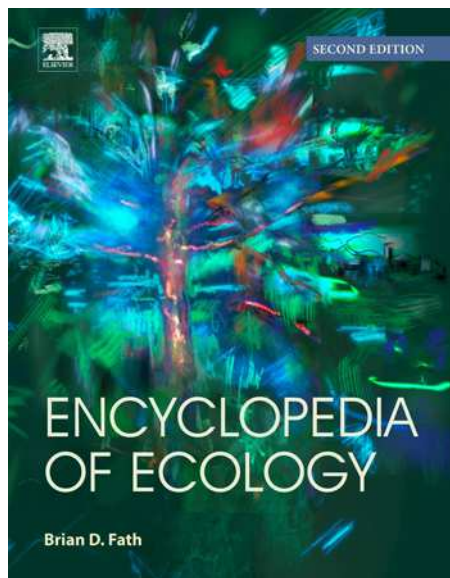


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## Protected Area

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### Introduction

Biodiversity is the key foundation of human survival and development. However, global biodiversity is declining rapidly and has become the most severe factor threatening safety of humanity. From 1970 to 2012, the global wildlife populations fell by 58%, and we may witness a 2/3 decline during the period from 1970 to 2020. Protected areas (PA) have long been the cornerstone of biodiversity conservation tactics. PAs are critical for maintaining a healthy environment for people and nature. They are essential for biodiversity conservation and vital to the cultures and livelihoods of indigenous peoples and local communities. They also deliver clean air and water, bring benefits to millions of people through tourism, and provide protection from climate change and natural disasters.

IUCN defines protected areas as “A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.” In view of the global current and future population, development trend and crisis pressure, the limited funds, scientific research, manpower, technology, time, etc. must be focused on the most important hot spots and key areas—PAs.

### History and Current Status

PAs have a long history. For example, India set aside specific areas for the protection of natural resources over 2000 years, Europe protected some areas as hunting grounds nearly 1000 years ago. Punkaharju Esker Nature Reserve established in 1843 in Finland is one of the oldest PAs in the world. The first true national park came in 1872 with the dedication of Yellowstone by United States law “as a public park or pleasuring ground for the benefit and enjoyment of the people.” 1866, the British Colony of New South Wales in Australia reserved 2000 ha of land for protection and tourism. Later additions created a park complex now known as the Blue Mountains National Park. In 1885, Canada gave protection to hot springs in the Bow Valley of the Rocky Mountains, an area later named Banff National Park. China's first PA could be the Nanhaizi—a royal hunting ground back to 1000 BC. Nanhaizi was the biggest wetland in South Beijing with 216.5 km<sup>2</sup> which was bigger than Beijing city in Qing Dynasty (1636–1912). It preserved the last population of David's deer which is endemic species of China. Before Nanhaizi was destroyed in 1900, some deer were sent to Europe and population expanded. After more than 80 years, 20 deer were reintroduced back to China and now the population increased to 3000. This demonstrated that Nanhaizi could be considered as a PA.

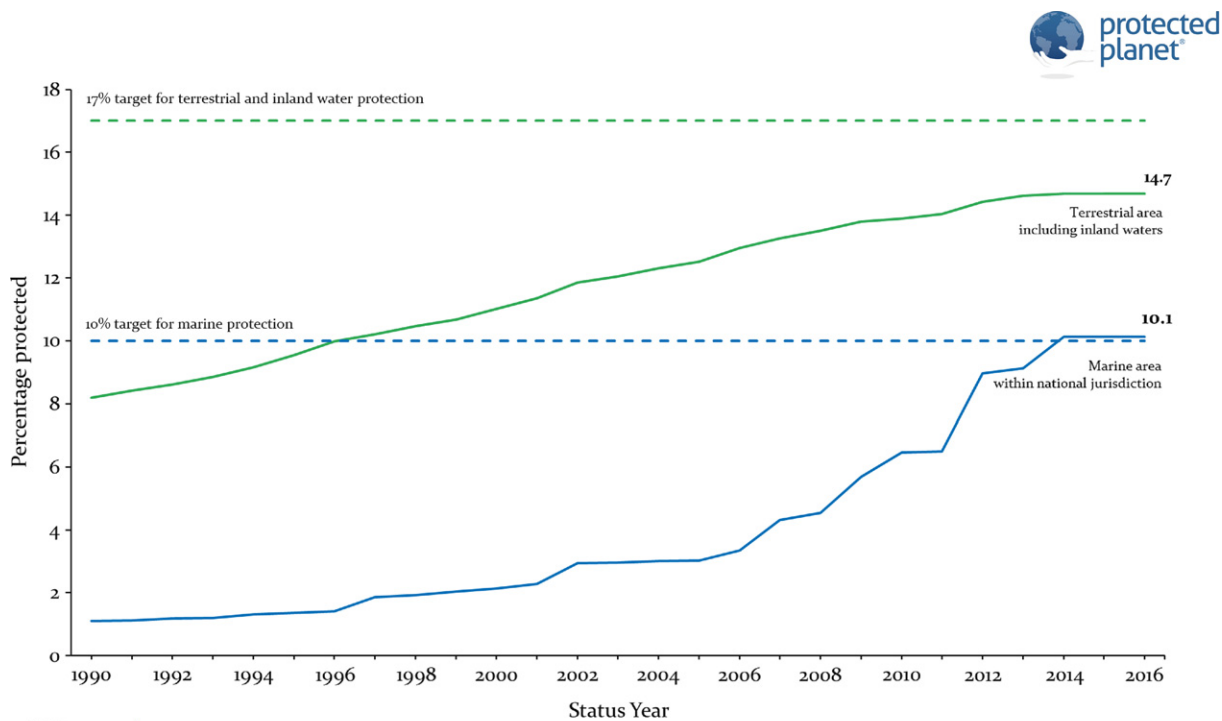
The modern PA movement has 19th century origins in the then “new” nations of Australia, Canada, New Zealand, South Africa, and the United States, but during the 20th century the idea spread around the world. The result was a remarkable expansion in the number of PAs. Nearly every country passed PA legislation and designated sites for protection. PAs continue to be established, and received a boost in 2004 when the Convention on Biological Diversity (CBD) agreed an ambitious Program of Work on PAs (Fig. 1).

The expansion history largely depending on political status of each country. The modern PAs in China were started to establish in 1956, with the first 20 years increased very slow due to cultural revolution, started to increase quickly from 1980s when the country opened to the world, and got its fastest development in numbers, areas and management quality since early 21st century. Now PAs have reached to over 10,000 occupying over 18% of the terrestrial land of China.

Realizing the importance of PAs to biodiversity conservation and therefore for survival of human being, the world's governments have committed to establish and manage PAs through Sustainable Development Goal Targets 14.5 (marine), 15.1 (terrestrial and freshwater), and 15.4 (mountains), Aichi Target of CBD 11 of the Strategic Plan for Biodiversity 2011–20, and numerous other international agreements such as the World Heritage Convention and the Ramsar Convention on Wetlands. By April 2016, under 15% of the world's terrestrial and inland waters, just over 10% of the coastal and marine areas within national jurisdiction, and approximately 4% of the global ocean are covered by PAs (Fig. 2). The Parties of CBD have agreed 20 “Aichi Targets” in which Aichi Target 11 addresses PAs, calling for at least 17% of terrestrial and inland water, and 10% of coastal and marine areas to be established by 2020, including especially areas of particular importance for biodiversity and ecosystem services that are conserved through effectively and equitably managed, ecologically representative and well-connected systems of PAs and other effective area-based conservation measures, and are integrated into the wider landscapes and seascapes.

### Role of PAs

Ensuring a more sustainable future for people and the planet will require greater recognition of the important role that PAs play in underpinning sustainable development. PAs are a key part of national and local responses to address harmful incentives to



Source: IUCN and UNEP-WCMC (2016). The World Database on Protected Areas (WDPA) [On-line], April 2016, Cambridge, UK: UNEP-WCMC. Available at [www.protectedplanet.net](http://www.protectedplanet.net)



Fig. 1 Development of protected areas in the World.



Source: IUCN and UNEP-WCMC (2016). The World Database on Protected Areas (WDPA) [On-line], April 2016, Cambridge, UK: UNEP-WCMC. Available at [www.protectedplanet.net](http://www.protectedplanet.net)



Terrestrial protected areas Marine and coastal protected areas



Fig. 2 Map of protected areas in the World in 2016.

biodiversity, biological invasions, anthropogenic impacts and climate change challenges will help to halt biodiversity loss, improve food and water security, increase the resilience of vulnerable human communities to cope with natural disasters, and promote human health and well-being. PAs also play a key role in enhancing fish stocks and strengthening sustainable management of fisheries, and PAs in landscapes can promote sustainable production of natural resources in areas under agriculture, aquaculture and forestry.

However, the role of PAs largely depends on the management effectiveness. Conservation effectiveness of PAs varies in PAs and countries, with some showing positive on habitat or species conservation and some negative. However, selected studies that had counterfactual assessments of PAs, either of species populations or habitats, where outcomes could be attributed to PAs. Evaluation on change in the Red List Index for species for which PAs cover more than half of their important sites (key biodiversity areas) relative to those species for which less than half of their key biodiversity areas are protected, the result showed that the rate at which species are sliding toward extinction was halved for species with more than half of their range inside PAs. Globally, the Living Planet Index reports an average decline in vertebrate populations of 52% from 1970 to 2015. The same index of vertebrate populations for PAs shows a decline of only 18%. The synthesis in 2015 concluded that partial PAs significantly enhanced density and biomass of fish relative to open fishing areas, while fully no-take reserves in turn yielded a significantly higher biomass of fish relative to partially PAs.

A global analysis of the effectiveness of the full range of marine PAs found that, on average, coral cover within marine PAs remained constant, while coral cover on unprotected reefs declined, although the differences were not statistically significant. While the short-term differences between unprotected and protected reefs were not statistically significant, the trend in the differences could be significant over the long-term if the trends remained constant. Their results also suggested that older marine PAs were generally more effective in preventing coral loss.

### Problems Existing in PA Management

These PAs are cornerstones of biodiversity conservation policy in the world and important in maintaining ecosystem functions and services. It is also the case, however, that obsolete, unreasonable, or unbalanced planning and legal protections for PAs make the overall management of these different PAs very poor. The many roles PAs could play in biodiversity conservation, therefore, far from being fulfilled.

Many PAs are not yet fully implemented or managed. Marine PAs are lagging far behind land and inland water PAs although there are now great efforts to rectify this situation. This is necessary because although the rate of growth has been impressive, many PAs have been set up in remote, unpopulated or only sparsely populated areas such as mountains, ice-fields and tundra and there are still notable gaps in PA systems in some forest and grassland ecosystems, in deserts and semideserts, in fresh waters and, particularly, in coastal and marine areas. Many of the world's wild plant and animal species do not have viable populations in PAs and a substantial proportion remain completely outside PAs.

The tension between community development and biodiversity conservation can be difficult to resolve. A large number of key ecological-function areas are located in impoverished and underdeveloped regions. Restrictions on resource use in these areas need to be accompanied by better compensation mechanisms and support policies.

Following are the key areas for improving effectiveness of PA management.

### PA Management Categories

PAs are by no means uniform entities however; they have a wide range of management aims and are governed by many different stakeholders. At one extreme a few sites are so important and so fragile that no-one is allowed inside, whereas other PAs encompass traditional, inhabited landscapes and seascapes where human actions have shaped cultural landscapes with high biodiversity. Some sites are owned and managed by governments, others by private individuals, companies, communities and faith groups. PAs in China could be described using established national categories, such as nature reserves, scenic and historic areas, and forest parks, as well as international categories, such as natural and mixed heritage sites, wetlands of international importance, global geo-parks, and biosphere reserves, as well as new categories as national parks since 2013, and they are current now managed by a dozen governmental departments. There are also quick investment to establishing private PAs for commonweal with donation funding from private companies.

In order to speak a common language, The IUCN developed PA management categories as an important global standard for the planning, establishment and management of PAs, recognized by the CBD and adopted by many countries. Due to PAs exist in an astonishing variety—in size, location, management approaches and objectives, the IUCN PA management categories are not a straitjacket but a global framework to guide improved application of the categories.

IUCN first effort to develop the PA management categories was in 1934 and after many revisions, the IUCN General Assembly meeting approved the new system in 1994 and the first guidelines were published by IUCN and the World Conservation Monitoring Centre (WCMC) later that year. IUCN secured the endorsement of the system by the CBD, at the seventh Conference of the Parties in February 2004. The latest revision was done in 2008 with publication of Guidelines for Applying PA Management Categories. The current version of the IUCN PA management categories are summarized below.

Ia *Strict nature reserve*: Strictly protected for biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.

Ib *Wilderness area*: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.

II *National park*: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational, and visitor opportunities.

III *Natural monument or feature*: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.

IV *Habitat/species management area*: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.

V *Protected landscape or seascape*: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI *PAs with sustainable use of natural resources*: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level nonindustrial natural resource use compatible with nature conservation is seen as one of the main aims.

The category should be based around the primary management objective(s), which should apply to at least three-quarters of the PA—the 75% rule.

More and more countries have adopted the IUCN PA management category system, including Australia, South Korean, New Zealand, Canada, South Africa, Laos, and India.

## PA Zonation

Many PA however promote multiple-uses (and are thus not only focused on nature conservation) or suffer from human disturbance inside their borders. One option to answer the challenges of combining the needs of economic and social development and the ecological requirements of the species and habitats that PA seek to protect is to design zoning schemes inside PA. Such zoning schemes can spatially and temporally refine the list of activities allowed and banned through the mapping of “functional zones.” Different zoning models are used in different countries and within single countries. The UNESCO's Man and the Biosphere Programme (MAB)'s system of core, buffer and transition zones holds considerable influence and many countries adopted a similar system with three zones, given different names by different countries. Starting to become widespread in the 1980s, buffer zones are some of the most common zoning tool and are usually defined as zones where only a limited list of nondestructive activities are allowed, and located between strict conservation zones and zones outside the PA. However, the zonation system is too crude and failed guide PA management practices. More detailed zonation system, with clear zoning names referring to management strictness, clear allowed activities, level of impact to nature and permit management systems should be established and promoted around the world, is believed to be more effective to improve management level of PAs (Table 1).

## System Planning

System planning is an organized way to carry out conservation planning for PAs at the macro level. It is recognized as a key management principle for increase the effectiveness of in situ biodiversity conservation. As explained by IUCN-WCPA, system planning in relation to PAs is about: (a) defining the priority of PAs as a worthwhile national concern; (b) defining the relationships between different units and categories of PAs, and between PAs and other relevant categories of land or sea; (c) taking a more strategic view of PAs; (d) defining roles of key players in relation to PAs and the relationships between these players; this may include building support and a constituency for PAs; (e) identifying gaps in PA coverage (including opportunities and needs for connectivity) and deficiencies in management; and (f) identifying current and potential impacts—both those affecting PAs from surrounding land or sea, and those emanating from PAs which affect surrounding land or sea.

Over the years, IUCN-WCPA has developed guidelines on the main characteristics and considers that the main characteristics of a PAs system should include:

- *Representativeness, comprehensiveness and balance*: ability to represent or sample the full variety of biodiversity and other features such as landform types, and landscapes or seascapes of cultural value, so as to protect the highest quality examples, especially threatened and underprotected ecosystems, and species globally threatened with extinction.
- *Adequacy*: supporting the viability of ecosystem processes as well as species, populations and communities that make up the country's biodiversity.
- *Coherence and complementarity*: the extent to which each site makes a positive contribution to the system as a whole.

**Table 1** Proposed PA zonation system

<i>Zone name</i>	<i>Description</i>	<i>Activities allowed</i>	<i>Impact on biodiversity</i>	<i>Restrictions on activities</i>
1. Closed zone	Sanctuaries for species very sensitive to disturbances. Human disturbances strictly controlled	Nondestructive scientific monitoring Enforcement patrols and footpaths Fireproofing Very limited religious practice in sacred sites	Very low	Permit needed for scientific research. Religious practice limited to a very low number of individuals requiring permits
2. Active management zone	Areas where limited human intervention is necessary to manage and restore habitats in order to achieve the conservation goals	Habitat and species management (including through grazing) Ecological restoration Local species reintroduction Small-scale expeditions guided by PA staff Scientific research with little disturbance (e.g., specimen collection, interventionist conservation experiment) Trail for motorized vehicles (staff only)	Positive to low  Low	Permit needed for scientific research and expeditions
3. Limited use zone				
3A. Limited visitor use zone	Areas for light visit, tourism and recreation	Nature tourism Access roads, weather shelters, rest pavilions, camp sites Traditional wilderness-based lifestyle and customs, (low densities and in ways compatible with the conservation objectives)	Medium	Tourism submitted to entry fees. No high impact accommodation or recreational activities unrelated to the nature area (golf, etc.). Control on access roads
3B. Limited resource use zone	Areas for sustainable natural resource utilisation	Hunting (if allowed by national laws) Fishing Collection of wild nontimber forest products (NTFP) Grazing	Medium Medium <sup>a</sup>	Resource use permit system ensuring the viability of populations
4. Reasonable use zone	Areas for PA management, heavier tourism and local residents	Tourist centre (accommodations, etc.) High intensity tourist areas Staff housing PA administration office areas Parking Residential areas Small-scale agriculture for auto-consumption in the PA	High	Ban on fertilizer and pesticide use wherever it can impact water quality or feeding habitats
5. External support zone (outside the PA)	Areas outside the PA but submitted to increased environmental scrutiny and collaborating closely with PA managers. The aim of such areas is to mitigate the impacts of surrounding human activities and PAs on each other	Large-scale agriculture Plantations Fish ponds Extractive industries, pipelines, power lines, cell phone towers, etc.	Very high <sup>a</sup> Very high	Ban on fertilizer and pesticide use wherever it can impact water quality or feeding habitats. Extractive industries, etc. submitted to environmental impact assessment and a no net loss of biodiversity standard

<sup>a</sup>These activities can have a positive impact if they are part of species or habitat management actions (implemented in a two active management zone). Unless stated otherwise, the impact described in column "impact on biodiversity" is negative.

- *Consistency*: the application of management objectives, policies and classifications to individual sites under comparable conditions in standard ways.
- *Cost-effectiveness, efficiency and equity*: an appropriate balance between the costs of and benefits flowing from PAs, equity in their distribution, and efficiency in terms of the minimum number and size of PAs needed to achieve system objectives.
- *Persistence*: the ability to promote the long-term survival of biodiversity contained within a PA by maintaining natural processes and viable populations and by excluding or overcoming threats.
- *Resilience*: the ability to adapt and sustain primary conservation objectives of the site and the system overall in the face of climate change and other global change factors.

## Legislation and Enforcement

The global conventions noted below as the main instruments concerning a nation's PAs are the CBD, UNESCO's World Heritage Convention, the Ramsar Convention and the Conservation of Migratory Species of Wild Animals (CMS). Some regional law instruments spell out important commitments and guidance for PA legal frameworks, such as African Convention on the Conservation of Nature and Natural Resources, Convention on the Conservation of European Wildlife and Natural Habitats, Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, UNESCO Man and the Biosphere Programme. Many of these commitments, as with global treaties, generate national obligations that require legislative action for implementation.

At the national level, over last 100 years, almost all countries have issued relevant legislation to secure PA supervision and management. However, legislation status varies largely among different countries and different regions. Some countries have issued laws or regulations for each PA types, such as Republic of Korea and Japan. Although diverse legislation make implementation more flexible, but duplication, gaps or contradiction among different legislation could bring problems when implementing laws. To address the issue, some countries have issued one unified law to manage all PAs. For example, Federal Nature Conservation Act 2002 of German, National System of Conservation Units 2000 of Brazil, PA Act 2003 of South Africa, PA Act (1949 revised 2015) of Kenya, National Integrated PAs System Act 1992 of Philippines, and PA System Act 1997 of Peru. Australian government issued Environment Protection and Biodiversity Conservation Law to replace several legislations issued before and unify management standards of all types of PAs. There are also many countries have include PAs managed by indigenous or local communities and private PAs into national PA management system. By 2011, Australia have 42 indigenous PAs, about 1/4 of national PA system, and India has several thousand community PAs around the whole country.

However, many countries PAs are governed not by legislation but by a patchwork quilt of administrative rules, regulations, and guidelines issued by various departments and agencies. This means, of course, that the existing legislative framework is insufficient to deal with some of the major threats to PAs, and this is a major reason why critics of PAs in these countries have referred to them as "paper parks," saying that they are characterized by the "threewithouts." They are without a management agency, without staff, and without recurrent funding.

Good legislation would largely improve PA management effectiveness. IUCN Guidelines to Legislation of PAs lists following important elements to be included into PA legislations based on good practices in the world: Policy and objectives, Institutional arrangements, Planning for PAs, Establishment of PAs, PAs management, Conservation agreements, Regulated activities, Compliance and enforcement, Environmental and social impact assessment, and Special financial tools.

## Community Participation

Local people in and around PAs has long history of coexisting with nature, and their traditional culture and knowledge are part of the nature. Governments and PA managers should incorporate customary and traditional resource use, and control systems, as a means of enhancing biodiversity conservation. WWF and IUCN/WCPA have adopted principles and guidelines concerning indigenous rights and knowledge systems, consultation processes, agreements between conservation institutions, decentralization, local participation, transparency, accountability, sharing benefits and international responsibility. The five principles are as follows:

*Principle 1:* Indigenous and other traditional peoples have long associations with nature and a deep understanding of it. Often they have made significant contributions to the maintenance of many of the earth's most fragile ecosystems, through their traditional sustainable resource use practices and culture-based respect for nature. Therefore, there should be no inherent conflict between the objectives of PAs and the existence, within and around their borders, of indigenous and other traditional peoples. Moreover, they should be recognized as rightful, equal partners in the development and implementation of conservation strategies that affect their lands, territories, waters, coastal seas, and other resources, and in particular in the establishment and management of PAs.

*Principle 2:* Agreements drawn up between conservation institutions, including PA management agencies, and indigenous and other traditional peoples for the establishment and management of PAs affecting their lands, territories, waters, coastal seas, and other resources should be based on full respect for the rights of indigenous and other traditional peoples to traditional, sustainable use of their lands, territories, waters, coastal seas, and other resources. At the same time, such agreements should be based on the recognition by indigenous and other traditional peoples of their responsibility to conserve biodiversity, ecological integrity and natural resources harbored in those PAs.

*Principle 3:* The principles of decentralization, participation, transparency and accountability should be taken into account in all matters pertaining to the mutual interests of PAs and indigenous and other traditional peoples.

*Principle 4:* Indigenous and other traditional peoples should be able to share fully and equitably in the benefits associated with PAs, with due recognition to the rights of other legitimate stakeholders.

*Principle 5:* The rights of indigenous and other traditional peoples in connection with PAs are often an international responsibility, since many of the lands, territories, waters, coastal seas and other resources which they own or otherwise occupy or use cross national boundaries, as indeed do many of the ecosystems in need of protection.

*See also:* Ecosystems: Ecosystems. Human Ecology and Sustainability: Environmental Protection and Ecology

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