complex of protected areas. Because of a mandate to work closely with NGOs and local communities, its managers have had to develop a more participatory style of management than is generally the case in the US National Park Service.

### **East Bay Regional Park District**

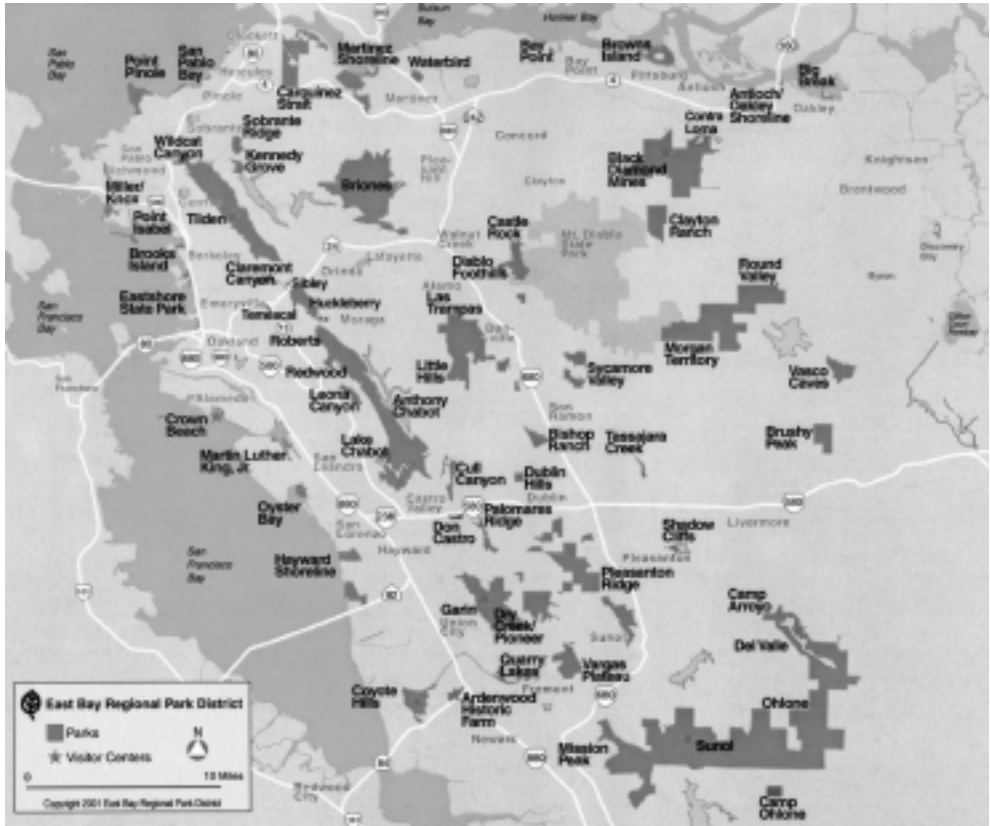
While GGNRA tends to get more publicity, this home-grown effort is of at least equal interest, particularly from the standpoint of protecting natural communities. Established in 1933, East Bay Regional Parks is an autonomous agency governed by a board elected by citizens of two of the region's nine counties. It has 56 units covering 36,500 ha.

Along with recreation and education, protection of biodiversity is a primary objective, unusual for a local park system. Over 80% of regional parks' lands are managed as natural parkland. They protect a number of endemic species, such as the threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*), found only within the district; and the endangered pallid manzanita (*Arctostaphylos pallida*), which grows only within the district's 95-ha Huckleberry Botanic Preserve.

Claremont Canyon Regional Preserve, East Bay Regional Parks, overlooking San Francisco Bay. Photo: East Bay Regional Parks.







**Figure 2.** Map of East Bay Regional Parks. © East Bay Regional Parks.

### **San Francisco Bay**

“Never was a metropolis more dominated by any natural feature than San Francisco by its bay,” writes Harold Gilliam (1969) in his history of bay politics. But by 1960 the largest estuary along the Pacific Coast of the Americas was seriously threatened. Diking and filling had reduced it from an original 176,100 ha to 111,400 ha; over 90% of its tidal wetlands had been destroyed; garbage and sewage polluted its waters.

In 1965, a movement spearheaded by the Save San Francisco Bay Association led the state government to create a powerful regulatory body, the 27-member San Francisco Bay Conservation and Development Commission, to plan and regulate the bay and its shoreline as a unit. This was one of the first major steps taken anywhere to protect coastal resources on a large and complex scale. The commission’s plan allocates zones for transportation and industrial uses along the 1,600-km shoreline, but aims above all to “protect the bay as a great natural resource.” While several public agencies and NGOs maintain protected areas along its shores, the major part of the bay system is a de facto protected area under a regulatory regime involving the commission and several other agencies.

### **San Bruno Mountain**

Rising 400 m above the bay, this ridge immediately south of the San Francisco city boundary has attracted attention from the state and national governments because it is home for three endangered butterflies and several endangered plant species, found only at this location. San Bruno Mountain has been threatened since the 1960s, first by a plan to remove its top to expand the San Francisco airport into the bay, and then by a proposal to cover it with residences and

office buildings. Its higher elevations are now protected in a 918-ha park operated jointly by the county and state park systems. The lower elevations are privately owned. The entire mountain is subject to a Habitat Conservation Plan adopted in 1983 under the national Endangered Species Act.

### **Benefits of California's urban protected areas**

Regardless of their original purposes, almost all of the protected areas in these two urban regions are now managed to provide a range of benefits. Four of these, outdoor recreation, nature education, scientific research, and aesthetics, need little elaboration. Watershed protection is a critical benefit of mountain protected areas. Collecting firewood, hunting, and gathering food (mushrooms and ferns, for example) are permitted in some areas.

Three other important benefits of urban protected areas in California deserve more explanation: preserving biodiversity; economic benefits; and intangible values.

#### ***Biodiversity***

Preserving biodiversity is increasingly seen as a primary goal of protected areas by policy-makers, managers, and the informed public. California is one of the most species-rich areas of the world: one commonly used list, Norman Myer's "hotspots" of endemism, ranks it twelfth (WCMC 1992).

Of the 6,300 taxa of flowering plants native to California, 36% are endemics (found nowhere else). Most of these are rare or uncommon; many are restricted to very small areas. About 40 plant taxa are thought to have become extinct over the last century (CNPS 1994). Some 15 mammals, 15 reptiles, 16 amphibians, and many invertebrates are endemic to the state (Thelander and Crabtree 1994). About 175 plants and 145 animals are listed as endangered or threatened either by the national or state governments or by both.

#### ***Economic benefits***

The economic benefits to California of urban protected areas are substantial. Many of these benefits derive from outdoor recreation. Although reliable estimates of their economic value are hard to find, the number of annual visits are impressive: Golden Gate NRA, 14.5 million; East Bay Regional Parks, 14 million; Tamalpais State Park, 2 million; Santa Monica Mountains NRA, 470,000; a number of urban state beaches all in the millions (California Tourism 2001).

The California Environmental Dialogue, a group of business and environmental leaders, recently concluded that California's "natural communities are an integral part of the economic foundation upon which future prosperity depends." It pointed out that many businesses and skilled workers locate in California because of its natural assets; protection of watershed and wetlands reduces the need for costly new water-treatment plants and lessens the cost of flood damage; and commercial fisheries depend on protection of wetlands, streams, and watersheds (TPL 1999). The Trust for Public Land has compiled a detailed list of these and other benefits (TPL 1993).

#### ***Intangible values***

One role of nature in California is intangible: it has to do with identity. In a place where most people come from somewhere else and have few traditions in common, the natural landscape dominates the California imagination. The extent to which this is so "is apprehended, even by Californians, only dimly," writes the novelist Joan Didion. "Deriving not only from the landscape but from the claiming of it, from the romance of emigration, the radical abandonment of established attachments ... this imagination remains obdurately symbolic, tending to locate lessons in what the rest of the country perceives only as scenery" (Wyatt 1986).

## **Management issues**

Policy-makers and protected-area managers in these metropolitan areas are faced with many problems familiar to their counterparts elsewhere in the world: under-funding, overuse, disturbance of plants and wildlife, litter, and petty crime. The cost of acquiring land has skyrocketed, but agencies and NGOs have become expert in finding ways to pay for it.

How to support operations and maintenance is another matter and a perennial problem. Should visitors be charged a fee? (Currently, the trend is for a small fee or none.) Should businesses be enlisted as contributing “partners”? (Generally, the feeling is strongly against this, but the state park system recently partnered with a car manufacturer.)

Four other aspects of managing urban protected areas are especially challenging in California: fragmentation; invasive alien species; fire; and water and air quality.

### ***Fragmentation***

Administrative fragmentation is a fundamental problem. The large number of actors involved in running protected areas in these regions makes it hard to do things ecologically. Managers spend much of their time on inter-agency coordination. This is often difficult because agencies have different purposes, constituencies, organisational cultures, legal structures, and technical systems. In some cases, cooperation is constrained by long-standing rivalries.

Physical fragmentation also presents serious difficulties. Most protected areas have not been designed to protect biodiversity, and many of the wildlife migration corridors still existing are in danger of development, especially around Los Angeles (CWC 2001).

California has no coordinated planning for protected areas. While there is system planning within agencies, what happens in practice has more to do with opportunism or political bargaining. As with other aspects of protected areas in California, NGOs such as California Wilderness Coalition, The Nature Conservancy, and the Sierra Club have led in promoting a larger vision. In 1991, state and national agencies formed the California Biodiversity Council to improve coordination statewide and within 10 bioregions; however, the council’s main role so far has been to facilitate information exchange (CIPA 2001a).

If more comprehensive approaches are adopted, care must be taken to leave room for innovative, catalytic agencies such as the Santa Monica Mountains Conservancy.

### ***Invasive alien species***

Invasive alien species of plants and animals are the most difficult challenge on the ground.

Over a thousand non-native plants are naturalised in California, making “natural” a relative term in many protected areas, particularly at lower elevations around cities. While many of these plants are only an annoyance, about 75 of them are aggressive invaders that displace natives and disrupt natural systems. Many organisations are involved in control efforts; the California Exotic Pest Plant Council, an NGO, serves as an information clearinghouse.

Among the most conspicuous aggressive species are blue gum (*Eucalyptus globulus*), fennel (*Foeniculum vulgare*), and, especially in the San Francisco Bay area, yellow starthistle (*Centaurea solstitialis*). One of the worst invasive plants is giant reed (*Arundo donax*), introduced for erosion control in the early 19th century. Giant reed chokes riparian systems, forming dense stands up to 8 m tall. It crowds out native plants that shade streams, resulting in warmer water that harms aquatic life. It uses more water than native plants, lowering groundwater tables, is highly flammable (Bossard 2000, CNPS 1998), but control is an expensive process that involves cutting plants to the ground and brushing on herbicide manually to avoid harming native species.

There are also aquatic plant invaders. One of these, purple loosestrife (*Lythrum salicaria*), a pretty ornamental, threatens the San Francisco Estuary and is on a “red alert” list of plants that have “potential to spread explosively”.

Non-native animals are an increasing problem, with aquatic environments most seriously affected. Of the 112 freshwater and estuarine fishes established in California, 54 are exotic species. The Chinese mitten crab (*Eriocheir sinensis*), first seen in San Francisco Bay in 1992, spread rapidly throughout the estuary and now numbers in the millions. According to the San Francisco Estuary Project, more than a hundred species of exotic aquatic invertebrates, including clams, oysters and worms, are found in the bay. New bottom-dwelling animals are unintentionally introduced at the rate of about one a year, mainly in ship ballast water. The Asian clam (*Potamocorbula amurensis*), first noticed in the bay 1986, has altered the food web to the detriment of native salmon, among other species; in one section there are up to 25,000 clams per m<sup>2</sup>.

### **Fire**

Controlling wildfires is a double-edged sword in California's urban protected areas. Lightning-caused fires are a natural part of California ecosystems. If fires are suppressed, fuel builds up and makes the inevitable human-caused or natural fire harder to stop. If fires burn out of control, they can move into adjoining built-up areas. Prescribed burning results in a healthier plant community (and helps to control invasive species), but it is risky.

Fires periodically burn large areas of the mountains in and around the Los Angeles area, sometimes invading residential areas. However, the worst recent fire on the urban-wildland interface was in the San Francisco Bay area. It started just outside one of the East Bay Regional Parks on a dry, windy day in October 1991. The flames killed 25 people, injured 150, and destroyed 2,900 houses. As part of an interagency fire-safety programme, the park agency now maintains a 25-km fuel break and closes parks during periods of high danger.

### **Water and air quality**

In both regions, water supply and flood-control projects disrupt natural hydrological cycles, and the ocean and many urban streams are polluted. San Francisco Bay, the outlet to the sea for 16,200,000 ha of California's interior, receives toxic chemicals from agriculture, industry, mining, and urban run-off.

Air quality impacts natural communities as well as humans. California has stringent programmes to control air pollution, but relentless population growth and a car-centred lifestyle make this an uphill battle. Air pollution affects vegetation types in different ways. Chaparral is relatively resistant, while some conifers are very sensitive to it. Effects are most dramatic in the mountains above Los Angeles, which receive the highest levels of ozone and nitrogen in North America; pines are dying and other native trees are taking their place.

### **Reaching out to urban residents**

As in large cities all over the world, many residents of California's urban regions have less and less connection to nature. Consequently, the quality of their lives is diminished, they have little understanding of the benefits of natural areas, and they may be less likely to give political support to conservation.

The reasons for this phenomenon are various. A large proportion of the residents of these cities came from elsewhere and may not be aware of what exists nearby. Some lack the means to visit protected areas. Others are afraid of wildlife and wildness, or too preoccupied with electronic diversions.

Appreciation for nature comes from outdoor experiences rather than environmental education; in fact, without direct experience of nature, teaching about environmental issues can actually breed cynicism about the environment (Finger 1992).

Agencies responsible for protected area systems are exceptionally qualified to provide outdoor experiences. Most such agencies are keenly aware of the need for urban outreach, but their performance has been very mixed.

In 1987, the US Forest Service established a Wildland Recreation and Urban Cultures Research Unit in the Los Angeles area to formulate “effective visitor management strategies for high-use wildland recreation areas with an emphasis on different cultural and user groups”. One of the main issues it addresses, nationally as well as in California, is the discomfort members of some ethnic groups have in visiting protected areas because they see few people like themselves among visitors or staff.

The National Park Service held a “Mosaic in Motion” conference in 1999 in San Francisco to address the lack of ethnic diversity among NPS visitors and staff nationwide. A follow-up Community Partners Programme has led to modest initiatives in Los Angeles and San Francisco that include junior ranger programmes and park job training for under-represented ethnic groups.

Some protected-area agencies work with school systems, but few links have been established with other urban educational institutions such as zoos, and natural history and science museums.

A number of agencies and NGOs have continuing programmes to take poor inner-city residents to nearby protected areas. Probably the oldest such programme is the Sierra Club’s Inner City Outings Program, which started in 1969. However, these efforts are small in relation to the need.

### ***Intervening in the inner city: a portal park in Los Angeles***

The Santa Monica Mountains Conservancy has taken a bolder approach to the inner city. Challenged by elected officials from inner-city Los Angeles to apply its expertise in their poor neighbourhoods, as well as in the affluent mountains, the conservancy decided to create a portal to the natural world of the region. The 3.5-ha Augustus F. Hawkins Natural Park was opened

*Nature Centre and ranger residence, Augustus F. Hawkins Natural Park, Los Angeles. Photo: Stephanie Landregan, Santa Monica Mountains Conservancy. Inset: Visitor’s plan of the Augustus F. Hawkins Natural Park. Santa Monica Mountains Conservancy.*



in December 2000. It lies on a busy street surrounded by recycling businesses and run-down houses occupied by recent immigrants. The park has samples of seven ecosystems, including chaparral, oak woodland, and freshwater marsh. The visitor centre and other structures conform to the high design standards the conservancy applies to all its projects. A ranger resides on site, supporting a junior ranger programme and organising trips to the conservancy's mountain parks.

### **An international perspective**

California has much to learn from other countries about protected areas, and much to share, but it is relatively isolated from the international conservation community. Two state park agencies recently asked the California Institute of Public Affairs to look for new ideas from abroad. One recommendation was to learn from British efforts to reach out to poor and minority communities, including the highly successful Groundwork programme. Another was to explore ways of protecting large-scale, lived-in landscapes as has been done in several European countries (CIPA 2001, Trzyna 2000).

One more international dimension needs mentioning. For two reasons, the World Conservation Monitoring Centre's Protected Area Database gives an incomplete picture of the situation in these urban regions. First, entries are limited to units managed by the national and principal state agencies. Omitted are sizable areas managed by other state agencies, as well as local governments and NGOs. Examples are several units of East Bay Regional Parks, including the 3,700-ha Ohlone Wilderness; and The Nature Conservancy's 3,400-ha Santa Rosa Reserve. Second, the database does not include substantial areas with unconventional means of protection such as the regulatory regime for San Francisco Bay.

Los Angeles and San Francisco have strong legacies of protected areas and have made much progress in recent years despite daunting pressures. Many natural places have been destroyed around these cities, but others can still be preserved. As in the past, strong and inspired citizen leadership will be the deciding factor.

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# The mission of protected areas in Brazil

PEDRO DA CUNHA E MENZES AND LUIZ OTÁVIO TEIXEIRA MENDES

In Brazil, the planning and management of protected areas of the National Parks category (IUCN Category II) has been made in a standard pattern. Very few differences have been made from park to park. The differences, in general, are not the result of the understanding of the diverse objectives of each park but, more so, are the result of the unequal levels of funding each park is allocated. It is of utmost importance to understand that the National System of Protected Areas is not the result of the simple adding up of equal and self-reliant protected areas, but rather a quilt of highly diverse areas, which together and complementarily make up the whole of the Brazilian protected territory. This understanding is a basic tool to define the mission of each individual protected area, including those in urban areas, in order to better serve the mission of the system as a whole.

**IN URBAN AREAS**, protecting the environment has historically meant protecting the quality of the watershed. That was certainly the case in Brazil's best known urban protected area: Tijuca National Park (3,200 ha). Located just outside Rio de Janeiro, the Tijuca Massif's natural cover was rapidly cleared in the 18th century to make room for coffee plantations. George Gardner, an English traveller of the 1840s, wrote that he saw all the vegetation cover of Pedra Bonita – one of the park's most remarkable mountains – completely disappear in less than one year.

By 1856, there was very little left of the Tijuca's original 5,000 ha of Atlantic rainforest. In its place, there were 117 coffee farms. As a result, the rivers and streams became silted and Rio suffered severe droughts in the succeeding years.

Pressed by the lack of water, in 1861, Emperor Pedro II ordered the expropriation of all Tijuca's farms and the complete reforestation of the area. Fortunately, the man in charge, Manuel Gomes Archer, was an amateur botanist who chose to favour native species for the reforestation. By the time Archer resigned in 1888, he reckoned his task was accomplished, as he foresaw: *"I have done all that could be done by Man. Now, Nature will do the rest simply by regenerating itself"*. He was so right that, 112 years later, the vast majority of the Cariocas (inhabitants of Rio de Janeiro) do not realise Tijuca is a forest planted by man.

Archer was replaced by Lieutenant-Colonel Escragnolle in a time when Europe was rethinking the effects of the Industrial Revolution on the quality of human life. Germany, France and England were busy establishing urban parks and setting aside vacant suburban land for recreation. This trend had its followers among the Brazilian elite and deeply affected Tijuca. Escragnolle hired French landscaper Glaziou and re-arranged Tijuca in order to make it a fine recreation site, whilst retaining its watershed protection role. Such dichotomy has remained ever since.

## Recent years

In 1961, to commemorate the 100th anniversary of Archer's reforestation, Tijuca was proclaimed a National Park, and thus withdrawn from the administrative responsibility of the Rio de Janeiro Local Authority and put under Federal management.

Three years later, within the Cold War context, the Brazilian democratically-elected Government was ousted by a rightist military coup. The new rulers established a centralised autocratic Government with all decision-making concentrated in Brasília, the country's new capital. State Governors and City Mayors became all but decorative figures.

The main goal of the military was to develop the country and to provide it with basic infrastructure. The environment came second. From 1972 onwards, with the first United Nations

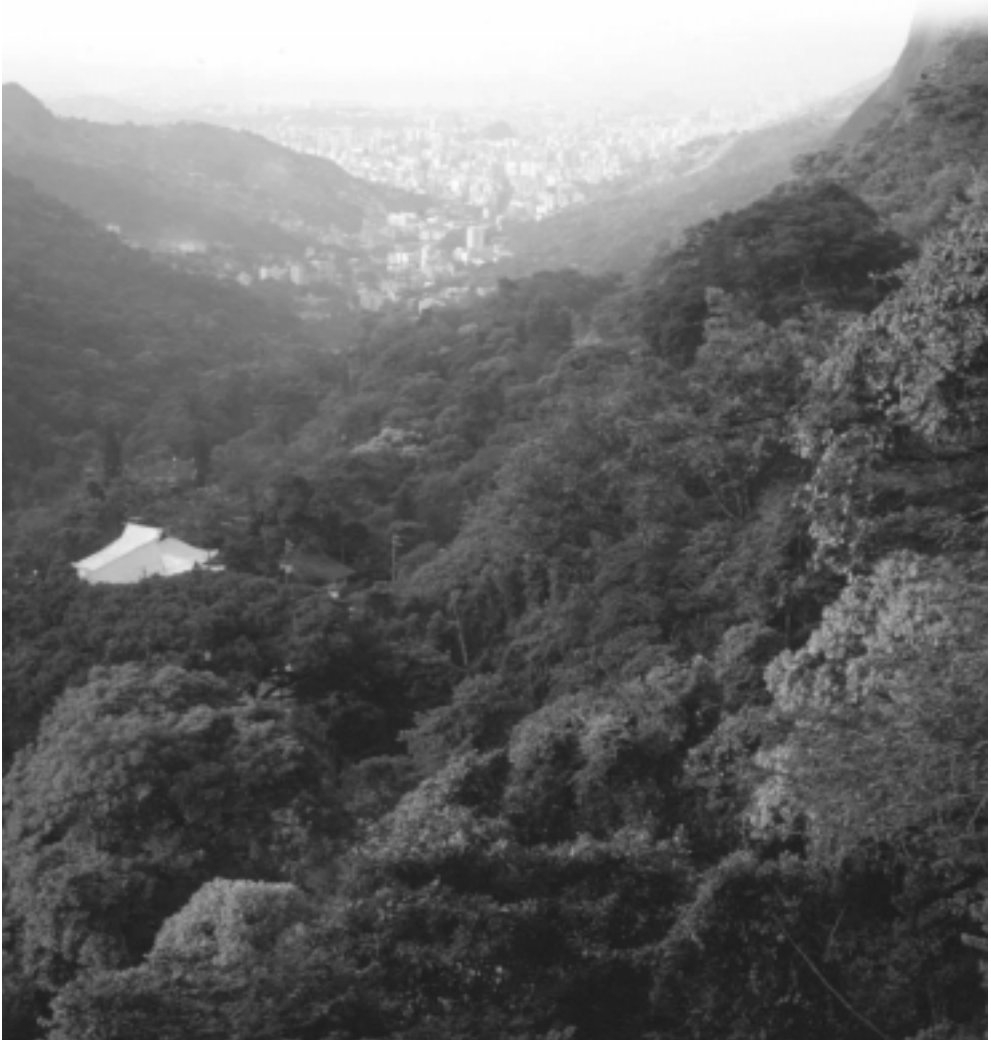


Conference for the Environment in Sweden, and the rising global concern about deforestation and pollution, some first steps towards addressing environmental problems were taken. In 1975, FEEMA, the Rio de Janeiro State Environmental Agency, was established.

With the re-establishment of democracy and the reinstatement of civilian rule, environmental affairs became more important within the institutional framework. IBAMA, the Federal Environmental Agency, was established in 1981. It came before free elections for State Governors and State Capital Mayors (who have strong executive powers), at a time when the Federal structure was still very centralised, with strong Ministries in the economic and infra-structure fields. Hence, IBAMA had to be a sturdy enough agency to be able to face up to these all-powerful Ministries. Bearing that in mind, its creators devised a broad agency encompassing the political and the executive responsibilities of all matters concerning the environment. It was organised in many different Directorates, one of them, DIREC, exclusively designed to manage protected areas.

Much happened during the 20 years following IBAMA's establishment – the Berlin Wall fell and the Iron Curtain was lifted. As a consequence, pro-west Governments lost their international

*Regenerated Atlantic forest in Tijuca National Park, with Rio de Janeiro in the background. Photo: Tony Morrison.*



political alibi to mistreat the environment. In 1988 in Brazil, a new constitution was drafted and voted in. As a result, many powers were transferred from national level to local authorities. In the environmental field, States and municipalities created their own secretariats for the environment and environmentally-related police battalions, fire fighter squads, district attorneys, and courts were established. Especially after Brazil hosted the United Nations Conference on Environment and Development (UNCED), in 1992, the environmental question became more and more a local matter.

Protected areas under IBAMA, however, remained a strictly federal issue. That was to be expected, since national parks and reserves usually border many different municipalities and, in many cases, one single protected area sprawls over two or three States. The municipalities whose territory is partly shared by protected areas are invariably economically unimportant, sparsely populated and very remote. Their mayors often carry less political power than the protected area's managers.

Also, in developing countries, urban national parks are less important from a strictly conservationist point of view. As a rule, the human pressure is overwhelming. These protected areas often are too fragmented, threatened by encroachment, over-visited and subject to heavily-damaging side effects in the form of feral cats and dogs, and human-provoked wildfires. Such problems combined with a tight Federal budget usually make urban protected areas the ugly duckling of the environmental family.

When the time comes to prioritise, it seems only natural that one should allocate more resources to parks that are larger, better conserved, and richer in biodiversity. After all, the mission of a national protected-areas system is to preserve the environment and its biodiversity.

That would be a valid assertion, should the mission apply equally to all protected areas within the same country. However, parks and other protected areas can and should be managed differently from each other, making better use of each area's specific advantage, to achieve the mission as a whole. In other words, to accomplish the aim stated in the general mission, each protected area must fulfil its own particular mission, which may differ from park to park.

In the context of developing countries (but also in developed countries), urban protected areas, arguably, have the most important mission of the whole system. In these countries, what has been treated as over-visitation should be perceived as an unique opportunity to reach out to vast numbers of people and, thus, spread the conservation message.

The world population tends to focus on metropolises. The headquarters of major TV networks, national newspapers, universities, political institutions, primary and secondary schools are all located there. It is here that the opinion-makers reside. New cultural trends of a country are set in urban areas and, from there, spread throughout the country.

If an urban national park is in a shambles, the underlying message to the millions of people living in its vicinity is that caring for protected areas is not a national priority. In the Brazilian case, this is equivalent to saying that the fight against the deforestation of the Amazon is not going to be won in the Amazon, but in Rio de Janeiro, in São Paulo, in Brasília and in Belo Horizonte, which are the largest cities in the country.

The case of Tijuca National Park is revealing: with close to 2 million visitors a year, it receives more people than all other Brazilian federal protected areas combined. However, such a huge number of visitors was not considered an opportunity, but a problem, exacerbated by the mounting pressure from neighbouring favelas on the park's boundaries, and various other anthropogenic pressures. This all led to a federal disinvestment of the park. A five-star hotel inside the park was abandoned and left to decay, trails were not managed at all (not one single trail even posted with signs), most entrance gates and guard houses were left unmanned, anti-poaching patrols were suspended, and 20 tons of garbage left uncollected. In the meantime,

Serra dos Órgãos and Itatiaia, (nearby National Parks), gained new visitor centres and acquired new 4 x 4 vehicles.

At the beginning of 1999, pressed by Rio's public opinion (note that Rio is the second largest city in Brazil, with a population of 5.5 million inhabitants; Greater Rio has 10 million inhabitants), the City Mayor and the Minister for the Environment signed an agreement providing for joint management of Tijuca. The rationale behind the agreement was precisely that intensive recreation, watershed protection and the national environmental policy for protected areas **were not** antagonistic but complementary. From that moment on, two million visitors a year were no longer regarded as a problem but as a potential opportunity for raising the profile of the environmental cause.

Since then, all Tijuca National Park planning takes into account its education mission towards the two million visitors and the 10 million people who live nearby. It is of paramount importance that the public understands the mission of protected areas and the negative consequences for the country as a whole of failing to attain it.

The history of Tijuca National Park demonstrates the real possibility of not merely halting but even reversing degradation. In all our environmental/outreach activities we emphasise the fact that only 140 years ago Tijuca was the site of a vast coffee plantation. Prior to the 1999 agreement, 90% of Tijuca's visitors were unaware of its rich history, believing themselves to be hiking in pristine, old-growth forests.

Environmental education became a must for the park, and an Environmental Education Centre was set-up. Teachers from the municipality were seconded to the park in order to take Tijuca's message to the 1,000 primary schools existing in its vicinity. Resources were put towards finishing a visitor centre and its exposition was planned to reflect the inclusion of Tijuca in the Brazilian System of Protected Areas and the importance of caring for the environment as a whole.

To enhance recreation on a responsible basis, 40 km of trails were restored and signposted. Over 500 shortcuts were closed. Interpretation signs were put up. Programmes showing the park's concern with the environment as a whole were given high priority. The building of cycle paths instead of roads and the establishment of a costly selective garbage collection scheme are good examples of that trend.

Problems and challenges faced by protected areas around the world is also a wider concern of the park. With this in mind, Tijuca hosted the IUCN Protected Areas Commission annual meeting, the Regional Rio de Janeiro State Protected Areas Managers Meeting and two international seminars on Urban Protected Areas.

With these measures made possible through the combined efforts of the local and national authorities, Tijuca National Park is beginning to be perceived by its visitors (and, through the media, by a substantial percentage of Rio's population) as a strong example of the effort the country is putting towards protecting natural areas.

In future, while retaining its recreational function, Tijuca will move towards gearing itself to be a better contributor to the system as a whole. Other tasks an urban national park can perform better than remote protected areas, and to which Tijuca must get ready to contribute are:

1. To be a fundraiser for the whole system, through eco-tourism, but especially through water collection and power lines right of way fees, sponsorship and image rights associated to park's features (e.g. the statue of the Christ on Corcovado Hill) and related memorabilia.
2. To be the headquarters of an eventual Protected Areas Academy. In countries with a low level of formal education to have an Academy where managers, rangers, administrative personnel and eco-tourism managers could be trained would be an invaluable asset. To have such an academy in a national park inside a metropolis, while providing the perfect

*locus* for practical lessons, would allow for cheaper boarding costs and allow access to academics and professionals who already teach in nearby universities.

3. To be the first learning ground for university junior researchers and graduating students.

## **Conclusion**

In the global context of an increasingly fragmented collection of protected areas, the implementation of any system of protected areas must take into account the specifics of each site. Accordingly, urban protected areas should be managed as the frontline in the war for the inclusion of environmental matters into the national priorities.

In democracies, no matter how obvious technical decisions are, they must always be decided by the will of the citizens, and citizens will not decide or care about the unfamiliar. An urban protected area well equipped, managed and prepared to receive and interact with huge numbers of visitors is a powerful tool in the building of a political pressure group in defence of the conservationist cause.

The fight for the conservation of biodiversity will not be won in the remote depths of the forests and mangroves. It will be won in the large metropolises. From there, the news is broadcast, there the parliaments convene, governments take decisions, courts rule, and new cultural trends arise. It is there that we will begin to win the cause for protected areas. However, to achieve this goal, environmental agencies must understand the unique role of urban protected areas and begin to prioritise them in the short and medium term.

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# Lane Cove: national park in the city

IAN RUSSELL BROWN

The Lane Cove National Park is located within the inner suburbs of Sydney, Australia's largest city, less than 8 km from the central business district. It is both one of the smallest and one of the most visited of the 161 national parks in the state of New South Wales. The natural environments of this national park have been severely impacted by urban development resulting in loss of biological diversity and disruption to ecosystem function. In meeting the challenge of managing for nature in such circumstances, the New South Wales National Parks and Wildlife Service is enlisting the assistance of its neighbours and local communities in new partnerships for conservation.

**THE LANE COVE NATIONAL PARK** lies at the heart of the city of Sydney, less than 8 km from the central business district, and surrounded by housing, industry and roads. It forms a corridor of green in the valley of the Lane Cove River, from its headwaters to Sydney Harbour.

Sydney is Australia's largest city, with a population of approximately 4.1 million, and it is the capital of the state of New South Wales. By world standards it is a young city, established as a British penal settlement in 1788, and one that reflects both its British origins and its multi-cultural development in the second half of the 20th century.

Sydney is a suburban city anchored on the shores of Sydney Harbour but sprawling in a semi-circle for more than 50 km, from the shores of the South Pacific Ocean in the east to the foothills of the Great Dividing Range in the west.

To understand the development of the city one must understand its geology and landforms. Sydney lies at the centre of a great sedimentary basin. The western boundary is defined by the escarpment of the Blue Mountains, while to the north the uplifted sandstone plateau has been incised by rivers forming valleys such as the Lane Cove. Along the eastern coastline the sea has eroded great cliffs, deposited sandy beaches and flooded the river valleys, creating dramatically indented bays such as Sydney Harbour and the aptly named Broken Bay.

*A corridor of green and blue – the Lane Cove River estuary with the national park bushland and mangroves.*  
Photo: Ian R. Brown.



### Box 1. Vegetation types in Lane Cove National Park

1. Blue gum high forest – high rainfall on shale soils on the city’s North Shore give rise to a tall forest with Sydney blue gum (*Eucalyptus saligna*) and blackbutt (*E. pilularis*) to 40 metres in height. Ferns and other rainforest plants are common in the understorey. Remnants exist in the headwaters of the Lane Cove River.
2. Turpentine/ironbark forest – moderate rainfall on shale soils supported an open forest characterised by turpentine (*Syncarpia glomulifera*) and grey ironbark (*E. paniculata*). This forest is found in the western parts of the park.
3. Sandstone heath, woodlands and forest – the infertile and sandy soils of the sandstone plateaux and valleys support an extraordinary complex of vegetation communities and species. Tall forests and rainforest patches occur in wetter and more sheltered valley bottoms. These communities are the most widespread in the park.
4. Wetlands – freshwater wetlands occurred on the floodplains. Estuarine wetlands occurred on all estuaries but were most extensive in the upper Sydney Harbour and in Botany Bay. Mangrove woodlands occur on the lower reaches of the Lane Cove River.

## Biological diversity

Sydney is a centre of biological diversity, with more than 1,500 vascular plants recorded. About 150 of these are trees, mostly of the ubiquitous Australian genus *Eucalyptus*. Botanists recognise eight major vegetation types that reflect geological, landform and climatic variation. Four of these are found in Lane Cove National Park (see Box 1 above).

## The city grows

The expansion of the city, with its associated farming and natural resource extraction, has differentially impacted the natural environments of the region. The turpentine/ironbark forests occupying the flatter, more fertile lands and have been mostly obliterated, first by farming and then by urbanisation.

The blue gum high forests were a significant source of timber and of land for small farms and orchards. The Lane Cove River was the transportation route for timber from the settlement’s earliest days with sawpits and wharves constructed in what is now the national park. Today less than 1% of the high forest remains.

Most of the freshwater swamps and many of the estuarine wetlands have been drained, filled or otherwise severely modified. Several mangrove woodlands on the Lane Cove River escaped this fate and are incorporated into the park.

Only Sydney’s sandstone vegetation remained relatively undisturbed and forms the largest component of the city’s protected areas, including Lane Cove National Park.

## Protecting areas

Sydney was a new city on the edge of a vast continent and governments in the early 1800s were preoccupied with settlement and “opening-up” the land. Formal parks, in the English fashion, were created close to the city centre but there was little interest in providing recreational space in the suburbs and no interest in conserving bushland.

However, by the 1870s public sentiment had begun to change. In 1879 a community group petitioned the colonial government affirming that:

“...the good health of the people should be the primary consideration of all good Governments, and to ensure the sound health and vigour of the community it was necessary that all cities, towns and villages should be possessed of parks and pleasure grounds as places of recreation.”

The response of government was swift and dramatic. In April 1879 it dedicated nearly 8,300 ha on the southern outskirts of the city for “the use of the public for ever as a national park”. The following year the National Park (since renamed Royal National Park) was extended to more than 17,000 ha, encompassing sandstone heath, woodlands and forests, rainforest, wetlands and estuary. It also included beaches and cliffs along 15 km of undeveloped coastline.

There was no Australian precedent for the government’s action. It is generally acknowledged that Royal National Park is second only to Yellowstone in the USA as the world’s oldest national park. However, unlike Yellowstone, this was no distant park in the wilderness but within easy reach of the continent’s largest city. It became even easier to access when a railway was constructed into the park, from which roads and walking tracks radiated.

After such an impressive start the national park idea spread slowly. In 1894 Sydney’s second national park, Ku-ring-gai Chase (14,860 ha), was dedicated in the city’s northern suburbs. The new park was similar in size to its predecessor and protected the spectacular shores of Broken Bay and Pittwater.

The Lane Cove National Park was created in 1938 when a little over 1 km<sup>2</sup> of bushland and formed farmland was dedicated. What made Lane Cove different from Royal and Ku-ring-gai (apart from its small size) was that it was placed within the city’s suburbs and close to its centre. It was also mostly privately owned land that had to be bought at significant cost at a time of economic depression. Today the national park has grown to some 600 ha and protects 60% of the remaining vegetation in the Lane Cove valley.

### **The management challenge**

Unlike many countries, in Australia national parks are created and managed by the six states, each of which has its own agency. Lane Cove National Park is managed by the NSW National Parks and Wildlife Service, which was established in 1967 to provide professional direction and management for the state’s national parks and natural and historic heritage. The NSW protected area system covers nearly 5,500,000 ha or nearly 7% of the state. There are now 607 national parks and other protected areas in the state, of which 29 lie in the Sydney region.

When national park administration was consolidated in 1967, Lane Cove was considered too small and developed to be counted as a national park and was excluded. It was not until 1992, after 25 years as a recreation reserve and state recreation area, that its national park status was re-instated.

Lane Cove National Park is a long, thin corridor of forest and woodland that stretches from the headwaters to the estuary of the Lane Cove River. It has an area of around 600 ha but has a perimeter of 70 km and more than 2,000 neighbours. Nowhere is there a site more than 500 metres from a road or a house and, at its narrowest, one can literally throw a stone across the park.

The park’s small size, its convoluted shape, lack of connectivity with other bushland and its location in the bottom of a developed urban catchment have all conspired to critically degrade park ecosystems. Ground dwelling mammals have been hit particularly hard with only the short-beaked echidna (*Tachyglossus aculeatus*) known to remain in the valley. Birds have fared better with about 200 species recorded, although some of these are only occasional visitors. The vegetation communities and waterways have also been seriously affected.

### **Visitors**

Lane Cove National Park caters for more than one million visitors each year, making it one of the most popular national parks in Australia. Because most visitors come by car, the parking areas are regularly full to overflowing on weekends with the picnic grounds correspondingly busy. As with most national parks, one has only to walk a short distance from the recreational

centres to find relative tranquillity. However, with tens of thousands of people living within walking distance of its boundaries there are few places in the national park where one can be truly alone.

The current pattern of access is set to change with the announcement of a new underground railway and two suburban railway stations to be constructed on the park boundary. This development will put the national park within easy reach of nearly four million people and is likely to markedly increase visitor numbers. On the other hand, the railway provides the opportunity to reduce the "tyranny of the car" with the possibility of phasing out some roads and car parks. The outcome may well be that the national park caters for more visitors but in a safer and more peaceful environment.

*Peace and tranquillity within the city.* Photo: Ian R. Brown.





## **Pollution**

The river and its tributaries carry high levels of run-off from housing, commercial and industrial areas, and from overflow from inadequate sewerage systems. These pollutants have resulted in extremely high coliform levels, excessive algal growth, reduced oxygen levels and high nutrient loads. There are also high levels of litter, especially plastic.

The NPWS recognises that these problems can only be addressed in a “whole-of-catchment” approach. It is a member of the Lane Cove Catchment Management Committee, set up by the NSW Government to involve all levels of the community, from state and local municipal agencies to local volunteer groups in improved catchment management and river health.

Progress is slow but certain. Municipal councils have placed strict conditions on new development to reduce soil erosion and retain stormwater on-site. Councils are also attending to their own problems by controlling fertiliser use on playing fields and golf courses, capturing litter from shopping centres and rehabilitating former garbage tips. The NPWS supported students from the adjacent Macquarie University who undertook stormwater and sediment amelioration measures in four creeks draining into the park. Works included channel hardening, low-cost sediment ponds, energy dissipaters and litter traps. The project is being evaluated to determine if the techniques can be used more broadly in the valley.

## **Weeds**

Few non-native plants can successfully invade undisturbed bushland but, unfortunately, no area of the park is far from disturbance. The most severe infestations are associated with the urban/bush interface, often where stormwater discharges into the park, and along the river and its tributaries. Construction of roads, tracks, picnic grounds and public utilities, such as sewers, water supply and powerlines, have also created disturbed areas.

Some species, such as narrow-leaved privet (*Ligustrum sinense*) present an intractable control problem and may have to be accepted as naturalised. Others, like bitou bush (*Chrysanthemoides monifera*), have the potential to spread but are currently restricted in their distribution. Species in this second category, high risk and limited distribution, have the highest priority for control action.

Following a severe bushfire in 1994, the NPWS received a grant of A\$330,000 (US\$165,000) to form and support The Friends of Lane Cove National Park, a community-based bush regeneration programme to help control weeds. In the three years to the end of 1997 the Friends contributed over 10,000 hours to bush regeneration. At any one time up to 200 volunteers work in 26 separate teams throughout the national park.

Bush regeneration seeks to re-establish stable, weed-free bushland by using minimum disturbance techniques. Typically these involve small groups of volunteers, led by trained bush regenerators, using hand-weeding and targeted use of herbicides. It is a method that involves moving from the least affected areas towards areas of higher weed infestation, allowing the native species to successfully regenerate on sites previously occupied by weeds. It does not work in areas where weeds dominate or where the cause of the weed infestation continues. Both conditions exist on the riverbanks, and they remain among the mostly heavily weed infested environments in the valley.

## **Fire**

The bushland of the Lane Cove valley, like most of the Sydney region, is susceptible to summer bushfires. While fire is a natural phenomenon in south-eastern Australia, the location, topography and shape of Lane Cove National Park present special challenges for the NPWS in managing fire. The primary legal and moral responsibility of the park manager is to protect life and property. When a park has 2,000 direct urban neighbours, and many times more in the vicinity, this amounts to thousands of lives and billions of dollars of property. In 1994 the valley experienced

## Box 2. Fire Regimes in Lane Cove National Park's Plant Communities

Mangrove wetland	no fire, any fire will have significant impact
Closed forest (rainforest)	no fire, any fire will have significant impact
Blue gum high forest	not less than 15 years or more than 30 years between fires
Ironbark/turpentine	not less than five years or more than 30 years between fires
Sandstone forest/woodlands	not less than five years or more than 30 years between fires
Sandstone shrubland/heath	not less than eight years or more than 30 years between fires

two high intensity bushfires that burned 95% of the national park and destroyed houses and infrastructure. Both were acts of arson.

The principal methods of reducing fire intensity are to deliberately burn under controlled conditions and to physically clear vegetation from high-risk sites adjacent to housing. Both methods have impacts on park ecosystems that are compounded by the small size of the park and its isolation from other potential species recruitment sites.

Research has shown that fire regimes have three critical components that affect vegetation communities in the park. They are intensity, frequency and fire seasonality:

- too hot and fire-sensitive species are killed;
- too cool and some species will not set seed;
- too frequent and many plants won't reach maturity;
- too seldom and fire-sensitive plants dominate communities; and
- the wrong season increases species vulnerability.

While each species of plant and animal has its own tolerances to fire regimes, general parameters have been established by the NPWS for plant communities in the national park (Box 2).

Unfortunately the reality is that ecologically-determined regimes will seldom be met. The main reasons for this are that property protection requires fire frequencies in excess of ecological requirements. Furthermore, controlled fires seldom reach the intensity of a "natural" summer bushfire, affecting plant responses. Finally, the potent combination of frequent hot-dry summers and arsonists makes frequent fires a sure bet.

### *The future*

Nature can survive in Lane Cove National Park only if the challenges of managing a park in a city can be addressed. Critical among these are "off-park" issues such as water and air quality, exotic species and use of adjacent lands. Also critical is securing the future for nearby bushland that is currently outside the national park.

The Friends of the Lane Cove River National Park give hope for a better future. Apart from the direct benefit of its bush regeneration programmes, the Friends are tapping into the local community, building links and conveying the conservation message. As is often the case, a lesson is better taught in the doing rather than in the telling, and the Friends are certainly "doers". Many of the park's 2,000 neighbours and many more besides, now have a much better understanding of the values and vulnerability of "their" national park. Understanding leads to action such as restraining pets, not dumping garden waste, controlling invasive garden plants and refraining from using fertilisers. Even small changes such as these, when multiplied by the tens of thousands of households in the national park catchment area, can make an important difference.

The NPWS has steadily added more of the remaining bushland in the Lane Cove valley to the national park. Most of these additional lands have been donated by local municipal councils who have been happy to see the bushland permanently protected. Negotiations continue with the objective of including all the publicly owned bushland in the valley in the national park.



Art in the park – a youngster enjoys a school holiday activity. Photo: Ian Russell Brown.

Additionally, many of the natural areas remaining in private ownership have been protected under local environment plans, restricting the uses to which they may be put.

The NPWS is also responsible for administering the state's threatened species legislation on all lands. Several plant and animal species found in the Lane Cove valley are protected under this legislation and are therefore subject to special consideration where development is proposed. Furthermore, local populations and communities may also be protected under the legislation. Within the Lane Cove valley, the Blue Gum High Forest and the local population of the gang gang cockatoo (*Callocephalon fimbriatum*) are protected, giving both the planning authorities and the NPWS responsibilities and opportunities to conserve nature outside the national park.

Lane Cove National Park continues to be severely affected by the city that surrounds it. Nevertheless, it maintains many of the natural values of the valley and provides places for recreation, contemplation and inspiration within the heart of a city.

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# Urban wildlife and protected areas in India

A. PATWARDHAN, S. NALAVADE, K. SAHASRABUDDHE AND G. UTKARSH

Contrary to popular belief, urban areas can serve as significant wildlife refugia, a value that needs to be understood and maximised amidst the rampant urbanisation that characterises many parts of the world. Indian case studies show that rational biodiversity assessments through amateur naturalists can serve as an efficient tool to monitor and plan for sustainability of urbanisation. Cities harbour between a quarter to half the total biodiversity in their biogeographic region. However, over half the total urban biodiversity is lost in the city core – the most human impacted zone. Further, up to half the total organisms are confined to a few patches of remnant forests, grasslands or wetlands. Such refugia often occur as part of university or defence premises, which now need to be specifically protected against any land use changes, so biodiversity may continue spreading to other urban sinks (such as public places and home gardens). Complementary biodiversity-friendly strategies include the planting of native plants to provide pollen and fruits for birds, insects and mammals, besides serving as larval food for several butterfly species. Native fish may be reintroduced in ponds and rivers, after removing invasive alien species such as water hyacinth.

**THE STRAYING OF A LEOPARD** (*Panthera pardus*) or a gaur (*Bos gaurus*) or slender loris (*Loris tardigradeus*) into cities along the Western Ghats mountains such as Pune or Bangalore makes news. Such straying is commonly blamed on the loss of their natural habitat and consequent flushing out to surrounding areas due to overpopulation. However, it is often ignored that these cities are still surrounded by habitat corridors that facilitate the dispersal of these creatures in and around the city. Such straying of wildlife into urban areas is thought accidental and unwelcome, but it never prompts reflection on how much of urban biodiversity is actually 'wild' or how urban habitats could become 'wildlife-friendly'.

*Habitat corridors can bring wildlife such as leopards into close contact with urban areas.*



**Table 1.** Distribution of diversity of organism groups in urban habitats at Pune.

Group	Niche (primary)	Unit	Total	% of total diversity								
				F	S	G	A	P	H	W	I	
Fungi	Decomposer	Genus	65	65					95	40	80	95
Herbs	Producer	Species	600	20	10	15	10	20	40	45	55	
Trees	Producer	Species	350	25	15			65	15	35	65	
Aquatic insects	Herbivore	Family	13							75	70	
Snails	Herbivore	Species	15							60	70	
Ants	Omnivore	Genus	12	45		35	35	65	35	50	70	
Butterflies	Pollinator	Species	105	70	75	40	70	55	35	95	70	
Fish	Herbivore	Species	70								100	50
Amphibians	Omnivore	Species	14								100	60
Reptiles	Carnivore	Species	50	60	40	40	45	50	15	80	55	
Birds	Omnivore	Species	300	35	50	15	30	25	10	95	35	
Mammals	Omnivore	Species	65	60	30	15	30	20	20	65	55	

Note: The land habitat types roughly in the decreasing order of relative human influence include: forest (F), scrub (S), grasslands (G), plantations (P), agriculture (A), habitations (H). The first three habitat types constitute the wilderness (W) zone while the latter three types constitute the impacted (I) zone. The aquatic ecosystem classification remained at a broad level: low (W) and high (I) impact zones. While sensitive groups such as birds lose two-thirds of their taxa in high impact zones, stress-tolerant groups such as ants or butterflies retain two-thirds the total diversity even in heavily human-impacted zones.

Such re-thinking is essential, given the global trend of rampant urbanisation. The world will soon be left with an impoverished biota unable to tolerate direct (e.g. pollution) or indirect (e.g. habitat fragmentation) impacts of urbanisation worldwide, from Amazonia to Australia. Identifying what management strategies might maximise the biodiversity in these impacted, fragmented landscapes is a significant research concern globally (Szaro and Johnston, 1996).

Many people in India believe that the urban areas are the choicest roosts of most well known naturalists, but poor habitat for wildlife. But the ushering in of the new millennium reveals otherwise, as recent studies at Delhi, Mumbai (Bombay), Bangalore and Pune show (Ghate *et al.* 2001). This wisdom has dawned only when urban naturalists chasing wilderness in remote forests and oceans opened their eyes to homegrown natural bounty (Dixit *et al.* 2001, website: <http://www.ranwa.org/punealive>).

Delhi, the Indian capital, hosts over 400 species of birds – about one-third of birds found in the subcontinent. The Pune urban area shelters around half the species of higher animals recorded from the whole of the Deccan plateau. In part, such high diversity levels can be attributed to the location of such cities in transitional biogeographic zones. However, high urban biodiversity is also largely due to the unnaturally high diversity of both natural and artificial habitats (e.g. garbage dumps that attract scavengers) and year-round supply of water (Burton, 1977). Bodies of water are perhaps the favourite haunt of naturalists in most cities, especially during winter, when migratory birds flock to these wetlands.

### Urban planner's dilemma

The living world is a strange combination of order and chaos. Various groups of organisms differ considerably with respect to their distribution of diversity across habitat types and human impact levels. Naturalists from Pune tried to unravel this pattern (Table 1). While there is a general decline in diversity along the increasing human impact gradient that reaches its climax

### Box 1. Wetland resorts: for birds and birdwatchers

Urban areas may not be the favourite roosts of birds, but they certainly host numerous birdwatchers. Naturally, wetlands near cities become favourite birding spots where many birdwatchers congregate on holidays, especially during winter when migratory waterbirds arrive from other continents in thousands. Since waterbirds are sensitive to both water quality and the surrounding landscape, they serve as easy and effective indicators of the health of the waterbody and its environs. Waterbirds are better than other organismic groups as indicators, due to the ample systematic records or observations made by amateur naturalists.

Pashan Lake, like other wetlands around Pune city, hosts over 100 bird species, including charismatic migratory visitors like cranes. It has been a favourite birding spot for local naturalists and visitors. The greatest Indian ornithologist, the late Dr Salim Ali, was a notable visitor. Records of systematic annual winter bird-counts are available for this lake over the last decade or more. A decade ago, the lake was declared a bird sanctuary by the government, who fenced it off and planted exotic (*Eucalyptus*) trees along the periphery. The lake hosts over hundred bird species; including charismatic migratory visitors like cranes. The lake also represents the agony of birds amidst urban sprawl. Besides, recent landscape changes around the lake include deforestation on nearby hills, leading to heavy siltation that makes the lake shallower. Consequently, deep-diving ducks such as pochards (*Aythya ferina*) are being out-competed by the shallow-water dabbling ducks such as pintails (*Anas acuta*) and shovellers (*Anas clypeata*). Marshy flowering plants have begun dominating shallow waters, replacing the aquatic species like lotus (*Nymphaea* spp.) and emergents like water corn (*Typha angulata*), hampering the nesting of shorebirds like pheasant-tailed jacana (*Hydrophasianus chirurgus*).

Exotic aquatic weeds like *Ipomoea* spp. have covered the banks, nearly invading the natural ground vegetation. Pollution tolerant birds like little cormorant (*Phalacrocorax niger*) and black-winged stilts (*Himantopus himantopus*) have increased; just as have introduced fishes like *Tilapia* spp. that outcompete native fish species. Bivalve species preferring unpolluted water are now replaced by pollution-tolerant *Bellamya bengalensis*.

For the eco-restoration of Pashan Lake, appropriate management strategies needed include: diversion of sewage pipes from the lake; dredging silt and removing weeds; planting native trees around the lake, such as thorn acacia (*Acacia nilotica*) and jujube (*Zizyphus jujube*) where waterbirds prefer to nest (instead of less useful exotics like *Eucalyptus*); allowing controlled grazing by cattle to keep check on *Ipomea*; planting trees on nearby hills to prevent runoff. While the municipal corporation is bent upon immediate beautification and tourism promotion in and around the lake, Pune University Environment Department and NGOs such as RANWA are advising care and caution.



Observations of soil fauna during dry season along lake periphery. Photo: Utkarsh Ghate.

at the city centres, this trend does not apply to all forms of life. Sensitive organisms like fish or birds lose over two-thirds of their species in high human impact zones, while in contrast, stress tolerant groups like ants or butterflies retain two-thirds (Utkarsh *et al.* 2001).

Although urban areas maintain considerable biodiversity, unique or rare species such as eagles and hornbills are often replaced by more stress-tolerant species such as crows (*Corvus corvus*) and mynas (*Acridotheres tristis*). The conversion of old houses into skyscrapers has often triggered loss of populations of squirrels, snakes or civets. Conversion of old growth wilderness areas to manicured parks may result in the disappearance of many bush-dwelling or tree-nesting species, something that often goes unnoticed.

The higher diversity recorded in some moderately or even considerably human impacted zones such as the city heart or home gardens must not mislead one to undervalue the less impacted zones like the hill forests surrounding the city. For these protected areas in the hills continue to be the biodiversity source while most urban habitats serve merely as sinks, unable to sustain the diversity on their own.

## Box 2. University premises: biodiversity and carbon sinks

Urbanisation and habitat fragmentation are commonplace the world over. Identifying and conserving the less urbanised and biodiversity-rich fragments thus becomes important for town-planners. Pune city, for instance, shows 25% decline in vegetation cover during the last five decades, due to encroachment of human habitation. But, green cover still survives in fragments in educational institutes such as the Ferguson College and Pune University campus. Rich in residual biodiversity and threatened with infra-structural encroachments these urban biodiversity hotspots need conservation, as a case study from Pune underlines (Kulkarni *et al.* 2001).



*Guided nature walk to expose citizens to their natural bounty in Pune, India. Photo: Utkarsh Ghate.*

Such educational premises may occupy below 5% of the urban area, but may harbour up to half the plant, bird and butterfly species from the urban biota. Further, over a quarter of the species inhabiting such a premise may be found nowhere else in the city, making conservation of such premises indispensable for survival of such exclusively held species. Such premises also lock up nearly a quarter of the green biomass of the cities and thus constitute vital urban carbon sinks. The Pune study asks for abandoning the traditional ignorance about the keystone ecological value of such educational premises and urban plantations that occupy about 6% of the country's landscape. This refocusing is important given that the forests that occupy 18% of the national area attract all the national attention regarding biodiversity conservation and carbon sequestration; but educational premises are not much poorer in biodiversity and perform these functions in urban landscapes far away from the forests.

For instance, nearly a fifth of the butterfly species at Pune emerge from their food plants confined to the protected hill forests which also exclusively host over a sixth of the bird species, seldom seen elsewhere in the city. Because bird or butterfly richness in the city gardens is difficult without the hill forests, urban planners can involve rational naturalists in evaluating the ecological values of various optional sites as demonstrated above and sacrifice the one with lowest ecological value.

## Institutionalising protected areas

While most cities incidentally and inadvertently shelter wildlife all around, a few Indian cities, such as Mumbai, Chennai (Madras), Chandigarh, and Bhopal, have established formal protected areas, cheek by jowl alongside skyscrapers. Cities like Chennai and Mumbai contain important coastal habitats, with mangroves, sea turtle nesting sites, and other interesting flora and fauna. Most cities host regionally important educational institutions, such as universities, that often constitute the largest and/or the last green patches amidst urbanisation. Besides cultivations, such establishments also harbour derelict areas, with remnant natural vegetation such as grassland or thorny bushlands. These vestigial green patches may support up to half the total urban species. Such refugia, particularly the university premises, must be recognised by conservationists and environment departments; for wilful protection against any land-use changes. Conservation of these refugia would help ensure that biodiversity from these source populations can continue to diffuse in to other urban sinks such as public parks or home gardens.

Urban avenues and home gardens can act as significant sinks of biodiversity (such as butterflies or birds) provided suitable trees and even native shrubs or climbers and annuals are intentionally and carefully planted, instead of exotic flowers.

## Living barometers

Citizens can do a lot towards the protection of their immediate environment. Delhi's wonderful Ridge forest today survives because of citizen protests and vigilance (see Box 4). Citizens can put

### Box 3. Defence premises as biodiversity refuges

Most Indian cities have green pockets also locked up in defence premises. Such refuges also shelter and may serve as sources of organisms for eventual recolonisation and eco restoration of the neighbouring urban areas, as evident from study at Pune (Alkutkar *et al.* 2001). The National Defence Academy owns hundreds of hectares along a hillock on the outskirts of Pune city. Due to formidable isolation from human pressure because of national security concerns, the campus shelters some of the few forest vestiges that still survive around Pune. It hosts about half the biodiversity recorded from Pune environs as shown from the records of trees, birds and butterflies. Nearly half of the species recorded from this wilderness reserve have now disappeared from Pune city. The area is facing increasing human pressures such as encroachments or intrusion and overgrazing by the cattle, due to increasing urban sprawl. Nevertheless, the NDA case underlines the need to recognise and encourage the substantial incidental contribution by defence establishments to biodiversity conservation.



*Walking the nature trails to nearby hills during the morning can be both educational and healthy.*  
Photo: Utkarsh Ghatge.

### Box 4. Delhi Ridge: an urban wildlife sanctuary

Amidst the teeming traffic of Delhi, stands a tranquil, dense forest, popularly known as the Delhi Ridge. An extension of the Aravalli hill range, the Ridge forest spreads over almost 7,800 ha. Extensively planted since 1847, the Ridge is a mix of native and exotic plants, but still retains its natural semi-arid scrub vegetation characteristics. Up until the early part of the last century, large mammals like the blackbuck, nilgai and chinkara roamed this scrub jungle. Rapid urbanisation and habitat degradation have taken their toll and over the years the Ridge has lost most of its big mammal population, with only the occasional hare or jackal still left. The area, however, still remains a birdwatchers' paradise, with almost 200 species being reported. The Ridge performs several ecological functions for Delhi, including trapping tons of dust blowing in from the Western Indian Desert and helping to make Delhi more habitable. However, the Ridge is rapidly shrinking, falling prey to construction activities, parklands and garbage dumping. In 1979, hundreds of citizens organised a rally, led by the NGO Kalpavriksh, protesting against the construction works on the Ridge. Consequently, a large portion of the Ridge was declared protected and has survived.

pressure on the administration to plant appropriate tree species, or to ensure that biodiversity conservation is an important consideration in urban development plans. An innovative exercise carried out in a number of cities is a tree census, which gives a very good idea of the diversity and number of trees, and changes in these parameters over a period of time. Chennai's turtle nesting sites have long been protected by the famous "turtle walk" initiated by students and young professionals. Kolkata's (Calcutta) wetlands at least partially survive because of a number of NGOs, and resistance against urban development by traditional fisher folk who depend on them for their livelihood. Many small groups have triggered locality-specific data literacy. Prakriti Samsad, a birdwatcher's group in Kolkata, has been monitoring the bird population in the city and publishing the ongoing changes. Similarly, the NGO Kalpavriksh has carried out monthly bird counts across Delhi for over a decade. Students from Pune University have initiated monthly monitoring of the living wealth of their campus, and the nearby wetland at Pashan.

## Ecorestoration

Many urban administrations have responded positively to citizens' environmental concerns, by declaring protected areas, enacting legislation like Urban Tree Acts, and integrating some





The Dhangar tribe, nomadic shepherds near Pune, Maharashtra, India. © WWF-Canon/Mauri Rautkari

biodiversity concerns while making their master plans. In many cities, protection by local authorities, coupled with the vigilance of nearby residents, has facilitated regeneration of natural plants and revival of native fauna such as birds and butterflies. Even seasonal puddles formed in these areas harbour moults of dragonfly nymphs, indicating ongoing colonisation and establishment even of those organisms highly susceptible to seasonality. Increasing tree cover of suitable species in the Rajnesh Park at Pune, may have helped conserve predominantly Western Ghats butterflies, such as the blue mormon (*Papilio polymenstor*) seldom seen in the city earlier.

An understanding of eco-restoration processes can help their manipulation and replication in neighbouring areas and even other cities. Besides, such ongoing monitoring can easily detect notable declines in certain species like sparrows and vultures, which are currently being debated. If such sudden population fluctuations are signals of impending calamity, the purpose of monitoring is served much beyond academic interests.

Such monitoring can even become quite popular, yet cost-effective, through Internet publicity such as the electronic discussion group of Asian naturalists having thousands of members worldwide <nathistory-india@lists.Princeton.EDU>.

### **Pre-emptive environmental assessments**

Notably, such publications based on long term observations might pre-empt the facile environmental impact assessments (EIAs) that are currently in fashion. Unfortunately, environmentalists do not have much concrete, scientific data readily available. That scientific data can at times lead to stringent legal action against environmental hazards is proven by the case of pollution in Delhi and Agra. If the recent legal activism takes note of such serious publications, environmental care cannot be easily wished away by the half-hearted EIAs.

Urban wilderness management is globally relevant as is being gradually recognised by the Millennium Ecosystem Assessment project (Ayunse, 1999) launched by the United Nations Development through the World Resources Institute. Living organisms certainly serve as efficient indicators, for example, as barometers of the scale of human pressure (Patwardhan *et al.* 2001). Love for nature is latent in all of us and surfaces often a curiosity and observations about nature, according to the biophilia hypothesis (Wilson, 1984). If these nature observations are maintained as systematic records in an analytical framework for town planning, the ethereal love for nature can be transformed into rational marriage with urban sustainability.

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# Nature in cities – biodiversity and protected areas in London

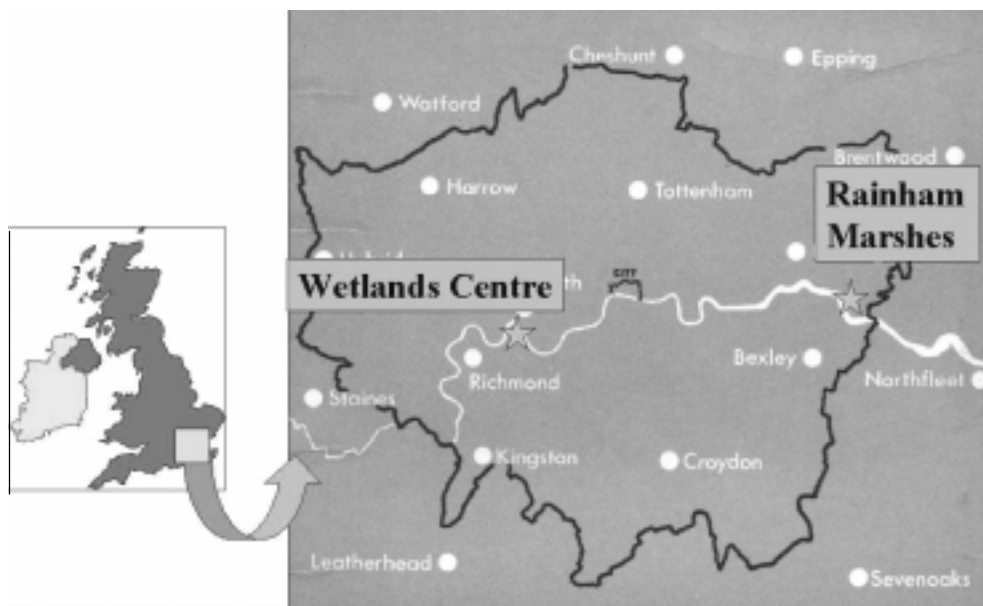
ADRIAN PHILLIPS AND HONOR GAY

This article briefly reviews the biodiversity assets of London, showing how it occurs in the most unlikely places. London has many open spaces, some of which are, or contain, protected areas as understood by IUCN. As in cities elsewhere, London's protected areas are neighbours to millions of people, and therefore have added value, over and above that for conservation, for their potential to contribute to the quality of many people's immediate environments and daily lives. Two case studies from within London – Rainham Marshes and Barnes Wetlands – show that: involvement in the management of urban protected areas can lead to greater social cohesion in nearby communities; such places often occupy land that is contested for development; but that they can be central to the identity of their city or town, and attract business and prosperity. In urban protected areas, more than anywhere, management objectives must provide maximum public access and benefit, in addition to landscape and habitat conservation.

**TOWNS AND CITIES** evoke images of crowds, buildings and little space for the natural world. But a closer look at urban environments shows a tremendous diversity of protected and unprotected green spaces. For example, the 33 Greater London boroughs, which make up the Greater London Area, cover nearly 158,000 hectares, and over two-thirds of this comprises open land (London Ecology Committee, 2000). This consists of gardens, squares, burial grounds, large and small parks, engulfed commons and village greens, wastelands, sewage works, reservoirs, military areas, gravel pits and open water. Taking a rather more restrictive definition, more than 40% of the total land area is green open space and nearly half of that is considered valuable as wildlife habitat (London Biodiversity Partnership, 2000).

Indeed London contains varied wildlife habitats. It has nationally-important ancient woodlands, such as those at Oxleas in South East London and Ruislip in West London. It contains pockets of more recent woodlands in Victorian cemeteries and along railway lines. It

**Figure 1.** Greater London Area: location of case studies.



includes diverse, human-modified habitats such as: the flower-rich chalk grasslands of the North Downs and the amenity grasslands of the central London parks; the reservoirs of the Lea Valley and the Thames Estuary; the wet meadows of the Ingrebourne Marshes in Havering (East London), and the dry, disturbed land of inner city 'wasteland'. Flowing through the heart of the city is the River Thames, perhaps London's most valuable and well-known natural asset, which provides a wide range of habitats including shingle, mudflats and grazing marshes. The river is home to more than 350 invertebrate species and 115 different species of fish. And finally, because Londoners aspire to own their own private space, there are hundreds of thousands of private gardens which can provide wildlife refuges. This potential is often made real by the current enthusiasm for wildlife gardening.

London's diverse habitats support a remarkable diversity of species. Most, like the hawfinch (*Coccothraustes coccothraustes*), bluebell (*Hyacinthoides non-scripta*) and small blue butterfly (*Cupido minimus*), are remnants of native fauna and flora that survive in encapsulated fragments of semi-natural habitat. Other species, like the robin (*Erithacus rubecula*) and common blue damselfly (*Phoenicurus ochruros*), have adapted well to the human environment of parks and gardens. Some are urban 'specialists': one of Britain's rarest birds, the black redstart, can be found on sparsely vegetated industrial areas such as old power stations, wharves and factory sites that mimic the scree-slopes and cliffs of their original natural habitat further south in Europe. Also the legacy of London's trading history includes some plants that were accidentally or deliberately introduced. This throws a rather different light on the usually negative associations of introduced species. For example, *Buddleia*, which originated in China, occurs on wasteland throughout London. It attracts butterflies and thus helps maintain London's native wildlife.

This wealth of wildlife, and its proximity to millions of people, has led to the establishment of the London Biodiversity Partnership of statutory, local government and voluntary bodies, which is producing a London Biodiversity Action Plan. This plan addresses the concerns of landowners and land users, planners and politicians, businesses and local communities, who are beginning to recognise that biodiversity is a vital part of London life. London has recently (and belatedly) moved to a mayoral type of government. Its new Mayor, Ken Livingstone, has taken a close personal interest in the conservation of biodiversity, and making it more accessible to people. He will be required to draw up a Biodiversity Strategy for the Greater London Authority, which will be supported by the Partnership's action plan. By producing the strategy and action plan, Londoners hope to be giving a lead to other World Cities – not only in making its own particular contribution to conservation of global diversity, but in demonstrating that nature is a vital ingredient in the quality of life of city dwellers everywhere.

### **London's open spaces**

In attempting to relate London's green places to the interest of the *parks* readership in protected areas, it may be helpful to distinguish between three categories:

- Designed green spaces that assist in biodiversity conservation, but normally have no statutory or official role in that regard, such as London's many formal parks and gardens, sports pitches, cemeteries and arboreta. It should, though, be said that in some cases, such as the Royal Parks, there is now a conscious effort to manage such places with nature conservation in mind (while the contribution of Kew Gardens to biodiversity conservation is arguably greater than that of any other place on earth!);
- Many other green spaces, including some local parks, small nature reserves, railways cuttings and so forth, where policies of nature conservation have been recognised as of metropolitan (i.e. London-wide), borough or local significance. The aim of these designations is to protect the best natural sites in the capital, and also 'to provide each part of London with

an accessible wildlife site, so that people are able to have access to nature in their local neighbourhood' (London Ecology Committee, 2000);

- A few major open spaces of semi-natural character, most of which have been protected for their amenity value, although biodiversity conservation is sometimes a formal policy for whole or part of the area. Thus at least parts of many such areas may be considered as protected areas *sensu* IUCN. Examples include the parts of the Lea Valley Regional Park, Hampstead Heath, Richmond Park, Wimbledon Common and Epping Forest. The two case study areas explored below, Rainham Marshes and the Barnes Wetland Centre, also meet IUCN protected areas criteria.

### Protected areas in or near large cities

Box 1 was prepared to help show how this last group of London green spaces relates to protected areas in other large cities around the world.

The protected areas in Box 1, all of which occur in or near cities, appear to be of four types:

1. A piece of protected wild country of relatively high biodiversity value that has been partially or wholly engulfed in the city as it grows. Brasilia, Nairobi and Cape Town National Parks have this type of relationship to their neighbouring cities. Within the UK, Arthur's Seat in Edinburgh is also of this type;

Box 1. Some protected areas near large cities					
Protected area	Nearby city	Country	IUCN category	Size (ha)	Principal value to city
Brasilia NP	Brasilia	Brazil	II	28,000	education / recreation
Tijuca NP	Rio de Janeiro	Brazil	II	3,200	recreation watershed protection disaster prevention
Costanera Sur Natural Park	Buenos Aires	Argentina	V	320	education
El Avila NP	Caracas	Venezuela	II	85,192	recreation watershed protection disaster prevention
Golden Gate National Recreation Area	San Francisco	USA	V	29,611	recreation landscape setting
Rome Natura network	Rome	Italy	V	14,000 (in 12 parks)	recreation landscape setting
Nairobi NP	Nairobi	Kenya	II	11,721	education recreation
Cape Peninsula NP	Cape Town	South Africa	II	21,837	education recreation
Margalla Hills NP	Islamabad	Pakistan	V	17,386	recreation watershed protection
Sydney Harbour NP	Sydney	Australia	III	393	recreation landscape setting
Gede Pangrango NP	Jakarta/ Bogor	Indonesia	II	15,000	recreation water supply
Yatsu-Higata wetland reserve	Tokyo	Japan	IV	40	education

2. Forested hills or mountains, sometimes too steep to develop, that provide both recreational opportunities and water supplies (and may perhaps also serve to protect against disasters like landslides). Tijuca, El Avila, Margalla Hills and Gede Pangrango are of this type;
3. A single or, more often, several protected areas of semi-natural quality which provide a regional landscape setting for the city, and help to shape its growth by providing large-scale green lungs which have a regional importance in land-use planning. Golden Gate, the Roma Natura system and the Sydney Harbour National Park are all of this kind. This type of relationship is especially appropriate where the city borders a natural network of coastal sites (e.g. wetlands or cliffs) or has developed in parallel with the floodplain of a river or river system (Montreal offers an example).
4. Small wetlands or other areas of high biodiversity value occurring within major built up areas. These have often been left undeveloped by chance and are now highly contested for alternative land uses. Nonetheless, they are very important for education and related values, and especially suitable for “creative” conservation. Costanera Sur and Yatsu-Higata are all of this type.

Of course such a typology is bound to be an oversimplification of the real-world situation. Often protected areas will have features of two or more such types, and sometimes small areas in one category will be nested within a larger area of another. Furthermore, the true nature of any protected area in an urban context can only be appreciated with a full understanding of its own, individual history of conservation. Nonetheless, the analysis can be applied to major open spaces in the Greater London Area. This reveals that three of the four types are to be found (it is no surprise that in London, where no natural landmark is as high as many of the capital’s buildings, so Type 2 is not represented) – see Box 2.

The two case studies from London, which are explored in the remainder of this article, are examples of Type 4 protected areas. Their value to conservation is high, but their value to the community (economically, socially and environmentally) is potentially immense – much more indeed than is captured by the terms “education” and “recreation”.

### **Rainham Marshes, East London**

Reclamation of the once extensive Thames marshland began in Roman times and accelerated during the 20th century: 65% of the Inner Thames marshes were lost between 1950 and 2000. Rainham Marshes, on the eastern edge of London and adjacent to deprived communities with high unemployment is the only substantial remnant of this system.

The Thames marshes are lonely and evocative landscapes, broad expanses of grazing land, divided by ditches. They are important for the flora and fauna of the ditches and for their resident

#### **Box 2. Major open spaces within London**

<b>Types of protected areas occurring in or near large cities</b>	<b>Comparable examples of major open spaces within the Greater London Area</b>
1. A piece of protected wild country of relatively high biodiversity value	Hampstead Heath, Richmond Park, Epping Forest, Wimbledon Common
2. Forested hills or mountains	none
3. Protected areas of semi-natural quality which provide a regional landscape setting	Lee Valley Regional Park
4. Small wetlands or other areas of high biodiversity value	Rainham Marshes, Barnes Wetland Centre



Rainham Marshes. Photo: Andrew Hay-RSPB Images.

and migratory bird populations. Many species listed in the UK Biodiversity Action Plan occur at Rainham Marshes, including snipe (*Gallinago gallinago*), redshank (*Tringa totanus*), lapwings (*Vanellus vanellus*), peregrine falcon (*Falco peregrinus*), short-eared owl (*Asio flammeus*), kingfisher (*Alcedo atthis*), curlew (*Numenius arquata*), water vole (*Arvicola terrestris*), emerald damselflies (*Lestes sponsa*) and great-crested newt (*Triturus cristatus*). Notable plant species include the divided sedge (*Carex divisa*), golden dock (*Rumex maritimus*), lesser pondweed (*Potamogeton pusillus*) and soft hornwort (*Ceratophyllum demersum*). The habitats are important too at a European scale.

Part of Rainham Marshes became a firing range in 1906, before any conservation legislation. It was the military use that protected it from people and development. Silt lagoons were built in the 1960s, the operational use of which added to the bird interest and this led to its designation as a Site of Special Scientific Interest in the 1980s. Nonetheless, grazing, which was necessary to maintain the habitat, was abandoned, and urban fringe problems, such as vandalism, joy-riding and fly-tipping, gave the marshes a desolate, even threatening, character. In addition to these eyesores, military use of the marshes had left a legacy of unexploded ordnance and the land was heavily contaminated.

When the Ministry of Defence began to relinquish its interest in the site, Rainham became a celebrated conservation cause with battles fought over development proposals for twenty years. The pressure for development has been most marked since 1994 when a major road was built through the marshes. Nonetheless, in 2000, the Royal Society for the Protection of Birds (RSPB), one of the UK's major non-governmental organisations, acquired 375 ha of the marshes with the aim of developing a flagship nature reserve. In developing a vision for managing the marshes, the organisation has been sensitive to the human context of this important biodiversity area:

“We want to do more than simply establish a nature reserve. Our vision is about a major national contribution to biodiversity, dramatic improvement in the local landscape and the provision of a high quality environment for local people and visitors. In the long-term we will work with key stakeholders in the local area to develop a major visitor complex and country park integrating with other local environmental, leisure and economic projects. This ‘conservation park’ will be a flagship project, crucial to the environmental regeneration of the Thames Gateway. The attraction of substantial numbers of visitors



Rainham Marshes. [need credit](#)

will also benefit the local economy, thus helping the social and economic regeneration of the area. We aim to return the Marshes to a national asset of which Londoners can be justifiably proud.”

RSPB plans a five-year restoration programme for the site, including raising water levels to produce shallow winter flooding, extending grazing in summer to control vegetation levels and unclogging and re-profiling ditches to benefit a variety of wildlife. Restoration of the marshes will contribute 4% towards the national target set for grazing marsh in the Government’s national Biodiversity Action Plan (BAP, the UK Government’s response to the requirement of the Convention on Biological Diversity), and the return of species for which BAP targets have been set, such as bittern (*Botaurus stellaris*), bearded tit (*Panurus biarmicus*), avocet (*Recurvirostra avosetta*), marsh harrier (*Circus aeruginosus*), water rail (*Rallus aquaticus*) and corn bunting (*Miliaria calandra*).

RSPB predicts visitor numbers of 20,000 per annum initially, rising to 80,000–100,000. In ten year’s time, it has the potential for up to a million visitors per annum, if the RSPB’s bold plans to link the nature reserve to the proposed country park being created on a neighbouring landfill site come to fruition. Although the site is currently closed while the hazards associated with contaminated land are dealt with, RSPB wants to encourage as many local people as possible to use the reserve and will provide free passes to local residents. A reception centre and classroom will be built in 2004. An education and outreach programme will be developed, including information leaflets, displays, programmes of walks, talks and day courses for adults based on the Marshes. A structured volunteering programme will give people the opportunity to become directly involved in the management of the site.

### **Wetland Centre, Barnes**

On a day of prevailing south-westerlies, and a minute or two before landing at London’s Heathrow, passengers may glimpse a strange set of watery shapes beneath the plane, set in a bend of the River Thames and near the unlovely inner suburb of Hammersmith. This is the Wildfowl and Wetland Trust’s (WWT) new Wetlands Centre at Barnes. The story of its creation, and of its economic, social and environmental significance, is unusual and instructive.



The vision was that of Sir Peter Scott, a giant in the conservation movement for many years before his death in 1990. Building on the established success of the WWT's centres at Slimbridge and elsewhere, Peter Scott wanted to bring the "wetland experience" to the heart of the capital. An opportunity arose when four large reservoirs and adjoining land, covering more than 50 ha in all at Barnes, in the London Borough of Richmond, became redundant. The reservoirs had some conservation value (chiefly for wintering ducks), but nothing exceptional and with very little access or educational possibilities.

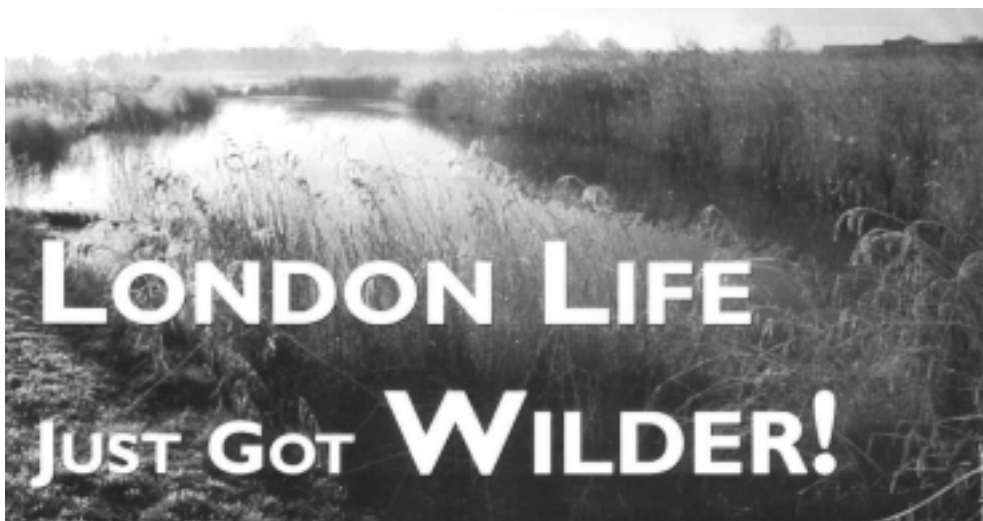
To create a wetland from these rectangular reservoirs was a major engineering and financial challenge. It was achieved in 1995 through a creative deal involving the owner, Thames Water, a housebuilder (Berkeley Homes) and the WWT. With the support of Richmond Borough, which is the planning authority, Thames Water sold nine ha of land to the north of the reservoirs to Berkeley Homes for housing development. Through this deal, £11 million was made available to WWT, going a long way to meet the £16 million that they needed to create the wetland – an excellent example of "development for conservation". The balance was duly raised by appeals, sponsorship, donations and grants from various sources.

In place of the reservoirs, WWT has established 30 ha of diverse wetland habitats, including open water, reedbed and carr (marsh woodland), seasonally inundated grasslands and open mudflats with 'scrapes' (artificial shallows) for waders. These are designed to maximise the attraction of the site for birds and other aquatic life. Water is drawn from the Thames above the site and, controlled by a system of sluices, it flows through it to discharge back to the river below. The remaining 12 ha has a major visitor centre and areas devoted to displaying a range of wetland types, with their pinioned wildfowl birds, from various parts of the world and from the British Isles. Seven hides and 3.4 km of trail enable visitors to get access to the wetland areas, but the more "remote" of these are left, undisturbed, to the birds.

The Wetland Centre was opened only last year but can already claim to be a model of a sustainable project, bringing not only environmental and biodiversity benefits but also social and economic ones.

The site has become an important addition to London's environment. Considering that Barnes lies near the centre of one of the largest metropolitan areas in Europe, wildlife has been surprisingly resilient. There has been an explosion of frog populations, the site is among

*The Wetland Centre, Barnes: the poster that marked the official opening.*



London's best for bats, and rare butterflies and dragonflies have already bred. As to birds – lapwing, little ringed plover, gadwall, shoveler, reed warbler and little grebe have all bred or been seen in vastly greater numbers than hitherto. A number of rarities have also been recorded. WWT are confident that the site will soon be officially designated as a Site of Special Scientific Interest, and indeed hope in due course that it might meet Ramsar criteria.

In broader environmental terms, the Wetland Centre figures prominently in Ken Livingstone's Biodiversity Strategy (see above), who sees it – along with London Zoo, Kew Gardens and the Natural History Museum – as one of the city's major green assets. It also contributes to London's environmental aims by depending heavily of public transport for access, rather than the private car.

The social benefits are even more impressive. The Wetland Centre was planned, and is now managed, with a strong injection of community involvement. An active volunteer group has come into being, with 120 individuals, each ready to give at least a day a week of volunteer time (and there is a waiting list to join). 170,000 people visited the site in the first year and the target is to double this in the near future. Significantly, as many as 12–13% of all visitors decided on the spot to join the WWT as members, a far higher proportion than expected. There is emerging evidence that for a number of visitors the Wetland Centre has offered a *quality* of experience that few other places can offer. However, the WWT recognises that at present their support comes mainly from wealthier citizens and neighbours. It acknowledges that a greater degree of "social inclusion" is desirable: the Wetland Centre should be relevant to a wider range of Londoners, the less affluent, less well educated and ethnic minorities in particular. Indeed more generally, for many of those involved in conservation in the UK, this is seen as one of the major challenges.

Economically, the centre has had a significant impact. Through the efforts of key individuals in Thames Water and Berkeley Homes, £5 million has been raised for the centre. Between 30 and 40 full time jobs have been created. The value of houses near the site has risen more rapidly than elsewhere in London, an indication of how protected areas can generate economic values. The WWT itself has been able to raise its profile and develop a consultancy arm to share its experience at Barnes, and elsewhere in the UK, with places around the world keen to develop their own national wetland centres, for example near Philadelphia, USA and in Hong Kong, Austria, Belgium and South Korea.

The achievements of WWT have been recognised. For example, UK Government officials frequently include the centre on its itineraries for distinguished visitors from abroad, presenting it as a showcase example of sustainable development. The centre has also been the recipient of the prestigious British Airways Tourism for Tomorrow Awards in 2001.

## Conclusion

As noted above, both Rainham Marshes and the Wetland Centre are Type 4 protected areas in an urban setting. They also meet IUCN criteria as Category IV protected areas – managed nature reserves – although both involve a higher degree of deliberate manipulation of the environment than is usually the case.

The principal lessons that can be drawn from these two case studies are as follows:

- Even the most neglected and damaged environments contain the potential for environmental recovery and biodiversity restoration;
- The creation, or re-creation, of biodiversity-rich habitats in urban areas comes about through partnerships, often involving the public, private and voluntary sectors;
- Land in Type 4 urban protected areas often has development potential, and conservation will therefore be a contested land-use;
- Such areas also illustrate the importance of creative conservation as a means of establishing habitats that attract wildlife;

- Moreover, while such areas are obviously important for conservation, recreation and education, they also have the potential to contribute to economic recovery and vitality, and to community action and involvement;
- Investment in major projects of environmental rehabilitation and creative conservation is more easily obtained if there is a city-wide policy towards biodiversity conservation, as is emerging in London.

**Adrian Phillips** was formerly Director General of the UK Countryside Commission and Chair of the World Commission on Protected Areas of IUCN.

**Dr Honor Gay** is a tropical ecologist who now runs the People and Wildlife Programme of the Wildlife Trusts, a leading conservation NGO in the UK.

# Globally significant biodiversity within city limits: the case of South Africa's Cape

JEFFREY A. MCNEELY

Located in close proximity to a major urban centre (Cape Town), the unusually rich biodiversity of the Cape of Good Hope region, South Africa, is under considerable pressure. Intensive tourism and the unauthorised use of resources by poverty-stricken people both present major management challenges. Other key threats to biodiversity include colonisation by alien invasive species and uncontrolled fire. In an attempt to stem ecosystem degradation, various steps have been taken.

Three hitherto independent nature reserves have had land added and, in 1998, were merged into a single Cape Peninsula National Park, creating a more viable protected area. Considerable international support (from GEF [the Global Environment Facility], WWF, and the French Development Agency) has been given to a variety of regional projects attempting, with some success, to integrate biodiversity and human development objectives during this challenging period.

**“A MOST STATELY THING** and the fairest Cape in the whole circumference of the globe.” So said Sir Francis Drake. The vegetation Cape of Good Hope region of South Africa is so distinctive that it is considered a plant Kingdom in its own right. Myers (1990) considers this the world's “hottest hot-spot” of plant diversity and endemism. The region as a whole contains nearly 6,200 endemic species of plants (those found nowhere else in the world), including 193 endemic genera and five endemic families. Over 1,400 of these plants are listed in the South African Red Data Book for Plants (Rehelo, 1992). Within the Cape Floristic Kingdom, one of the most interesting sections is the Cape Peninsula, dominated by Table Mountain, with the city of Cape Town lying at its base.

Cape Peninsula National Park (14,523 ha) contains over 4,600 species of plants of which around 32% are endemic. This relatively small area also supports at least 113 endemic species of animals, mostly insects. This level of endemism may be among the richest of any area in the world for its size. With the highest topographic and climatic diversity of any area in Southern Africa, the Cape has a spectacular richness of habitats, with annual rainfall ranging from 400 mm to well over 2,000 mm on parts of Table Mountain. Further, the area has outstanding scenic beauty, with landmarks such as Table Mountain and Cape Point. In short, the Cape Peninsula is a very special area.

The natural features of the Cape would make it outstanding in any case, but it is even more interesting that it is located in such close proximity to a major urban centre, Cape Town. Cape Town has long been a major trading centre for South Africa, attracting visitors from around the world. Considered the “Mother City” of South Africa, the current population of the greater Cape Town area has reached around 3 million and is expected to attain as many as 6 million by 2020, posing considerable challenges for the management of the remaining natural areas on the Cape.

## Management challenges

One major challenge in trying to conserve globally important biodiversity so close to an attractive city is the pressure of tourism. Over half the international tourists to South Africa visit the Cape Town area, and visitation by international tourists is expected to reach over 1.5 million by 2002. Four of the top ten tourism destinations in South Africa are found in the Cape Peninsula, including the Cape of Good Hope, the Table Mountain Cable Way, Boulders Penguin Colony, and Kirstenbosch Botanic Gardens. The Boulders Penguin Colony attract some 400,000 visitors,

while over 900,00 use the cable way to reach the top of Table Mountain each year. Domestic visitors to the National Park far exceed the international tourists, and some visitor impacts are now being felt, including formation of gullies along tracks and paths, and the usual problems of graffiti, litter, and illegal cooking fires. Because so much of the site is freely accessible, informal use is considerable, and exceeds 1 million visits per year. Many of these visits involve unauthorised use of resources by poverty-stricken people living around the protected areas.

The area faces two rather more dramatic major management problems: invasive alien species of plants; and uncontrolled fire. The two are closely related. With a Mediterranean climate (warm, dry summer and wet, cool winter) and sitting on a major shipping route between Europe, Asia, and Australia, the Cape region is particularly vulnerable to the invasion of species from other Mediterranean-climate parts of the world. Alien plants, mostly trees and woody shrubs, have invaded over 10 million hectares of South Africa, including considerable areas within the Cape Peninsula. In addition to disrupting natural ecosystems, these invasive species also have a significant impact on the hydrology of the ecosystems, reducing the available water by over 300% in the South-western Cape (Le Maitre *et al.* 2000).

Mediterranean systems are often fire-adapted, but the changing hydrology has increased the hazard. In January 2000, nearly 10,000 ha along the Table Mountain were burned, with substantial loss of both lives and property. Another reason the fire was so destructive is that invasive alien species, especially of highly combustible pines, had encroached into natural habitats, turning the normal fire regime into a far more dangerous phenomenon. These threats have already had a substantial impact on the plants of the peninsula, with 39 native plant species having been extinguished, 15 of which were endemic to the peninsula (Trinder-Smith *et al.* 1996). It is expected that climate change will make the linked problems of invasive species and increasing fires even more destructive in the future (Rowlands, 1998).

## **Management responses**

Until the mid-1990s, the Cape Peninsula region included three separate nature reserves (Cape of Good Hope Nature Reserve, Silvermine Nature Reserve, and Table Mountain Nature Reserve), the latter perched immediately above Cape Town. But recognising that this was an inadequate approach to conserving the region's biodiversity, scientists identified additional areas that should be added, to comprehensively conserve of the biodiversity of the Cape. This required a new approach to management, known as the Cape Peninsula Protected Natural Environment (CPPNE) (van Wilgen, 1996).

The proposed CPPNE would involve significant areas of land owned by the central government, the provincial government, the municipality of Cape Town, a state-owned company (South Africa Forestry Company Ltd), the National Botanical Institute, the South African National Defense Force, and even some private nature reserves that have been proclaimed by land owners. The Cape Peninsula National Park, incorporating the three existing nature reserves, was declared in 1998. CPPNE followed in 1999, with an additional 7,314 ha as core areas and 7,282 ha as buffer zone. Together, the conservation units contained within the Cape Peninsula Protected Natural Environment (CP1~NE) now cover nearly 30,000 ha.

Putting all of this onto a sound social and economic basis has been an additional challenge. As a result of considerable negotiations, plus a significant grant to South Africa National Parks by the Global Environment Facility, plus a grant of US\$6 million for the establishment of the Table Mountain Trust Fund (through WWF-South Africa) and provision of about US\$1 million from Agence Française de Développement for capacity building and educational programmes surrounding the park, local authorities agreed to transfer their management responsibility to South Africa National Parks. Negotiations are continuing to transfer the South African Defense Force lands to the park. Their work is supplemented by an innovative social programme that both removes alien vegetation from important catchment areas to enhance water supplies, and

creates employment opportunities for previously disadvantaged communities. Known as the Working for Water Programme, it has been considered one of the most successful public works programmes in South Africa, with many social benefits in the Cape Peninsula (Noemdoe, 2001). USAID also provided funding to support the work of Working for Water Programme in eradicating invasive alien species of plants and achieving social development objectives.

In conclusion, the Cape Peninsula is one of the world's outstanding natural treasures, as well as the site of a spectacular city that is developing quickly. Through careful integration of environmental planning, protected areas, social programmes, education, site management, and innovative funding mechanisms, both biodiversity and human development objectives are being met in challenging times.

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## **The Urban Parks Forum**

The Urban Parks Forum (UPF) is an independent voluntary sector body, formed in 1999 to support the regeneration of public parks and open spaces in towns and cities in the UK. Supported by the Department for Transport, Local Government and the Regions (DTLR), the Heritage Lottery Fund and the Esmée Fairbairn Foundation, the Urban Parks Forum is to become the focus of park regeneration in the UK.

The Forum recently published a Public Parks Assessment and is developing much needed research and a comprehensive networking infrastructure. Access to this information will be offered to professional and community groups alike and to anyone with an interest in parks and green spaces, making the Urban Parks Forum a positive force in the successful regeneration of urban parks and green spaces.

For further information please contact Dave Tibbatts at Urban Parks Forum, tel: +44 (0)118 901 5200, e-mail: [Admin@upfor.fsbusiness.co.uk](mailto:Admin@upfor.fsbusiness.co.uk) or visit [www.urbanparksforum.co.uk](http://www.urbanparksforum.co.uk)

# Résumés

## Les aires protégées urbaines de la Californie: des progrès en dépit des pressions décourageantes

TED TRZYNA

Dans l'état de Californie aux États-Unis, des progrès se font à l'égard de la protection des aires naturelles dans et autour des grandes villes, malgré l'étalement urbain incessant. Bien que le grand nombre d'agences concernées puisse entraîner la confusion, le partenariat reste fréquent. Les organisations non gouvernementales jouent un rôle essentiel. On donne ici des exemples tirés des deux villes les plus grandes de l'état, Los Angeles et San Francisco. La quasi-totalité des aires protégées est gérée en vue d'une gamme de bienfaits, la biodiversité constituant un but principal, ainsi que la récréation, l'éducation et, dans bien des cas, la protection des réseaux hydrographiques. Les avantages économiques sont divers et importants. Les problèmes de gestion comprennent la fragmentation administrative et physique, les espèces envahissantes, le feu et la pollution. Les agences reconnaissent un besoin d'établir des liens avec les habitants des villes, mais les résultats sont variables. Un nouveau «parc naturel» dans un quartier pauvre de Los Angeles constitue une innovation saisissante. La Californie doit tirer bon nombre de leçons des autres pays, mais elle peut en même temps leur en offrir beaucoup.

## La mission des aires protégées urbaines au Brésil

PEDRO DA CUNHA E MENEZES ET LUIZ OTÁVIO TEIXEIRA MENDES

Au Brésil, la planification et la gestion des aires protégées de la catégorie Parc National (catégorie II de l'UICN) se sont effectuées suivant un modèle généralisé. Il y a eu très peu de différences de parc en parc, et celles qui existent ne proviennent pas en général d'une compréhension des objectifs divers de chaque parc, mais plutôt de la variabilité du niveau de financement qui leur est affecté. Il est capital de comprendre que le Système national d'aires protégées n'est pas le résultat d'une simple addition d'aires protégées égales et indépendantes, mais plutôt un tapis d'aires très diverses, qui composent ensemble et de manière complémentaire la totalité du territoire protégé du Brésil. Cette compréhension est fondamentale pour définir la mission de chaque aire protégée, y compris celles des zones urbaines, afin de mieux servir la mission du système entier.

## Lane Cove: un parc national en ville

IAN RUSSELL BROWN

Le Parc National de Lane Cove se situe dans la petite banlieue de la plus grande ville de l'Australie, à moins de huit kilomètres du quartier des affaires central de Sydney. Il compte à la fois parmi les plus petits et les plus visités des 161 parcs nationaux de l'état de New South Wales. Les environnements naturels du parc national ont beaucoup souffert de l'urbanisation qui a entraîné une perte de diversité biologique et des perturbations du fonctionnement de l'écosystème. Pour faire face au challenge de gérer le parc pour la nature dans de telles circonstances, le New South Wales National Parks and Wildlife Service (Service des parcs nationaux et de la nature de New South Wales) s'assure le concours de ses voisins et des communautés locales dans de nouveaux partenariats pour la protection de l'environnement.

## Flore et faune urbaines et aires protégées en Inde

A. PATWARDHAN, S. NALAVADE, K. SAHASRABUDDHE ET G. UTKARSH

À l'encontre de ce que l'on peut croire, les zones urbaines peuvent servir de refuges importants pour la faune et la flore, une importance qu'il faut comprendre et porter au maximum face à l'urbanisation incontrôlée qui caractérise de nombreuses régions du monde. Des études de cas faites en Inde montrent que l'évaluation de la biodiversité par des naturalistes amateurs peut fournir un outil efficace pour surveiller et planifier une urbanisation écologiquement durable. Les grandes villes abritent entre le quart et la moitié de la biodiversité totale de leur région biogéographique. Cependant, plus de la moitié de la biodiversité totale urbaine disparaît dans le centre des villes – la zone la plus touchée par les effets anthropiques. Par ailleurs, jusqu'à la moitié des organismes sont limités à quelques parcelles vestigiales de forêt, de prairie ou de marécage.



De tels refuges font souvent partie des établissements universitaires ou militaires, et il faut les reconnaître et protéger activement contre tout changement d'utilisation, afin que la biodiversité de ces réservoirs de population puisse continuer à se disséminer vers d'autres refuges urbains tels que les jardins publics ou domestiques. Des stratégies complémentaires pour favoriser la biodiversité comprennent la plantation des plantes indigènes qui fournissent du pollen et des fruits pour oiseaux, insectes et mammifères, tout en servant elles-mêmes de nourriture aux larves de plusieurs espèces de papillons. Il se peut que des poissons indigènes seront réintroduits dans les étangs et les rivières, après la suppression des espèces exotiques envahissantes telles que la jacinthe d'eau.

## **La nature en ville – biodiversité et aires protégées à Londres**

ADRIAN PHILLIPS ET HONOR GAY

Cet article donne un exposé sommaire des biens de la ville de Londres sur le plan de la biodiversité, et montre comment cette biodiversité se trouve aux endroits les plus inattendus. Londres possède beaucoup d'espaces libres, dont quelques-uns sont ou contiennent des aires protégées, selon la définition de l'UICN. Comme dans d'autres villes, les aires protégées de Londres avoisinent des millions de gens, et ont donc un valeur en outre de celui qu'elles ont pour la protection de la nature, à cause de ce qu'elles peuvent contribuer à la qualité de l'environnement immédiat et de la vie quotidienne de beaucoup de gens. Deux études de cas faites dans la conurbation londonienne indiquent que la participation à la gestion des aires protégées urbaines peut amener un accroissement de la cohésion sociale des communautés voisines; et que ces sites, bien qu'ils occupent souvent des terrains menacés par le développement, peuvent jouer un rôle principal dans l'identité de leur ville et attirer le commerce et la prospérité. Dans les aires protégées urbaines, plus que n'importe où, les buts de la gestion doivent comprendre un maximum d'accès et de bienfaits publics, en plus de la protection du paysage et des habitats.

## **Biodiversité d'importance mondiale dans les limites d'une ville: le cas du Cap en Afrique du Sud**

JEFFREY A. McNEELY

Situé très proche d'un grand centre urbain (Cape Town), la région du Cap de Bonne Espérance en Afrique du Sud possède une biodiversité d'une richesse exceptionnelle mais qui subit une pression considérable. Le tourisme intensif et l'utilisation non autorisée des ressources par des gens pauvres représentent de grandes épreuves pour la gestion. La colonisation par des espèces exotiques envahissantes et les incendies incontrôlés comptent parmi les autres menaces principales pour la biodiversité. On a fait plusieurs démarches pour essayer d'arrêter la dégradation de l'écosystème. Trois réserves naturelles, jusqu'alors indépendantes, ayant bénéficié d'un accroissement de superficie furent amalgamées en 1998 dans un seul Cape Peninsula National Park (Parc national de la presqu'île du Cap), créant ainsi une aire protégée plus viable. De l'appui international considérable (de la part du FEM [Fonds pour l'environnement mondial], du WWF [Fonds mondial pour la nature] et de l'Agence française pour le développement) a été donné à une diversité de projets régionaux qui tentent, non sans succès, d'intégrer les objectifs de la biodiversité et du développement humain pendant cette époque difficile.

# Resúmenes

## Las áreas protegidas de California: progreso a pesar de presiones de enormes proporciones

TED TRZYNA

En el estado de California, en los Estados Unidos, se han hecho progresos en la protección de áreas naturales dentro y alrededor de las ciudades a pesar del incesante crecimiento urbano. Aunque hay un número confuso de agencias que intervienen, las asociaciones entre las partes son comunes. Las organizaciones no gubernamentales tienen un rol crucial. Se presentan ejemplos tomados de dos importantes ciudades del estado, Los Angeles y San Francisco. Casi todas las áreas protegidas son administradas con el propósito de obtener una serie de beneficios. La meta principal es la biodiversidad junto con la recreación, educación y en muchos lugares la protección de las cuencas. Los beneficios económicos son variados y substanciales. Los tópicos de manejo incluyen la fragmentación administrativa y física, especies invasoras, incendios y contaminación. Las agencias reconocen la necesidad de extenderse hasta los residentes urbanos, pero su ejecución es variada. Un nuevo "parque natural" en un vecindario pobre de Los Angeles es una innovación sorprendente. California tiene mucho que aprender de otros países y mucho que compartir.

## La misión de las áreas urbanas protegidas de Brasil

PEDRO DA CUNHA E MENEZES Y LUIZ OTÁVIO TEIXEIRA MENDES

En Brasil, el planeamiento y manejo de las áreas protegidas de la categoría (categoría II de IUCN) de Parques Nacionales se ha hecho con un modelo estándar. Se han hecho muy pocas diferencias entre parques. Las diferencias, en general, no son el resultado del entendimiento de los distintos objetivos de cada parque sino el resultado de los niveles desiguales de financiamiento asignado a cada parque. Es sumamente importante entender que el Sistema Nacional de Áreas Protegidas no resulta de una suma de áreas protegidas autosuficientes e iguales, sino que es una trama de áreas muy diversas que unidas y complementándose forman el total del territorio protegido de Brasil. Esta interpretación es una herramienta básica para definir la Misión de cada área protegida individual, incluyendo aquellas en áreas urbanas, para servir mejor a la totalidad de la Misión del Sistema.

## Lane Cove: un parque nacional en la ciudad

IAN RUSSELL BROWN

El Parque Nacional Lane Cove está situado dentro de los suburbios interiores de la ciudad más grande de Australia, a menos de ocho kilómetros del distrito financiero central de Sidney. Es uno de los más pequeños así como uno de los más visitados de los 161 parques nacionales del estado de New South Wales. Los entornos naturales del parque nacional han sufrido un serio impacto causado por el desarrollo urbano, resultando en la pérdida de la diversidad biológica y el trastorno de la función del ecosistema. Para enfrentar el desafío del manejo de la naturaleza en estas circunstancias, el Servicio Nacional de Parques y Vida Salvaje de New South Wales está enlistando la ayuda de sus vecinos y comunidades locales y ha formado nuevas asociaciones con el propósito de conservación.

## La vida salvaje urbana y las áreas protegidas de la India

A. PATWARDHAN, S. NALVADE, K. SAHASRABUDDHE Y G. UTKARSH

Las áreas urbanas, contrario a la creencia popular, pueden servir como un refugio significativo para la vida salvaje; éste es un valor que necesita ser entendido y potencializado al máximo entre la urbanización desenfrenada que caracteriza muchas partes del mundo. Casos estudiados en la India muestran que evaluaciones racionales de la biodiversidad a través de naturalistas aficionados, pueden servir como herramienta eficiente para controlar y planear la preservación que la urbanización puede brindar. Las ciudades cobijan desde un cuarto hasta la mitad de la biodiversidad total en su región biogeográfica. Sin embargo, más de la mitad de la biodiversidad urbana total se

pierde en el corazón de la ciudad – la zona de mayor impacto humano. Más aún, hasta la mitad del total de los organismos están confinados a unas pocas pequeñas zonas de selvas sobrevivientes, praderas y pantanos. Tales refugios, a menudo, forman parte de una institución universitaria o son la propiedad del ministerio de defensa y deben ser reconocidos y protegidos vigorosamente de los cambios de uso del terreno, de manera que la biodiversidad de estas fuentes se mantenga y las poblaciones puedan continuar emigrando a otras zonas urbanas, tales como parques públicos y jardines domésticos. Las estrategias simpatéticas y complementarias incluyen el sembrado de plantas nativas que proveen polen y frutas para los pájaros, insectos y mamíferos, además de servir como alimentación para las larvas de los varios tipos de mariposas. Peces nativos pueden ser reintroducidos en los pantanos y ríos, después de quitar las especies foráneas tales como el jacinto acuático.

## **La naturaleza en las ciudades: la biodiversidad y las áreas protegidas de Londres**

ADRIAN PHILLIPS Y HONOR GAY

Este artículo relee brevemente los valores de la biodiversidad de Londres, mostrando el modo en que ocurre en los lugares más inesperados. Londres tiene muchos espacios abiertos, algunos de los cuales son, o contienen, áreas protegidas de acuerdo a la definición de IUCN. Como en otras ciudades, las áreas protegidas de Londres son vecinas de millones de personas y por lo tanto, tienen un valor extra por encima del de la conservación, debido a su potencialidad de poder contribuir a la calidad del entorno inmediato y a la vida diaria de mucha gente. Dos casos estudiados dentro de Londres – las marismas de Reinham y los pantanos de Barnes – muestran lo siguiente: el involucramiento en el manejo de las áreas protegidas urbanas puede conducir a una coherencia social mayor en las comunidades cercanas, tales lugares a menudo ocupan tierras que se reclaman para desarrollo pero que pueden ser cruciales para la identidad de su ciudad o pueblo y pueden atraer negocios y prosperidad. En las áreas urbanas protegidas, más que en otros lugares, los objetivos administrativos deben proveer beneficio y el máximo acceso al público, además de la conservación del medio ambiente y del paisaje.

## **Una biodiversidad significativa globalmente: el caso del Cabo de África del Sur**

JEFFREY A. McNEELY

Situada muy próxima a un gran centro urbano (Ciudad del Cabo), la excepcionalmente rica biodiversidad de la región del Cabo de Buena Esperanza en África del Sur, está sometida a una enorme presión. El turismo intensivo y el uso no autorizado de los recursos por parte de gente sumidas en la pobreza, ambos, presentan desafíos de gran magnitud para su manejo. Otras amenazas claves para la biodiversidad incluyen la colonización por parte de especies foráneas invasoras e incendios incontrolables. Se han tomado varios pasos con la intención de detener la degradación del ecosistema. Hasta ahora, tres reservas naturales independientes han sido aumentadas con el agregado de terrenos y en 1998, fueron unificadas en un Parque Nacional único de la Península del Cabo, creando un área protegida más viable. Un apoyo considerable por parte de la SGMA (Servicios Globales del Medio Ambiente), el WWF y la Agencia de desarrollo francés, ha sido otorgado a una variedad de proyectos regionales tratando de integrar con cierto éxito, durante este difícil período, los objetivos de desarrollo humano y la biodiversidad.

### **IUCN – The World Conservation Union**

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organisations in a unique world partnership: over 950 members in all, spread across some 139 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

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### **World Commission on Protected Areas (WCPA)**

WCPA is the largest worldwide network of protected area managers and specialists. It comprises over 1,300 members in 140 countries. WCPA is one of the six voluntary Commissions of IUCN – The World Conservation Union, and is serviced by the Protected Areas Programme at the IUCN Headquarters in Gland, Switzerland. WCPA can be contacted at the IUCN address above.

**The WCPA mission is to promote the establishment and effective management of a worldwide network of terrestrial and marine protected areas.**

### **IUCN – Union mondiale pour la nature**

Fondée en 1948, l'Union mondiale pour la nature rassemble des Etats, des organismes publics et un large éventail d'organisations non gouvernementales au sein d'une alliance mondiale unique: plus de 950 membres dans 139 pays.

L'IUCN, en tant qu'Union, a pour mission d'influer sur les sociétés du monde entier, de les encourager et de les aider pour qu'elles conservent l'intégrité et la diversité de la nature et veillent à ce que toute utilisation des ressources naturelles soit équitable et écologiquement durable.

Afin de sauvegarder les ressources naturelles aux plans local, régional et mondial, l'Union mondiale pour la nature s'appuie sur ses membres, réseaux et partenaires, en renforçant leurs capacités et en soutenant les alliances mondiales.

### **IUCN – Unión Mundial para la Naturaleza**

La Unión Mundial para la Naturaleza, fundada en 1948 agrupa a Estados soberanos, agencias gubernamentales y una diversa gama de organizaciones no gubernamentales, en una alianza única: más de 950 miembros diseminados en 139 países.

Como Unión, la IUCN busca influenciar, alentar y ayudar a los pueblos de todo el mundo a conservar la integridad y la diversidad de la naturaleza, y a asegurar que todo uso de los recursos naturales sea equitativo y ecológicamente sustentable.

La Unión Mundial para la Naturaleza fortalece el trabajo de sus miembros, redes y asociados, con el propósito de realzar sus capacidades y apoyar el establecimiento de alianzas globales para salvaguardar los recursos naturales a nivel local, regional y global.