HISTORY OF BIODIVERSITY CONSERVATION, PROTECTED AREAS AND THE CONSERVATION MOVEMENT

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Summary

Biodiversity is crucial for the existence of life on Earth, but it is currently under threat at a rate unprecedented since the extinction of the dinosaurs and the threat is due to human activities. *In situ* conservation (especially through protected areas) is by far the most efficient way to maintain important areas of biodiversity.

Historically, protected areas were not established for biodiversity conservation, but to maintain hunting lands for royalty and the landed gentry, to meet cultural and religious needs, or for aesthetic and recreational purposes. Different countries have recognized the value of their natural resources at different times, most frequently as these resources have been depleted. This has led to some striking differences between the developed and undeveloped world.

Early conservation reserves focused on the larger, obvious, popular, and charismatic species (e.g., forests, vertebrates), rather than on the species composing the bulk of biodiversity (e.g., nonvascular plants, invertebrates). Under global and local approaches, the challenge is now to assess and protect elements of biodiversity in a comprehensive, adequate, and representative (CAR) manner.

The conservation movement grew from various roots, including the vulnerability of tropical island Edens, the desire to preserve the landscapes of the New World, animal

protection groups, and nuclear protesters. The movement split early into the wise-use and preservationist streams, proposing respectively that resources could be utilized without affecting natural values, or that natural values should be preserved in reserves isolated from human intervention. Various philosophical bases underlie the movement including deep ecology, ecofeminism, and social ecology. Green political parties appeared in the 1970s and are now a force in many countries. Some arms of the conservation movement have become more militant and adept in the use of the media, while other threads have adopted a grass-roots, local approach to problems of land and water management.

1. Global Overview

The accelerating rate of global change has emphasized the urgency of the need to conserve biodiversity and to protect areas of biological significance. Key environmental problems include overuse of resources, habitat destruction, pollution and degradation, inappropriate land use, loss of threatened species, climate change, and the translocation of pests and diseases.

These problems, and the pressure that they place on natural systems, magnify as human populations grow and societies develop. Our understanding of many environmental issues and the solutions required is limited due to lack of knowledge of the detailed workings of many ecological systems and processes. Even where this knowledge is available, problems may be exacerbated by a lack of awareness among the general population, and by a lack of resources, funding and, frequently, political will to address these difficulties.

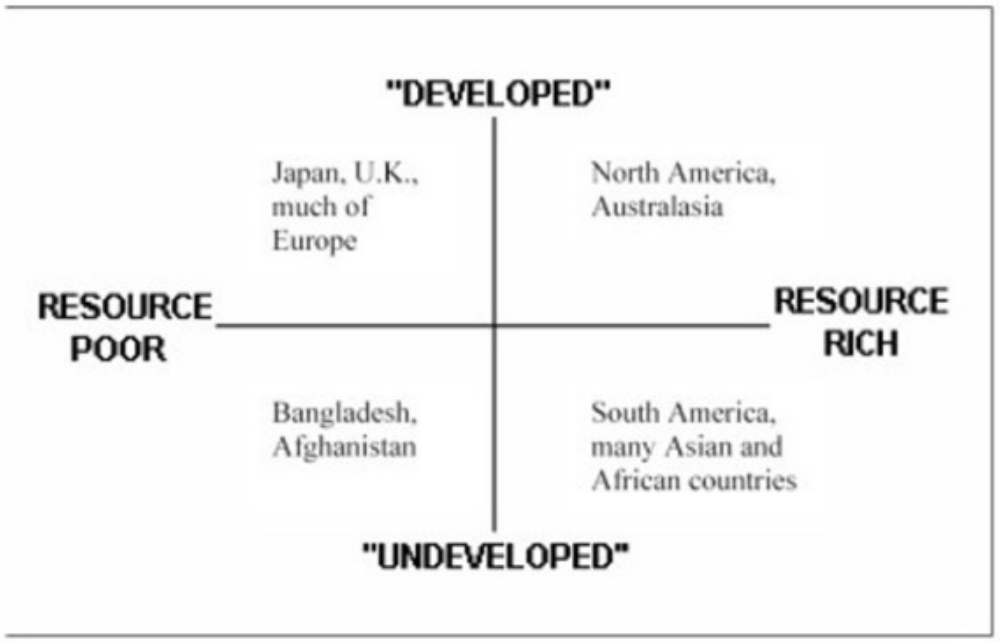

Figure 1. A matrix of global resources and development

Although the problems are global and their broad outcomes can be judged, individual comparisons and generalizations are often difficult given the varied policies and specific issues that exist in different provinces, countries, and continents. Broad-scale differences exist between "developed" countries, which have relatively few remaining, but highly valued, natural resources, and "undeveloped" countries, which still possess many natural resources, but are often prone to undervalue and exploit them. These extremes produce different pressures and approaches to conservation. Some Southern Hemisphere countries, such as Australia, are in the unusual position of being developed countries with a high level of natural resources remaining.

A global approach to dealing with biodiversity conservation and the need for protected areas has been promoted through the United Nations. The development of this approach has involved several processes for assigning protected status to geographic areas and features of global significance. Key steps have included:

- the establishment of the IUCN, or World Conservation Union, in 1948, and the subsequent development of the World Commission on Protected Areas and the IUCN Protected Areas Program;
- the establishment of the World Wildlife Fund (now the Worldwide Fund for Nature) in 1961;
- the United Nations Environment Program, established following the United Nations Conference on the Human Environment in 1972, and leading to the creation of the World Conservation Monitoring Center;
- the Convention Concerning the Protection of the World Cultural and Natural Heritage (the World Heritage Convention) in 1972, the establishment of the World Heritage Committee, the World Heritage Area program, and other programs of similar aims (e.g., UNESCO's Man and Biosphere Reserve Program);
- the World Commission on Environment and Development (the Brundtland Commission) in 1987;
- the 1992 Earth Summit (the United Nations Conference on Environment and Development) leading to the Framework Convention on Climate Change and, critically, the International Convention on Biological Diversity, and subsequent development of related biodiversity protection programs in individual countries and provinces;
- various related and complementary conventions, including the Ramsar Convention on Wetlands (1971), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975), the Convention on Migratory Species (1975), and the Convention on the Conservation of Antarctic Marine Living Resources (1980); and
- the continued development of new international network programs, including the International Biodiversity Observation Year (2001–2002).

This article aims to give an overview of global biodiversity conservation and the development of protected areas, alongside a history of the development of the conservation movement. Specific examples are given from an Australian perspective to demonstrate the similarities and differences that particular countries may display from global trends.

2. History of Biodiversity Conservation and Protected Areas

2.1. Biodiversity Conservation

2.1.1. Biodiversity

Biodiversity, or biological diversity, is essentially the variety of life on Earth: the plants, animals, and microorganisms from all terrestrial, freshwater, and marine environments, their genes, and the intricate ecological communities and systems in which they exist. Diversity occurs within and between species, and within and between ecosystems, to provide the intricacy of our natural environment.

Different habitats and geographic areas support different levels of biodiversity: different numbers and types of species, and different interactions between them. Tropical forests are estimated to contain at least half of Earth's species, while reefs, wetlands, coastal mangroves, tropical regions, and mountains also represent areas of high productivity and biodiversity. Biodiversity is high wherever there is good water and soil, and where conditions are stable or at least predictable, but it can also be high in environments that may initially appear barren and inhospitable.

Biological diversity is essential to our continued survival. It provides our food, fiber, fuels, medicines, and timber and other materials for shelter and various purposes. It harnesses energy, cleanses and maintains our environment, detoxifies and decomposes wastes, and recycles oxygen, water, and nutrients. It stabilizes and moderates climate, and provides extensive recreational, religious, and aesthetic values. None of these benefits come from a single source, but instead from the combined activities of the myriad different species that compose the ecosystems in which we live.

Estimates place the total number of living species on earth at ~13 million, but this figure may vary as widely as from 3 million to 100 million. Of these, ~1.75 million species have been identified, but most of these—and the interdependence between their ecosystems and human societies—are poorly understood.

2.1.2. Biodiversity Problems

Species are currently being lost at an unnatural, accelerated rate. The Secretariat of the Convention on Biological Diversity (SCBD) has reported that species have been disappearing at 50–100 times the natural rate, while the IUCN suggests that the current species extinction rate may have accelerated to 100–1000 times higher than the natural rate. At current extinction rates, it has been projected that Earth will lose 20% of all its living species by 2020. This represents a new mass extinction event, at a rate unseen since the disappearance of the dinosaurs, and, because of its unknown environmental consequences, must rate as one of humankind's greatest threats.

Even without the loss of species, the loss of genetic diversity within species, through massive reductions in numbers or range, represents a loss of robustness as well as of traits of potential value to both biotechnology and traditional activities (e.g., agriculture

and food production). The SCBD estimates that ~45% of Earth's original forests and 10% of its coral reefs are gone, with much of the remainder in imminent danger.

Such losses may be compounded by natural events, but there is little doubt that the bulk of species extinctions are directly and indirectly due to human activities. Causes frequently act in concert, and include:

- habitat loss and fragmentation (this is considered the main threat to 85% of IUCN Red List (threatened status) species through vegetation clearance, fire and, overuse);
- competition from invasive species;
- pollution;
- global climate change;
- desertification;
- salinization;
- population growth and overconsumption; and
- unsustainable use of natural resources.

2.1.3. Biodiversity Conservation

Two major tenets exist for the conservation of biodiversity. The first is an ecosystem rather than a single-species approach, while the second is the principle of sustainable use: the use of natural resources in ways and at rates that do not lead to the long term decline of biodiversity, therefore maintaining its ability to meet the needs of present and future generations.

Specific approaches to the conservation of biodiversity are:

- *in situ* conservation (in natural habitat);
- *ex situ* conservation (zoos, aquaria, botanic gardens, gene banks);
- use of international conventions and agreements; and
- modifying behavior (raising awareness, and promoting informed consumer choice).

In situ conservation, through habitat protection, rehabilitation, and prevention of impacts is by far the most important of these approaches. It is in this way that protected areas have come to be recognized as central to conservation as repositories of biological diversity.

2.2. Protected Areas

A protected area is a geographically defined area designated or regulated and managed to achieve specific conservation objectives. Such areas include national parks, nature reserves, sustainable use reserves, wilderness areas, and heritage sites. The IUCN defines an internationally recognized protected area as an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

The precise purposes for which different protected areas are designated and managed may vary greatly within this definition, and the protection of wilderness and biological diversity may be coupled with (or even outweighed by) aesthetic, cultural, recreational, educational, or research related purposes. In some cases, reserves may even be established by industries to ensure resource security. To account for these variations, the IUCN has formally defined six categories of international protected areas (Table 1). For all of these, the area should be a size appropriate to ensure the protection of the values for which it is reserved.

CATEGORY	MANAGEMENT OBJECTIVE
Category Ia	**Strict Nature Reserve: protected area managed mainly for science.** Defined as an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
Category Ib	**Wilderness Area: protected area managed mainly for wilderness protection.** Defined as a large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
Category II	**National Park: protected area managed mainly for ecosystem protection and recreation.** Defined as a natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
Category III	**Natural Monument: protected area managed mainly for conservation of specific natural features.** Defined as an area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
Category IV	**Habitat/Species Management Area: protected area managed mainly for conservation through management intervention.** Defined as an area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
Category V	**Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation.** Defined as an area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological, and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
Category VI	**Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.** Defined as an area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

Table 1. Categories of internationally recognized Protected Areas
Source: IUCN (1994). *Guidelines for Protected Areas Management Categories*, 261 pp. Cambridge, UK and Gland, Switzerland: IUCN.

Note: The following categories recognise and formalise many of the approaches currently and historically taken in the declaration of Protected Areas, including conservation, recreation, and aesthetic considerations. Where sites do not meet the

international criteria (e.g. where they are established under varying National criteria), the World Conservation Monitoring Centre recognises them as Category Unassigned in Protected Area lists. In all cases, the size of a Protected Area should encompass the area of land or water required to meet its management objective.

A variety of further classifications may be used at national and regional levels for different countries, and, as will be described, the conditions and opportunities available for the establishment of protected areas may vary according to the age and status of the country in question. Historically, however, protected areas were not established for the conservation of biological diversity, or even necessarily for conservation per se.

2.2.1. Origins of Protected Areas

The development of conservation actions and the declaration of protected areas have had different origins in different countries, with many different cultural underpinnings in attitudes to landscape and nature. In many cases, reserved areas were originally set aside to ensure a continuing resource, or for recreational or aesthetic purposes, usually for the benefit of royalty or a colonial elite, rather than for conservation per se. In Britain and many parts of Europe, protected areas developed primarily through the declaration of royal hunting grounds and land preserved by the landed gentry. In China and Japan, reserved areas were set aside specifically for a religious elite. In Finland, protected areas developed in the nineteenth century from the application of hunting and forest use regulations, while, in nineteenth-century Germany, they were initially established to protect natural beauty and landscape values.

The protection and reservation of natural areas followed increasing urbanization in the western world in the nineteenth century. Initially, these reservation efforts focused on small-scale parks within cities, such as Victoria Park in London (1842)—the first public park in England—and Central Park in New York (1853). In Australia, it was the urban parks (particularly in Melbourne) that laid a foundation of aesthetic/environmental values that were seen as a major contributor to the health and well-being of city residents, and these were frequently referred to as “Lungs of the City.”

Recreation played a major role in the establishment of these protected areas in many countries. The world’s first national park at Yellowstone (USA) was established in 1872 “for the benefit and enjoyment of the people” and to stop commercial monopolization, rather than solely for conservation. Early national parks and reserves in Australia from 1879 to the early 1900s were also predominantly established for recreation. Along with the United States and Bulgaria, Australia possesses one of the earliest formal national park systems in the world, following closely on the establishment of Yellowstone. Early Australian wildland reserves were established at Wombeyan (1865) and Jenolan (1866), while Australia’s first (and the world’s second) national park was established at Royal Park near Sydney in 1879. Reserves in Tasmania were established “for scenic purposes” under the Waste Lands Act in 1863, and the state possessed the first Australian authority (the Scenery Preservation Board) established for the creation and management of parks and reserves.

The focus of protected areas has subsequently developed and changed. By the 1960s, social/recreational values were considered alongside the aesthetic values of protected areas in Germany and other countries. More recently, this focus has come to be dominated by a philosophy of nature conservation, combined with a thrust towards land management rather than outright protection. Conflicts between recreational use and conservation have become recognized the world over, whether in Australia, Portugal, Bulgaria, or beyond. Within Russia, a country covering a vast geographic range, nature reserves cover an enormous network. These reserves fall into a wide range of classes based on whether they are protecting natural and cultural heritage, or whether they are for recreational use or scientific and conservation education. It is acknowledged that some areas within Russia are protected in name only, and only towards the end of the twentieth century has the conservation movement gained momentum in that country. As with many other countries the world over, however, social change and both economic and political reform have drastically reduced enforcement and resourcing for these areas (by 90% since 1989).

Different objectives behind the development of reserves—combined with historical time scales, rates of change, and technological advancement—also influenced the style and size of areas reserved in different countries. Within Europe, reserved woodlands form part of an intermixed mosaic of villages, farmlands, and developed areas, while in more recently developed areas (e.g., North America) reserves tend to be larger, more extensive, and at a distance from developed areas. Australia, Canada, and the United States are countries of broadly similar culture, age, and history, and they have established national parks covering similar percentages of their land area. The two North American countries have fewer parks than Australia, but these are generally much greater in size and provided with greater and more direct funding and resources.

The desirability of such large reserves was recognized in the United States in the late 1800s, but these in turn present their own problems. While continued loss and fragmentation of habitat needs to be urgently addressed in western Europe, management of large reserves in the United States—as in Russia—requires significant resources to address problems such as large-scale poaching. (Ecological rather than single-species approaches to habitat management will be discussed in following sections.)

The reasons why protected areas are declared, and their subsequent development for recreational or conservation purposes, also dictates their location, size, and the levels of resourcing and enforcement that they may receive. Sweden possesses 1175 protected natural areas, most commonly for recreational reasons. The perceived importance of recreational values increased in the mid-1960s, and protected areas established for these reasons are much larger and closer to cities than those established for scientific reasons alone.

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Biographical Sketches

Niall Doran was born in the United Kingdom, but now resides in Australia. He graduated with a PhD in zoology from the University of Tasmania, and works primarily as an invertebrate ecologist. His areas of research interest have involved spiders, cave fauna, freshwater crayfish, threatened species management, and microcrustacea. He was directly involved in the preparation of the Tasmanian Biodiversity (Nature Conservation) Strategy in 2000–2001, and is currently working in World Heritage Area (Fauna) Section of the Tasmanian Department of Primary Industries, Water, and Environment.

Alastair Richardson was born and educated in the United Kingdom. After completing a BSc (Hons) and PhD at the University of Exeter he moved to Australia in 1972, joining the staff of the Department of Zoology in the University of Tasmania in Hobart. His research interests include the ecology and evolution of freshwater and terrestrial crustaceans, and he teaches ecology and biogeography. He is involved in expert panels dealing with threatened species protection and forestry practices in Tasmania.