

Evolution of the system of protected areas in Western Australia

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Summary

The Western Australian system of protected areas (PAs) covers more than 15 million ha and is the second largest conservation estate of the Australian continent. An analysis of the history of the creation of PAs in Western Australia shows that the concept of nature conservation through reserves was slow to emerge. During the early decades of the century, reserves were mainly created for their recreation values. The lack of governmental interest in nature conservation led to a belated development of reserve coverage up to the 1950s, while vast areas of land were opened to farming and pastoralism. Following two scientifically-based reviews of the PA system, the number and coverage of PAs increased dramatically up to the late 1970s. The rationalization of the vesting and managerial responsibilities for PAs was only finalized in the 1980s. Since then, there has not been any large increase in PA area but a consolidation of the PA coverage. The development of the system of PAs has been impeded by the belated response of Western Australian governments to conservation concerns and a 'worthless' land approach to conservation as a land use. While large-scale land alienation for agriculture has now stopped, other types of land uses such as mining and other aspirations over land management and vesting, such as Aboriginal land claims and forestry are now constraining any large expansion of the PA system. Only an approach embracing the whole landscape can overcome the political and social limitations of the concept of PAs and the further degradation of developed land in Western Australia.

Keywords: protected areas, national parks, land use, nature conservation, Western Australia.

Introduction

The setting aside of land as protected areas (PAs) is a central part of the nature conservation strategies of most countries. In comparison with the original natural environment, land which has been exploited for intensive agricultural, pastoral or urban use is usually characterized by more rapid processes of change and disturbance, a decline in the heterogeneity of

the landscape, and disruptions associated with the introduction of exotic species. Ecosystem processes are diverted from their original functions and pressed into serving human activities. Most of the native environment, including its biotic and abiotic elements, is adversely affected. The purpose of setting aside land from human development is to reverse this trend by maintaining essential ecosystems processes and species diversity, and preserving wild genetic resources. Such conservation measures are, in turn, of advantage to the human populations, by increasing the sustainability of primary industries such as forestry or agriculture. These advantages, however, are more often than not overridden during the land allocation process by considerations about competing land uses.

The history of PAs around the world shows that the early motivations for establishing such areas have included game preservation in Africa (Neumann 1996), watershed protection in South Africa (Burnett & Harrington 1994), and wilderness protection in the USA (Runte 1979). Their management similarly differed, depending not only on the original purposes, but also on the degree of naturalness which was sought: from a park-like tamed landscape in several British colonies to uninhabited wilderness in the USA (Henderson 1992). Australia shares a history of European colonialism and land reservation for conservation similar to several countries in which the PA system is well developed, such as South Africa, New Zealand and Canada. For example, recreation parks close to the larger capital cities were reserved very early in the European history of Australia's colonization (Frawley 1988) and land was also reserved for the protection of watersheds servicing the urban areas. However, the concept of managing wilderness areas for recreation never developed as it did in the USA (Whitehouse 1990). The lack of large game species also precluded the need for hunting reserves, which were most developed in Africa (Neumann 1996). There was no urgency to protect the habitats of the native fauna and flora because European settlement was slow, especially in the Western part of the continent. Consequently, in most Australian States, the governmental managerial organizations in charge of parks and reserves were not in place until well into the second half of the century (Whitehouse 1990).

Because in Australia the constitutional power over the land is left with the States rather than with the Federal Government, the creation and management of PAs differs between States. Wescott (1991) provides an insight into this distinctive Australian approach to PAs in a study of the dif-

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Table 1 Conservation areas of the Australian States in 1991 (terrestrial reserves only). Source: Hooy and Shaughnessy (1992). ^a Indicator of participation: % of the State conservation estate divided by the % of the State total area. If < 1, the State contributes less to the conservation estate of Australia than its total area would predict. ^b Includes national parks under the control of the Federal Government.

States	Conservation area (ha)	Area under conservation (%)	Proportion of the conservation estate of Australia	Indicator ^a of participation
Australian Capital Territory	101 495	43.0	0.2	6.4
Tasmania	1 814 339	26.6	3.7	4.2
Victoria	2 940 364	12.9	5.9	2.0
Queensland	4 141 586	2.4	8.4	0.4
New South Wales	3 888 950	4.9	7.9	0.8
Northern Territory ^b	4 227 379	3.1	8.5	0.5
Western Australia	15 731 974	6.2	31.8	1.0
South Australia	16 675 080	16.9	33.7	2.6
Total Australia	49 521 167	6.4	100.0	–

ferent state systems of 'national' parks. Other articles on the development of the PA system in Australia include Frawley (1988), Hall (1988), Reed (1990) and Whitehouse (1990). The Western Australian experience in reserve creation, whilst not fundamentally different from that of other States, differs in particular details because of the distinctive geographical, political and scientific environment of the State. This article analyses the development of the system of PAs in Western Australia from its early beginnings until the 1990s, and examines the constraints of land uses on the creation of PAs.

The current system of PAs in Western Australia

There are only three denominations exclusively allocated for the conservation of the fauna and flora in Western Australia: national parks, nature reserves and conservation reserves. The purpose of national parks is to conserve the native fauna and flora and to enable their public enjoyment and appreciation. Western Australian national parks correspond to the IUCN Protected Area Category II (Hooy & Shaughnessy 1992). The main purpose of a nature reserve is the conservation of native fauna and flora. Nature reserves are the most used denomination, in terms of number of reserves and in terms of area (Fig. 1). Access by the public to nature reserves is either forbidden or by permit only. This type of PA conforms to the IUCN Category I. However nature reserves are conservatively classified as Category IV by the vesting authority because of differences in tenure level (Hooy & Shaughnessy 1992). Conservation parks and conservation reserves correspond to the IUCN Categories II and III (Hooy & Shaughnessy 1992). They are a recent denomination that covers land where some activities are temporarily impacting negatively on strict conservation goals and they will not be considered any further.

In Western Australia, the security of tenure of PAs is addressed through a system of classification which goes from class A, the most secure, down to class C. The purpose of class A reserves cannot be revoked except by an Act of Parliament, which has to involve the consent of both Houses of Parliament. The class B, of intermediate tenure (the

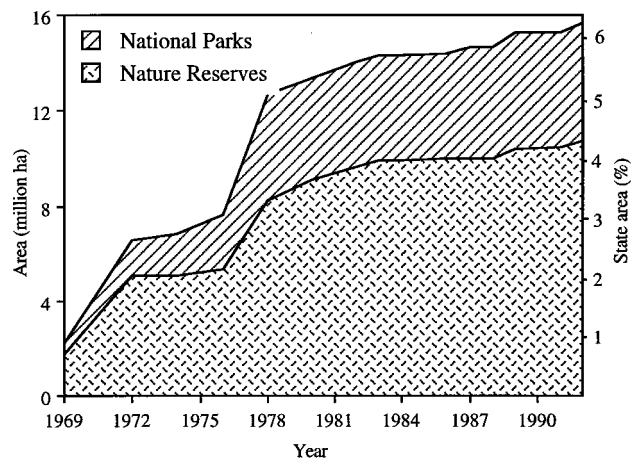


Figure 1 Area under terrestrial protected areas in Western Australia since 1969. Source: Pouliquen-Young (1995).

Governor can change or cancel the purpose but the Minister for Lands has to report to both Houses of Parliament), has been used in the case of nature reserves and national parks when the potential for the exploitation of the natural resources existing in the reserve was believed to be high. A class C reserve can be revoked or its purpose altered by ministerial notice without further public debate. The security of purpose of class C reserves can be easily altered by the addition of a second purpose (such as water added to conservation) or by changing it for another (from conservation to timber, for example). Most national parks are class A reserves, insuring a high level of security of tenure. Whatever their classification, national parks retain their purpose until an act dealing with a specific national park is enacted.

Most of Western Australia's PAs are currently vested in one single organization: the National Parks and Nature Conservation Authority (NPNCA). Its role is to develop policies regarding nature conservation on any land, to promote the appreciation of the natural environment, to advise the Minister for conservation on proposals to change the purpose of class B and C PAs and to prepare management plans for any land vested in it. The composition of the Authority covers a wide range of interests with representatives of rec-

Table 2 Status of species recorded from Western Australia (WA). Terrestrial mammals exclude bats. Sources: Department of Conservation and Land Management (1992); Government of Western Australia (1992).

<i>Selected groups</i>	<i>Total number of species in WA</i>	<i>Species endemic to WA</i>	<i>Species presumed extinct in WA</i>	<i>Number of threatened species in WA</i>
Terrestrial mammals	104	25	11	27
Birds	510	14	2	36
Reptiles	439	188	0	6
Amphibians	76	41	0	2
Fish	1600	113	0	2
Vascular plants	7954	≈5000	52	232

recreation groups, non-governmental conservation groups, local governments, as well as including *ex-officio* members of the governmental organization dealing with the management of PAs. Other governmental agencies and private organizations can also have joint vesting.

The Department of Conservation and Land Management (or CALM) is in charge of the management of land set aside for conservation purposes. The Department and the Authority were created by the 1984 Conservation and Land Management Act (Western Australia). The Department's role is to advise the Minister on additions or deletions to the system of nature conservation reserves, to administer the legislation relevant to the protection of the State's fauna and flora, to assist the NPNCA and undertake the management of conservation land according to management plans. In addition to the conservation estate of the State, CALM also manages the State forests and timber reserves.

The terrestrial conservation estate of Western Australia is the second largest of all Australian states (Table 1): a land area of 15.7 million ha (6.2% of the State) is managed directly for the purpose of fauna and flora conservation, either in national parks or in nature reserves (Fig. 2). The State also claims a few reserves of international importance, including wetlands to protect migratory waterfowl under the Ramsar convention, two international biosphere reserves declared under the MAB-UNESCO programme, and the Shark Bay World Heritage area. However, despite the size and coverage of the PA system, the State's flora and fauna has a high level of endangerment (Table 2), and it is not representative of most of the natural ecosystems still in existence (Thackway & Cresswell 1995). Regions with less than 5% of the area under conservation include the early-settled districts of the wheat-belt and most of the pastoral regions (Department of Conservation and Land Management 1992; Thackway & Cresswell 1995). Extremely large PAs are found in the extensive arid zone, where most other Australian states are lacking coverage because of pastoralism and restricted vacant Crown land (Morton 1990).

The historical development of protected areas in Western Australia

Early reservation concepts

In Western Australia, the concept of allocating large areas of land for the exclusive purpose of nature conservation had to await experiences overseas and in the eastern States of Australia for most of the nineteenth century. The first Western Australian national park was created in 1894, some 15 years after the first Australian national park was established in New South Wales. Swan View, later John Forrest National Park, was the first Western Australian PA to be created for the protection of the indigenous fauna and flora. Kings Park, a large park in the centre of the State capital city, Perth, had been created much earlier, in 1872, but it was reserved as a public park for the enjoyment of the community rather than as a conservation reserve, and only after most of its timber had been removed (Jenkins 1980; Bolton 1981*a*). There were still only seven PAs in Western Australia at the beginning of the century. One of the most important for later conservation strategies is the Barrow Island Nature Reserve on the Pilbara coast, which was created in 1908 after a deputation from the West Australian Natural History Society pointed out the importance of the island for the survival of rare species (Woodward 1907).

In the following decades, most parks and reserves continued to be created for the direct enjoyment of the public, and were chosen for their recreational and scenery amenities. These PAs were located within easy access from Perth. They included caves discovered in the 1870s in the south-west and which were protected by the early 1900s (Australian Academy of Science Committee on National Parks 1965; Black & Breckwoldt 1977). This bias towards recreation is reflected by the relatively high proportion of national parks in comparison with the number of reserves dedicated to the conservation of fauna and flora (Table 3).

There was a decline in the rate of creation of PAs in the 1930s and a decline in the grants provided to the different boards in charge of their management (Australian Academy of Science Committee on National Parks 1965). Commercial activities and recreational developments were allowed, partly to raise money for management, but these developments further threatened the conservation value of some reserves (Australian Academy of Science Committee on National Parks 1965).

The development of a conservation estate in Western Australia between 1830 and 1950 was a slow process. It was geared mainly towards recreation and the enjoyment of the public, and so the setting up of the PAs followed, rather than preceded, the pattern of urban and farming settlement. The more remote regions of the State were either areas left aside or taken up for extensive pastoralism, without any long term provision for environmental protection. A more scientifically-based process for the setting up of protected areas only arose when the rate of land alienation escalated during the post-Second World War rapid growth of agricultural development.

1. Barrow Island Nature Reserve
2. Cape Arid National Park
3. Fitzgerald River National Park
4. Great Victoria Desert Nature Reserve
5. John Forrest National Park
6. Kalbarri National Park
7. Mt Lesueur National Park
8. North Dandalup Reserve
9. Nuytsland Nature Reserve
10. Perth
11. Prince Regent River Nature Reserve
12. Queen Victoria Springs Nature Reserve
13. Shannon River National Park

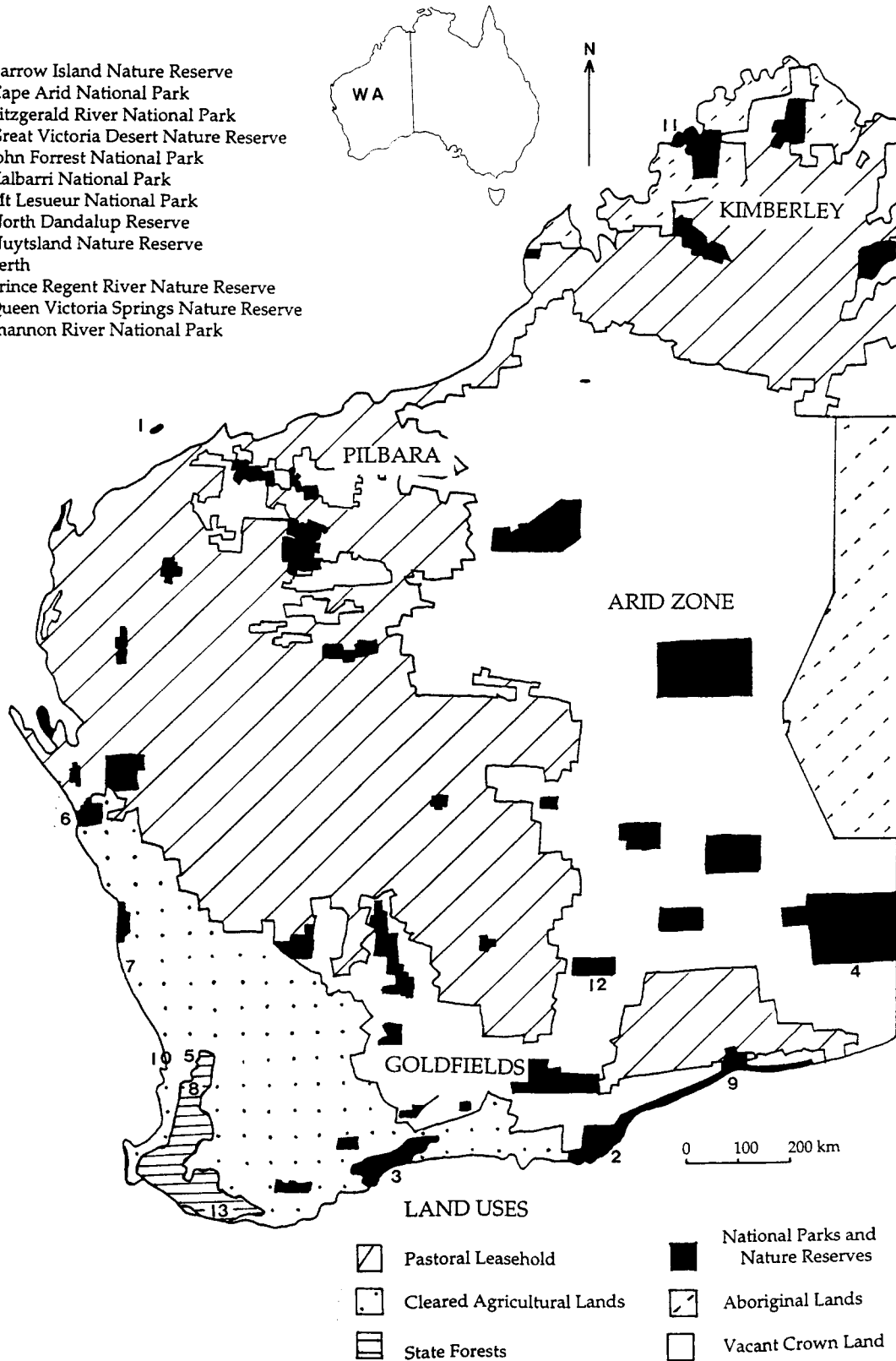


Figure 2 Map of main land uses in Western Australia. With the locations of protected areas mentioned in the text. Source: Pouliquen-Young (1995).

Table 3 Rate of nomination of protected areas in Western Australia from 1892 until 1961. Areas in ha. Source: Australian Academy of Science Committee on National Parks (1965).

<i>Decade</i>	<i>Number of:</i>		<i>Area of:</i>		<i>Total number</i>	<i>Total area (ha)</i>
	<i>Flora &/or fauna reserves</i>	<i>National parks</i>	<i>Reserves (ha)</i>	<i>National parks (ha)</i>		
1892–1901	0	1	–	40	1	40
1902–1911	4	2	20 300	2 700	6	23 000
1912–1921	8	3	6 000	109 600	11	115 600
1922–1931	18	10	6 300	15 900	28	22 200
1932–1941	7	2	2 900	400	9	3 300
1942–1951	33	8	3 600	16 100	41	19 700
1952–1961	135	15	1 052 800	21 000	150	1 073 800
Total in 1961	205	41	1 091 900	165 740	246	1 257 640

The rural boom: the 1950s

After the Second World War, governmental policies led to a surge in the alienation of land for farming and pastoral purposes. The developments in agriculture were only possible because of the active leadership of the State Government, especially through its financial help to the War Service Land settlers and its control over the land allocation process. The Government released more than 5.4 million ha to farmers and 24 million ha for pastoralism during the 1950s (Fig. 3; Ride 1975). Technical advancements in farming the light lands (infertile lands lacking in essential elements) enabled agriculture to be practised in regions which were previously thought to be too marginal for intensive farming. The clearing of native vegetation in the established farming districts also accelerated during this period, because of the introduction of mechanization. It continued in the light lands well into the 1970s.

While successive governments were ready to accept the financial burden of land allocation for agriculture, the environmental consequences of such a large-scale removal of native vegetation were generally ignored. The 1945 Soil Conservation Act (Western Australia) sought to address land degradation issues where clearing was detrimental to the use of the land, use that was however restricted to farming purposes and did not include the survival of native species (Jacob 1993). There was a lack of environmental policy at the government level, which paralleled the lack of policy on nature conservation issues and compared unfavourably with the enormous amount of governmental help given to the exploitation of the natural environment, from whale hunting to clearing the native vegetation.

The lack of a comprehensive government policy in relation to the conservation of the natural environment begun to be challenged during the 1950s in a systematic and co-ordinated way. A few scientists from government departments such as the Fisheries Department and the Department of Agriculture, and from the University of Western Australia, managed to lobby for the creation of large reserves on or near the coast, before the large-scale opening up of the light lands. A number of coastal reserves (Kalbarri, Cape Arid, Fitzgerald River) were created during the 1950s. As proof of

the efforts of the small group of dedicated scientists, the area under conservation in the State increased dramatically during this period (Table 3). Eighty-five percent of the land under conservation by 1961 had been reserved during the previous decade. Moreover, the passing of the 1950 Native Fauna Protection Act (Western Australia) and the influence of its associated committee enabled a significant increase in the number of nature reserves created for the sole purpose of conservation of fauna and flora (Table 3). However, this phase of concern and action was already too late for most of the wheatbelt region. The wheatbelt shires that had been established before the Second World War continued to clear the land rapidly. Creating conservation reserves in the wheatbelt was 'a salvage job' (A.R. Main, personal communication 1992), done by reserving land which had been set aside by the early surveyors for recreation, town sites, travellers, water supply and railway reserves (Main 1993). Remote regions, the Kimberley and the arid zone in particular, were not represented at all in protected areas, mainly because of a lack of specific biological knowledge. In the case of the Kimberley, the low level of scientific expertise was compounded by the fact that the region was considered a frontier for the development of the State (Harman 1981), and the creation of protected areas in the region followed the belated response pattern of the rest of the State, only much later.

Because the increase in the area of land under conservation was mainly due to the efforts of a few people rather than the result of an integrated government policy, the management and vesting of PAs remained in the hands of a multitude of boards, which were usually local, powerless and without finance (Australian Academy of Science Committee on National Parks 1965). All these features added to the general lack of interest by land planners and users in the State to the concept of conservation through reserves. More importantly, the conservation ethos that was emerging in some parts of the scientific community, went no further into a society as a whole and with a Government which were fully committed to economic development.

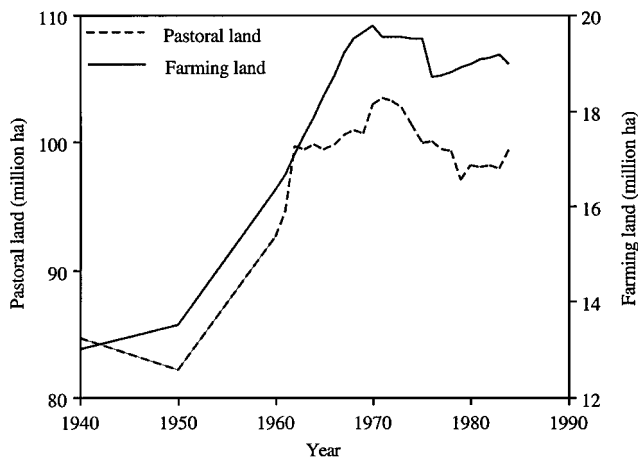


Figure 3 Area alienated for pastoralism and farming in Western Australia between 1940 and 1985. Source: Pouliquen-Young (1995).

The economic development of the state: the 1960s and 1970s

The early 1960s brought a new level of resource-development activity in Western Australia (Layman 1981). New developments, which were mainly centred around mineral exploitation and a few capital-intensive industries, began to overshadow the economic importance of agriculture, especially after the 1969 drought. More than 350 000 ha per year had been released for agriculture and more than two million ha per year for pastoralism since 1960 (Fig. 3; Ride 1975), but agricultural releases were almost completely stopped after 1970 due to a rural recession in the south-west of the State. The 1970s was 'a troubled decade' for agriculture in Western Australia (Burvill 1979, p. 76) and, from then on, agriculture played a less important part in the economy of the State.

The Government saw its main role to be a facilitator of the economic development of the State by subsidizing the costs of economic production, by controlling public opposition including concerns over the environment (Bolton 1981*b*; Harman 1981), and by setting up favourable policies, legislation and administration in a bid to attract and retain private investment (Harman 1981; Head 1981). Labour issues, environmental problems and issues of Aboriginal land claims, which originated directly or indirectly from these developments and from the high rate of economic growth, were pushed aside. In terms of the environment, bauxite mining and methods of timber logging such as clear felling were threatening the south-west forests (Sharp 1983). Salinity, water logging and wind erosion affected larger areas in the wheatbelt than ever before (Hobbs & Saunders 1991). In return for increased personal incomes, it was taken for granted by the Government, however, that people would accept the environmental 'price' of economic growth and that they would continue to place their faith in technological advancements as they had done before (Sinden 1972). This view ig-

nored the increasing development of environmental concern elsewhere in the world, as witnessed by the Stockholm UN conference in 1972.

Dire warnings of the ecological limits of Australia's natural and agricultural environments increased during the late 1960s and early 1970s (Costin & Mosley 1969; Costin & Frith 1971; Powell 1988). The main Federal organizations involved in nature conservation, including the Australian National Parks and Wildlife Service (now the Australian Nature Conservation Agency) and the Australian Heritage Commission, were in place by 1975. The Australian Biological Resources Study, established in 1973, provided for the first time a national basis for biodiversity studies. Among non-governmental conservation groups, the Australian Conservation Foundation, formed in 1966, began to flex its muscles against development schemes throughout Australia, including petroleum exploration in the Great Barrier Reef, logging and sand mining on Fraser Island, and hydro-electric schemes in the Tasmanian forests (Bolton 1981*a*). The opposition to such developments met with considerable public support, at least in the Australian eastern States. The protests crystallized the dichotomy between economic development and nature conservation in Australia.

In Western Australia, the growth of environmental concern was more subdued, but the rate of industrial and mining developments near the capital city began to concern the wider public. With the economic boom, the population of the State had increased dramatically, nearly doubling between 1961 and 1976 (Rundle 1978). The visitor rate of conservation areas also increased, not only because of the mere size of the population, but also because of its growing capital income and leisure spending. In turn, this interest in the natural environment led to an increase of public interest in conservation issues, especially in the south-west, the region most accessible to the growing population of Perth. This was mirrored in the increasingly vocal opinion of mainly city-based conservationists over forestry management and bauxite mining in the nearby Darling Ranges. Western Australia remained largely untouched by public confrontations until the dispute over the reservation of the Shannon River watershed in the Karri forest in the late 1970s (O'Brien 1979; Sharp 1983).

Up to then, the concept of PAs had mainly been advocated by scientists. During the late 1950s, the scientists' concerns over the lack of political interest in the environmental impacts of development in the country had prompted the Australian Academy of Science to initiate the first review of the system of protected areas in Australia (Frankel 1975). The Western Australian Australian Academy of Science Sub-Committee (WA AAS Sub-Committee) published its recommendations in 1962 (Australian Academy of Science Committee on National Parks 1965). The composition of the WA AAS Sub-Committee, which included governmental land administrators as well as knowledgeable biologists from the University of Western Australia and the State's Museum, was a great asset in the implementation of its recommendations in land of little immediate use. More than two million

Table 4 Large reserves created in the remote areas of Western Australia up to 1970 following the Australian Academy of Science Sub-Committee recommendations.

<i>Name</i>	<i>Current designation and year gazetted</i>	<i>Area (ha)</i>
<i>Arid zone</i>		
Great Victoria Desert wildlife sanctuary	Nature reserve (1970)	2 495 777
Queen Victoria Spring wildlife sanctuary	Nature reserve (1970)	272 598
<i>Nullarbor</i>		
Nuytsland wildlife sanctuary	Nature reserve (1965)	625 343
<i>Kimberley</i>		
Prince Regent River	Nature reserve (1964)	635 000
<i>Total area</i>		4 028 718

ha in the State had been set aside for conservation by 1969, increasing to 6.5 million ha in 1972 (2.6% of the total area of the State); there had been an almost five-fold increase in area under conservation since 1961 (Fig. 1). However, almost three-quarters of this gain in PA area was due to the creation of four very large nature reserves situated in the remote areas of the State, where land use conflicts were still low (Table 4, Fig. 2). The opportunity to create large PAs in or near the wheatbelt, or in the pastoral regions of the State, had already gone after the large scale agricultural expansion of the 1950s and 1960s. By the 1970s, it was the mineral potential of the land which limited the creation of PAs in the most remote regions, especially in the Kimberley and Pilbara. Time and land were running out for any attempt to implement an unchallenged and complete system of PAs in the State.

In 1971, the Western Australian Environmental Protection Authority (EPA) and a new Department of Conservation and Environment were formed to tackle increasing environmental problems such as growing industrial pollution. To fulfil its charter for conservation of the environment, the EPA decided to set up the Conservation Through Reserves Committee (CTRC) to review the AAS recommendations on the PAs that had not yet been implemented by 1971 (O'Brien 1979). The reports of both the CTRC and the EPA considerably advanced the status of the conservation system of the State (Conservation Through Reserves Committee 1975, 1978; Environmental Protection Authority 1975, 1976, 1980). The EPA reports also incorporated an unprecedented public participation process (O'Brien 1979; Burbidge 1984). The Wildlife Research Division, located since the mid-1960s in the Department of Fisheries and Wildlife, surveyed the remote regions that had been left aside by the WA AAS Sub-Committee report for lack of knowledge, principally the north of the arid zone and the Kimberley. The main contribution of the CTRC/EPA reports was not only an increase in size of the system of reserves (up to 13 million ha by 1980), but also the setting up of a reference tool for future increases and changes in the security of tenure and purpose of protected areas of the State. The

CTRC/EPA reports can be considered as part of the Government efforts at the time to consolidate its power over the land allocation process in the face of the differing interests of the mining industries, town planners, large industrial condominiums, Aborigines, farmers and the timber industry. The mining industry stopped a number of proposed PAs from being created, and managed to downgrade the tenure of recommended PAs in some areas. The development options for agriculture were kept open by decreasing the size of proposed PAs in the marginal farming zones.

Despite the growth of the PA system, the security of vesting and the management of the reserves were not addressed for a long time. The administration of environmental conservation matters in Western Australia remained scattered among different authorities and departments during the 1960s and 1970s. National parks and nature reserves remained under separate control, vesting and administration: most national parks were vested in the National Parks Board (1956-1976), then the National Parks Authority (1976-1984), and the flora and fauna reserves were vested in the Western Australian Wildlife Authority (1968-1984). The creation by the Forests Department of Management Priority Areas (MPAs), which were dedicated to conservation, created yet another tier of responsibilities for PAs. Up to three different departments and ministers were involved with the administration of legislative acts relevant to nature conservation; flora protection was in the Forests Department until 1978, fauna conservation had been in the Department of Fisheries and Wildlife since 1951, and environmental matters were in the Department of Conservation and Environment (Jenkins 1980). There was no department singly responsible for the research, control, management and administration of nature conservation matters in the State, in sharp contrast with the trend in other States and at the Federal level (Black & Breckwoldt 1977; McGrath 1983).

During these two decades, most of the legislative and administrative attempts at rationalizing the status of conservation in Western Australia focused on the amalgamation of the two vesting authorities, on increasing the powers of these authorities over conflicting land uses in national parks and reserves, and on simplifying the administration of conservation legislation. There were numerous attempts at reviewing the situation in the 1970s. Elements of conservation administration were transferred to the new Department of Conservation and Environment. The shortcomings of the 1976 National Park Authority Act (Western Australia, Hollick 1985), the separation still persisting between wildlife conservation on one hand and national parks on the other, and the dominance of other land uses over conservation continued up to the early 1980s. The confusion did little to solve the main issue of who should administer, control and manage conservation land in the State.

1984 to the present

In the early 1980s, concerns about the rate of development emerged forcefully in Western Australia as the economic and

Table 5 Major terrestrial land uses in Western Australia. Source: Department of Conservation and Land Management (1992).

Land use	Total area (ha)	State area (%)
Pastoral leases	95 852 000	37.9
Vacant Crown land	84 459 000	33.4
Aboriginal reserves	20 100 000	8.0
Farming	16 000 000	6.5
Nature reserves	10 433 554	4.1
National parks	4 849 205	1.9
Urban, transport and industrial	2 206 000	0.9
State forests	1 750 467	0.7
Other reserves and leases	16 271 100	6.4

social benefits of some of the large-scale projects of the past two decades did not come to fruition (Harman 1981). In 1983, the newly-elected Government virtually stopped the release of new land for agriculture, thereby putting a moratorium on large-scale clearing of native vegetation in the wheatbelt. Farmers began to consider alternatives to their farming methods in the face of growing soil erosion and salt encroachment (Edmonson 1989). The assessment of land for agriculture became a more integrated decision-making process, and the first Soil Conservation Districts were formed in 1982. The EPA received stronger powers to deal with industrial and other types of developments under a new act, although its independence from Government was eroded (Chittleborough 1991). Forest management and mining in national parks remained volatile issues, as was the lack of proper public input into national park management plans. The mining industry was alarmed at the decline in the area of the State which was open to exploration and exploitation, despite government assurances to the contrary (Harman 1981; O'Neill 1984).

With non-vested land getting scarce, one of the most pressing issues for the Government was not only land allocation, but also the administration of, and control over, land management. New users had emerged in the previous decade with Aboriginal land rights getting more legal and political support (Bolger & Rumley 1981; Riley 1984).

The need to rationalize and allocate land uses saw the appointment in 1983-1984 of a Task Force on Land Resource Management, an Inquiry into the 1978 Mining Act (Western Australia) and the Seaman Inquiry on Aboriginal land rights, which attempted to find a 'greater harmony between values that are in conflict over the use of natural resources' (Schapper 1984, p. 95). The last two Inquiries are considered to have been ineffectual political exercises and they made only a few marginal changes to land uses patterns (Harman 1981). The Seaman Inquiry did delay the implementation of a number of large PAs in the arid zone and in the Kimberley, in time for the rise of Aboriginal land claims to become of much greater political and electoral interest. This in turn brought the process of PA creation in these regions almost to a stand-still during the 1980s and early 1990s (Environmental Protection Authority 1993).

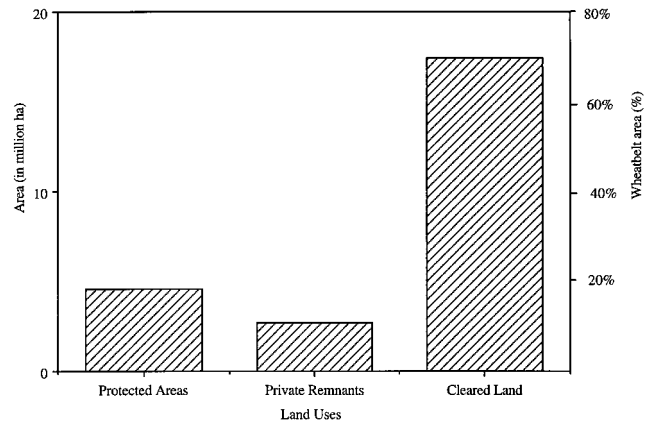


Figure 4 Status of cleared and uncleared land in the wheatbelt of Western Australia. Source: George *et al.* (1995).

The Task Force report on Land Resource Management was adopted by the Government in 1984 and work begun on the drafting of the 1984 Conservation and Land Management Act (Western Australia). The passing of the legislation resulted in the creation of the Department of Conservation and Land Management and of the National Parks and Nature Conservation Authority in which most protected areas are now vested. The creation of the NPNCA made it possible for the first time to have a single vesting authority for both national parks and nature reserves. The new Department of CALM inherited the conservation estate of the national parks and of the wildlife authorities and is now responsible for all legislation relevant to the protection of native fauna and flora and for the management of national parks and nature reserves. It also took the administrative responsibility for the Wildlife Research Division and the State Herbarium, the latter from the Department of Agriculture. It also amalgamated the Forests Department, and through it included in its estate the State forests and the timber reserves. Because of CALM control over State forests, the Forests Department MPAs were at last incorporated in the system of protected areas, resulting in a higher security of tenure and purpose for forest reserves (J. Bailey, personal communication 1994). The efforts of the new Department and Authority turned towards better management of the existing terrestrial reserves with the first management plans in 1986. Regions of poor reserve coverage are the main priorities for land acquisition (Department of Conservation and Land Management 1992) and progress has been rapid in some instances. The Act also enabled the creation of marine reserves and the first Marine Park in Western Australia was declared in 1987. The creation of CALM has not led to any significant increase in the extent of the terrestrial PA system of the State (Fig. 1). Successive reviews of the system of PAs and the upgrading of their implementation status have helped pinpoint the regions which need special attention (Environmental Protection Authority 1993).

PAs and conflicting land uses in Western Australia

In Western Australia, settlement and resource exploitations consistently had precedence over the protection of biota and ecosystems in determining land use allocation. I shall describe each of the main extensive land uses: agriculture (which includes pastoralism and farming) and Aboriginal land are the main extensive land uses in the State. Other significant land uses that conflict with nature conservation in the allocation process include forestry and mining (Table 5).

Agriculture

At a regional level, large PAs are found on the fringes of the agricultural and pastoral lands. In the south-west, the larger reserves can be found on the tracts of Crown land surrounding the core of the farming region (Fig. 2). In these often marginal lands, financial survival in agriculture has been linked to farm land acreage and attempts to increase the size of the PAs bordering farmed land have been hotly disputed (Land Resource Policy Council 1986). Much smaller reserves are found in the middle of the wheatbelt, where, for a long time, government policy made clearing land a condition of purchase (Burke 1991) and only small areas were left for recreational purposes, water points or for the establishment of town sites (Main 1993). These small reserves were actively targeted during the 1950s and 1960s to add to the nature conservation estate. Together with remnants left on private land, the proportion of land that has not been cleared for agriculture reaches almost 30% of the total area of the wheatbelt (Fig. 4), but the amount cleared varies with the districts (Department of Conservation and Land Management 1992; Thackway & Cresswell 1995). Characteristically, most of the PAs in the wheatbelt are under 5 ha. Their small size and fragmentation in a landscape dominated by crops and livestock make them sensitive to the natural depletion of larger species due to their isolation in the surrounding developed landscape and the decline in the natural disturbance regimes that once regulated their dynamics (Hobbs 1987; Saunders *et al.* 1987; Baker 1992).

In the pastoral region, the largest reserves have been created on the periphery of the best pastoral country: until very recently only three small national parks have represented the central Kimberley ecosystems (Environmental Protection Authority 1993). Affordability of land has been a key component in establishing reserves in the pastoral region. The pastoral industry has been in the midst of restructuring for some years now and the economic viability of many leases has been questioned in the light of the early 1990s recession (Select Committee into Land Conservation 1991). Some leases have been recently acquired by CALM for conservation purposes to increase coverage of the western Kimberley.

Aboriginal land

Most Aboriginal reserves are found in the coastal Kimberley and in the arid zone near the Northern Territory/South Australian border (Fig. 2). In the early days of creation of PAs, there had been a commonality of goals between the protection of Aborigines' sacred sites and of protected areas against other interests, in particular mining, when the philosophy was one of preservation rather than as in a museum (Australian Academy of Science Committee on National Parks 1965). It is only when the Aborigines themselves began to claim much larger pieces of land, and when Aboriginal land rights began to emerge as a forceful political issue, that the establishment of protected areas and of Aboriginal settlements clashed in sensitive areas (Seaman 1984). The search for security of tenure and control of access over the land has since expanded to larger and larger areas in the case of Aborigines and nature conservation alike. There are inherent limits in protecting only small areas and leaving the rest of the land at the mercy of powerful industries with low cultural and environmental concerns. It is likely that the rise of Aboriginal land rights will become one of the most important land-use issues in relation to the establishment of PAs and their management in the coming years (Strelein 1993). Recent challenges to the long-established doctrine in the law that Australia was an empty land when colonized by the British (*terra nullius*) have the potential to overthrow the principle of Crown control over State land and to constrain the creation of protected areas vested and managed by a State organization.

Forestry

Forests, as opposed to woodlands, are not extensive in Western Australia (Table 5). However, the importance of forest land and timber so close to the capital city led to early clashes between conflicting land uses. Large-scale clearing for agriculture was an important factor in requiring the protection of the south-west forests at the beginning of the century. Forty percent of the original forested area had been cleared for agriculture before 1920 and it was not until 1924 that the first State forest was declared (Government of Western Australia 1992). However, it is the utilitarian value of the timber that has been promoted by the Forests Department rather than the aesthetics or the conservation value of the forest biota. The North Dandalup Reserve, the first really large nature reserve to be set aside for the conservation of flora in 1894, was targeted for timber production in 1911 (Ride 1975). The claims made by foresters to be conservationists have to be understood as part of their fight in the early years of the century to protect economically-important timber from large-scale clearing for dairy farming, rather than as a primary commitment to the inherent values of fauna and flora protection in these ecosystems (Bolton 1981*b*; Sharp 1983; Hall 1988). As a result of the early efforts of government foresters, most of the forested area of the south-west

has remained in the public domain and is managed as State forest for multiple purposes, which include timber production. Other uses have been added over the years, such as the protection of the water supplies of Perth and the Goldfields, and recreation. The mining of bauxite dates from the 1960s, with most of the northern Jarrah forest now under long-term mining leases. Despite some advances in mine rehabilitation, mining threatens the stability of ecological processes in the Jarrah forest, not only because of forest clearing, but also through the introduction and propagation of dieback, a fungal disease to which many of the local endemic flora species are highly sensitive (Wills 1992).

Conservation goals in the forested areas of the south-west have been interpreted narrowly by the foresters. Their understanding of biota conservation has been to protect specific and representative stands of vegetation rather than the important ecosystems functions which maintain the forest and protect the surrounding areas. Thus, the proposal by the CTRC to protect the entire watershed basin of the Shannon River in the Karri forest on the south coast (Fig. 2) was an extraordinary event in the face of the Department's traditional forestry activities. The debate over the reservation of the Shannon River highlighted the opposing views on forest values held by the conservationists and foresters (Sharp 1983) regarding all aspects of forest 'uses', including timber production, wood chipping, recreation and bauxite mining. For historical and political reasons, the timber industry has thus been at the forefront of the attacks by the environmental movement, despite the relatively low importance of State forests in terms of land use area in Western Australia (Table 5). The proximity of the forested land to Perth, and the large scientific and managerial governmental structure involved in the industry, have meant that timber production and associated industries have maintained a high public profile in terms of pro-development policies and conservationist opposition to them (Thomas 1988). The system of PAs in the State forests has steadily increased to cover more than 10% of the forested area (Thackway & Cresswell 1995).

Mining

Mineral exploitation in Western Australia since the 1960s has resulted in the intensive exploitation of specific landscapes in a wide range of regions. Because of the probabilistic nature of finding a suitable ore body, mining exploration needs access to large tracts of land (O'Neill 1984). Despite Crown ownership of minerals, private land owners can veto mining exploration if the land is 'improved' by farming or cultivation. Mining is therefore mostly a form of exploitation added to land uses such as pastoralism and timber production. The interests of the mining industry in obtaining unlimited access to land are often integrated in PA policies through a low security of tenure or the setting up of complicated boundary lines to avoid mining tenements. Special legislation has also been set up in some circumstances to revoke or modify the status of previously protected areas. The PAs of the

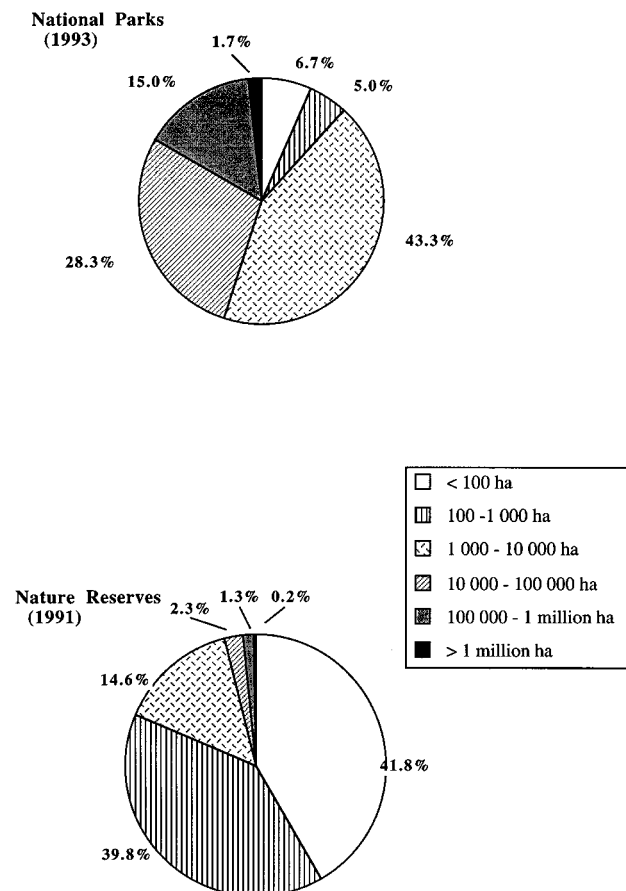


Figure 5 Size classes of national parks and nature reserves in Western Australia. Sources: Hooy and Shaughnessy (1992); Department of Conservation and Land Management (1993).

Kimberley and the Pilbara, regions high in mineral potential, are good examples of such compromises. To this date, mining remains one of the most contentious issues in the public mind in relation to protected areas (Environmental Protection Authority 1993) and related policies are hotly debated (Schapper 1984; Timberlake 1989). It is the uncertainty over the potential for mining which makes this industry so damaging for the reservation of land for conservation. During the 1970s and 1980s, mining interests, through the Department of Mines and industry lobby groups, blocked numerous proposals for PA creation in regions of high mineral potential such as the Kimberley or in locally interesting sites such as Mount Lesueur (Environmental Protection Authority 1993). Attempts to reach agreements failed until a short-term compromise was reached in 1990 over the security of existing PAs and the location of new ones (Government of Western Australia 1990). This compromise also saw three national parks opened to mining activities.

Conclusions

The first feature of the PA creation process in Australia and in other countries is that measures to create PAs have often been belated responses following a long period of development, and

have generally been stimulated by the recognition that any remaining undeveloped land was rapidly disappearing (Gardner & Nelson 1980; Frawley 1988; Hall 1988; Götmark & Nilsson 1992). Once the land has been explored and settled, concerns about the rate of its development and the changes from its original state trigger a counter movement that tries to protect what is left of the natural environment. The second feature of PA creation has been that the location of PAs is generally limited to land not wanted for other development purposes. Such a 'worthless land' hypothesis was put forward by Runte (1979) in his analysis of the USA's system of national parks. According to this author, parks have often been created only in areas where no other potential or existing land uses can be demonstrated. While aesthetics, recreation and later on ecological criteria have often been the catalysts in the process of selecting protected areas, the actual implementation process, the creation of the reserves, has more often than not been due to the lack of perceived economic advantages in keeping the land available for future development. This feature of the reserve creation process has been applied convincingly to the Australian experience by Hall (1988). In Western Australia, both features have impacted on the development of a representative PA system. Despite some clear achievements, the legal and social impediments towards reserving land for the sole purpose of protecting ecosystems or species are still in place and seriously constrain any large-scale increases in the system of PAs.

Because of the belated response of governments and their 'worthless lands' approach to the concept of conservation through reserves, the process of implementing reserves has been largely opportunistic in Australia, relying on acquiring 'worthless land' to rapidly increase the size of the system in areas of low land-use competition, and on the affordability of land and pastoral leases in areas of more intense land use (Pressey 1990; Whitehouse 1990; Pressey *et al.* 1993). While the flexibility of this approach has led to considerable gains, it has never really tackled the issue of establishing conservation as a valid land use. In Western Australia, the problems created by the opportunistic method of land acquisition have led to an incomplete ecosystem coverage which, when compounded by issues of reserve management, has been partially responsible for the continuing loss of biodiversity. The opportunistic creation process has also led to a disjunct PA system, difficult to manage and costly to increase (Environmental Protection Authority 1993; McKenzie & Sattler 1994). The system of reserves has been biased in Western Australia towards a large number of very small nature reserves, of less than five hectares, and a few very large reserves, of more than 100 000 ha (Fig. 5). As time passes, acquisition of land becomes more difficult while increased ecological and biological knowledge points to even more threatened natural ecosystems or taxa to protect (Wardell-Johnson & Horwitz 1996). The resources needed to manage the vast area of land reserved for conservation are unlikely to ever match its needs, as more internal and external pressures have to be borne, such as the control of feral species and tourism.

The flexibility of an opportunistic strategy of creating PAs for conservation can also become a hindrance for further extension of the system of reserves. For example, Pressey (1990) points out that in some regions, there is more redundancy in the PA system than should be strictly necessary under criteria of ecosystem representativeness, while in other regions there is a lack of PAs to protect locally-important ecosystems. This situation almost certainly applies to Western Australia. It could lead to serious problems when justifying an increase in reserve coverage in regions of adverse land uses, such as the south-west forest or the pastoral regions, unless some land already reserved, but ecologically redundant, is returned to production in exchange for the reservation of more biologically-important fragments of land. While there is a strategy in place on a small scale for rationalizing PA borders (Department of Conservation and Land Management 1992), it remains politically difficult to implement on a larger scale.

Almost all of the processes which prevent the biota from responding to increased protection in PAs occur at the level of the landscape and cannot be addressed by a State system of PAs (Recher & Lim 1990). Most of these processes are linked to the environmental degradation which arose from development activities incompatible with the local soil and climate conditions and which have led to a lack of regeneration of the native ecosystems and the depletion of the human-induced ecosystems which replaced them. It is the management of the land which has become the focus for activities which attempt to find ways of integrating conservation and development, rather than pushing them apart (Foran *et al.* 1990; Pickard 1990; Hobbs & Saunders 1991). The need for these activities is most pressing where environmental degradation is most pronounced, mainly in the wheatbelt. The agricultural productivity of the Western Australian wheatbelt is currently affected by a variety of soil and water problems, including waterlogging (3% of cleared land), water repellence and water erosion (6%), salt encroachment (3%), soil compaction (53%) and acidification ($\approx 2\%$) (Government of Western Australia 1992). Most of these problems can be directly linked to the over-clearing of the native vegetation. The landscape approach to land management in this region include establishing or maintaining corridors of native vegetation along roads and through farmed land (Saunders & Hobbs 1991; Merriam & Saunders 1993), plantations for timber on farms (Department of Conservation and Land Management 1992), fencing native vegetation remnants and re-vegetating with native species to lower the water table (Saunders *et al.* 1987, 1993a, 1993b). Against the background of social and political pressures which have plagued the allocation of land for conservation for the past century or so in Western Australia, a landscape approach will not only complement the conservation goals of publicly-owned PAs but also help address the long-term sustainability of economically-based land uses.

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