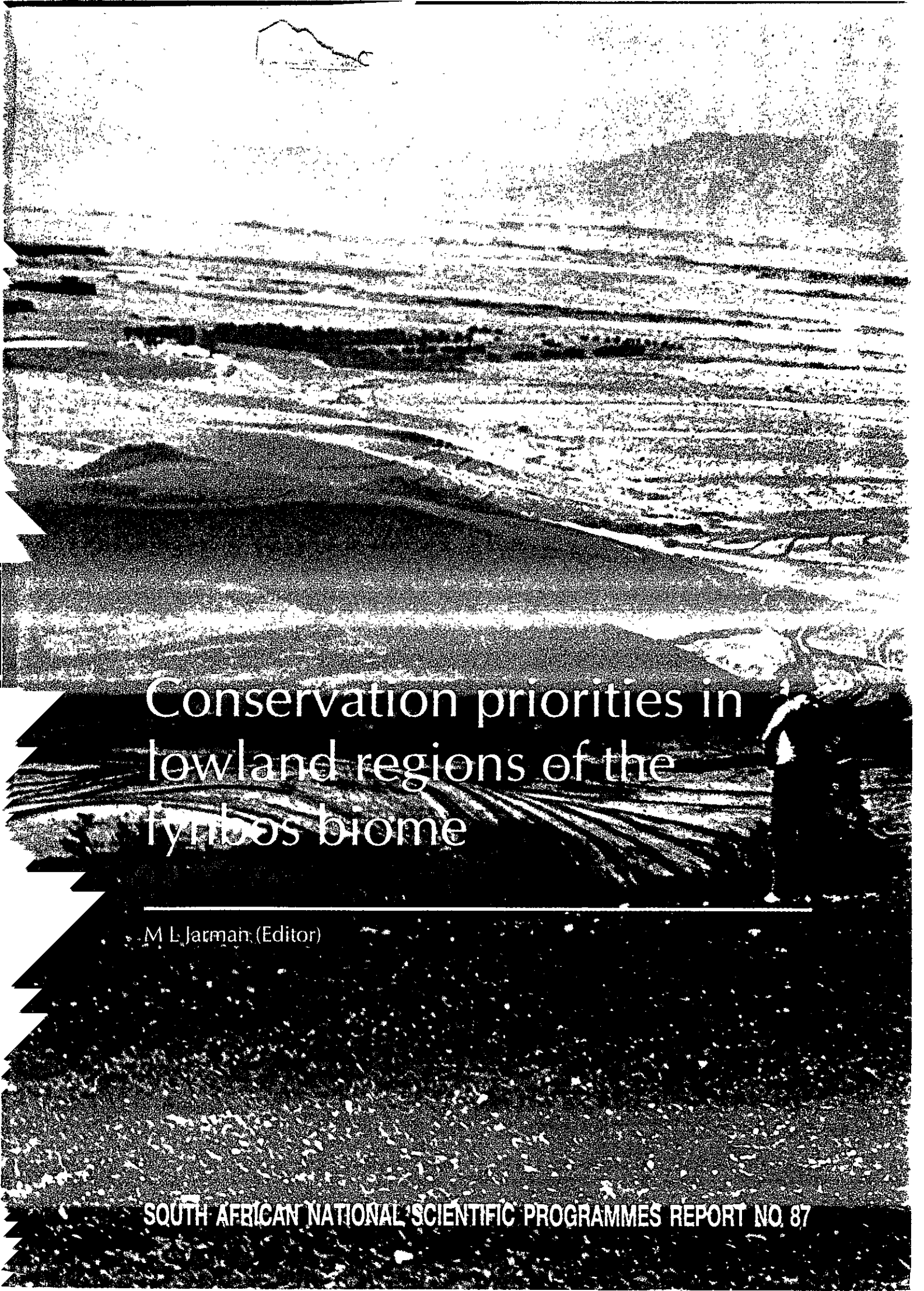


Conservation priorities in lowland regions of the fynbos biome

M L Jarman (Editor)

SOUTH AFRICAN NATIONAL SCIENTIFIC PROGRAMMES REPORT NO. 87

Conservation priorities in lowland regions of the fynbos biome

M L Jarman (Editor)

A combined report of the Committee for Nature Conservation Research,
and the Committee for Terrestrial Ecosystems,
National Programme for Environmental Sciences

SOUTH AFRICAN NATIONAL SCIENTIFIC PROGRAMMES REPORT NO

87

Issued by
Foundation for Research Development*
Council for Scientific and Industrial Research
P O Box 395
PRETORIA
0001
South Africa
from whom copies of reports in this series are available on request

Printed in 1986 in the Republic of South Africa

ISBN 0 7988 3145 6

Editor's address

Mrs M L Jarman
c/o Fynbos Biome Project
Department of Organic Chemistry
University of Cape Town
Private Bag
RONDEBOSCH
7700

*Previously Cooperative Scientific Programmes

PREFACE

This report was compiled under the auspices of the National Programme for Environmental Sciences (NPES), one of several South African scientific programmes administered by the CSIR. NPES is a cooperative undertaking concerned with research related to environmental problems. Within NPES, Ecosystem Programmes comprises a coordinated group of research projects and related scientific activities, aimed at improving understanding of the structure and functioning of natural ecosystems and the solution of environmental conservation problems. Two sections within Ecosystem Programmes have collaborated to produce this report. They are the Fynbos Biome Project based at the University of Cape Town and the Nature Conservation Research Programme based at CSIR in Pretoria. This joint activity, together with the varied make up of the constituent working groups, has produced a high level of multi-disciplinary interaction of great value.

This exercise has several further points of interest. It is the first instance in which a diverse set of detailed scientific data has been used to evaluate conservation priorities in South Africa. Secondly, it is satisfying that the wide range of expertise developed within the Fynbos Biome Project, together with its varied community of scientists, could so effectively respond to the needs of user agencies. The multi-disciplinary interaction developed through this project's activities has provided a unique capacity to examine and report on issues affecting the severely depleted natural habitats of the fynbos biome.

ACKNOWLEDGEMENTS

This report has been produced through a series of nearly 30 meetings in the five lowland regions of the fynbos biome. It has involved over 40 contributors both as representatives of scientific institutions and in their personal capacity and was spread over a period of more than three years. With due appreciation their names and addresses are listed at the end of this report.

In addition, several people contributed specifically to two large initial meetings in October 1981 and February 1982 and occasionally to material contained in this report. In this regard thanks are due to:

Miss S Brownlie, Dr J Day, Miss X Kyriacou, Professor E J Moll and Professor W R Siegfried (University of Cape Town); Mrs H Bowes and Mr J Greig (Wildlife Society of Southern Africa); Mr D Clark and Mr G Wright (Divisional Council of the Cape); Mr B J Huntley (CSIR); Dr C J Loedolff (Cape Provincial Administration); Mr J Malan (Department of Environment Affairs); and Dr K L Tinley (formerly Blue Bend, East London - now Western Australia).

Ms E Mantle and Mrs M Orton (CSIR), undertook the entire typography; Mrs P van Helsdingen (CSIR) provided invaluable secretarial back up at all stages of the exercise. Mr C Burgers (Cape Provincial Administration), not only contributed the major portion of the information on sites throughout the regions, but both he and Mr M Linger (Cape Provincial Administration) helped considerably in the final stages of proof-reading and the checking of the tabulated data in this report. Finally, Mr A A Ferrar (CSIR) was instrumental in initiating the activity and provided timely and necessary critical editorial input at the end of the exercise.

ABSTRACT

Natural vegetation in the lowland regions of the fynbos biome has been transformed by modern land-use practices to a patchwork of small remnants. A system is described for identifying sites of conservation merit from these known remnants, and ordering them by means of a numerical rating. The principal factor contributing to the value of the rating is the current rarity of the vegetation types of each site. A second level of factors comprises habitat diversity, plant species richness and the existence of rare or threatened species. A third level of factors includes the size of the remnant, its shape, the degree of invasion by alien woody plants and the degree of other forms of 'abuse' such as overgrazing, road building or quarrying. Finally a small bonus score is added to any site having a special attribute such as proximity to any other conserved remnant. Composite scores for 153 sites are presented with recommended conservation priorities in each of the five lowland regions of the study area. Comments on the methodology and the value of the data for further analysis are made.

SAMEVATTING

Natuurlike plantegroei in die laaglandstreke van die fynbosbioom is deur moderne grondgebruikpraktyke vervorm tot 'n reeks van onafhanklike klein oorblyfsels. 'n Sisteem word beskryf om bewaringswaardige gebiede uit te ken uit hierdie oorblyfsels en om aan hulle waardes toe te ken. Die belangrikste faktor wat bydra tot die waarde van hierdie beoordeling is die huidige seldsaamheid van die plantegroeitipes van elke gebied. 'n Tweede vlak faktore omvat: habitatverskeidenheid, plantspesiesverskeidenheid en die bestaan van seldsame of bedreigde spesies. 'n Derde vlak faktore sluit in: die grootte van die oorblyfsel, sy vorm, die graad van indringing deur uitheemse houtagtige plante en die graad van ander vorme van 'misbruik' soos oorbeweiding, die bou van paaie of steengroefwerke. Ten slotte word 'n klein bonuspunt toegeken aan enige gebied wat 'n spesiale kenmerk besit, byvoorbeeld as dit naby is aan 'n ander oorblyfsel wat reeds bewaar word. Saamgestelde tellings vir 153 gebiede word voorsien met aanbevole bewaringsprioriteite in elk van die vyf laaglandstreke van die studiegebied. Kommentaar oor die metodologie en die waarde van die data vir verdere analise word gemaak.

TABLE OF CONTENTS

	Page
PREFACE	(iii)
ACKNOWLEDGEMENTS	(iii)
ABSTRACT	(iv)
SAMEVATTING	(iv)
BACKGROUND TO THE PROBLEM	1
GENERAL APPROACH	3
DELIMITATION OF VEGETATION TYPES AND GEOGRAPHIC SUBDIVISIONS	5
DEFINITION OF REGIONAL CONSERVATION STATUS	8
REGION 1. West coast	8
REGION 2. South-west coast	10
REGION 3. Central south coast	11
REGION 4. South-east coast	13
REGION 5. Inland valleys	14
IDENTIFICATION OF SITES OF CONSERVATION VALUE	17
DEFINITION AND QUANTIFICATION OF CRITERIA FOR ALLOCATING CONSERVATION PRIORITIES	18
Vegetation type rarity factor	19
Primary attributes	19
Secondary attributes	20
Other criteria	20
COLLATION AND STORAGE OF SITE DATA	22
SCORING OF SITES ON SELECTED CRITERIA	22
RESULTS AND RECOMMENDATIONS	23
APPENDICES	26
Appendices 1 - 5 : Vegetative composition of existing protected areas in Regions 1 - 5	26
Appendices 6 - 10 : Vegetative composition of proposed sites of conservation value in Regions 1 - 5	31
Appendices 11 - 12 : Example of site data sheets	36
Appendices 13 - 17 : Conservation ratings proposed sites	38
Appendices 18 - 22 : Priority ranking of sites	43
REFERENCES	48
LIST OF PARTICIPANTS	51
RECENT TITLES IN THIS SERIES	54

BACKGROUND TO THE PROBLEM

Fynbos is a local term for the world famous flora of the Cape. The fynbos biome is a distinct biological region which stretches south from van Rhynsdorp to the Cape Peninsula (250 km) and east to scattered patches near Grahamstown (800 km). It forms a broken belt 40 to 150 km wide which contains all that is left of the smallest of the world's six floristic kingdoms, the Cape Floristic Kingdom. It has earned this status by being the richest known flora in the world, with three times the number of species per unit area of its nearest competitor in the Amazon Basin. A figure of 8 504 species of plants has been given for the region (Bond and Goldblatt 1984), which well exceeds that, for example of 7 000 species for the whole of Western Australia (McLarty 1952), an area twenty times its size. About three quarters of these species are of particular importance in that they are endemics, confined to this region alone.

The various plant and animal communities of the fynbos biome are thus internationally of considerable scientific interest. There are two major types, occurring in the mountain and lowland regions of the biome. The main economic value of these areas, in the case of the lowlands, stems from their suitability for agriculture (wheat, fruit, vineyards) and urban development, and in the case of the mountains, as recreational zones and vital fresh water catchments.

In a subcontinental context, Huntley and Ellis (1984) investigated the conservation status of 189 mapped vegetation types in the five major biomes of Africa, south of the equator. Their results showed that lowland fynbos is one of five vegetation types with the least area protected within national parks or nature reserves. In addition, apart from afromontane forests, it occupies the smallest total area. More than three centuries of settlement and development in the south-west Cape has led to the reduction of undisturbed lowland ecosystems to a mere patchwork of tiny remnants. The floristic richness, beauty and commercial and scientific value of these plant communities has long been recognized, as has the need for their conservation.

Concern about the survival of the fynbos has been expressed for many years (Bolus and Wolley-Dodd 1904; Compton 1924; Pillans 1924; Adamson 1927, 1941, 1953; Wicht 1945; Rycroft 1955; van der Merwe 1962; Esterhuysen 1966; Codd 1968; Bigalke 1973). This has been raised to a new urgency by the results of a variety of recent studies, which have explicitly described

the extents to which this unique flora has been fragmented and reduced (Edwards 1974, Campbell and Moll 1976; Hall and Boucher 1977; Milewski and Esterhuysen 1977; Hall 1978; Cowling 1980; Kruger 1980). Attention was specifically focused on the problem in the lowland regions at a "Symposium on coastal lowlands of the western Cape" held at the University of the Western Cape in March 1981. The proceedings of this symposium (Moll 1982) present a review of ecological information on these lowland communities, including a consideration of conservation options in the light of a variety of environmental impacts.

At a meeting of the Fynbos Biome Project Steering Committee in August 1981 it was recommended that a plan should be drawn up to initiate immediate action to conserve what remains of these lowland vegetation communities. As a result, working groups were established in five regions within the fynbos biome to assemble the data for this report.

In a recent revision of the fynbos biome portion of the existing South African vegetation map of Acocks (1953), Moll and Bossi (1984a) show the total extent of the biome, including agricultural and urban areas, to be approximately seven million hectares of which approximately 4,7 million ha comprises the remaining extent of natural vegetation. Eighty-one per cent of what remains is confined to the mountains. Lowland fynbos vegetation has been fragmented and reduced from an estimated original area of 2 850 800 ha to a mere 895 500 ha (31%). Along with the reduction of fynbos vegetation by agriculture and other development, further reduction in conservation value is caused by invasive alien woody plant species. Estimates show that about 24% of the areas carrying natural vegetation have been invaded (Hall 1978). This drastic combination of reduction in area and degradation of remnants throughout the biome has resulted in the extinction of 39 plant species and placement of a further 550 species identified in the South African Red Data book (Hall et al 1980), as species of established threatened status.

> This report is compiled in the assumption that it is a predominant purpose of nature conservation, to **preserve representative examples of these reduced plant communities and minimize further extinction of species.**

Prior to 1980 information related to conservation issues had concentrated on the preservation of species. More recently studies at the plant community and ecosystem levels have highlighted the fragmented nature of the areas of natural vegetation that remain. The combined results of these studies presented nature conservation authorities with a considerable dilemma. These results imply that tasks such as the protection of 550 rare and threatened plant species and the purchase and designation of dozens of nature reserves should all receive urgent attention.

In addition to suggesting unrealistic goals for conservation, individual sites, and occasionally species, were often selected on subjective criteria. It was therefore seen as an urgent need to devise more objective methods for the identification of conservation priorities, and a system that would permit them to be arranged in a logical and consistent rank order.

GENERAL APPROACH

This report serves to identify and categorize sites of particular conservation merit from throughout the lowland region of the fynbos biome. Once identified, a set of basic data for each site is collated to enable a numerical conservation rating to be derived and the sites subsequently listed in priority order. The lists are compiled in five parts in line with convenient geographic subdivisions of the study area. The data summarized here have been obtained from published and unpublished sources, with extensive use of the unquantified and often unrecorded field knowledge of the experienced biologists and ecologists in the five regional working groups. Finally, specific recommendations are made in respect of area-based or in-situ conservation with special emphasis on the fact that most of the areas identified are at present privately owned.

This document is merely a summary of the rating process and a presentation of the results. The raw data set which is a valuable resource in itself, comprises a bulky archive of information which, for various reasons, needs to be kept confidential. It is housed for the time being at the office of the Fynbos Biome Project at the University of Cape Town. In time it is intended that its curation and maintenance will be taken over by the Cape Department of Nature and Environmental Conservation. The value of the information in the data base, for future research on a whole range of topics is immense. Opportunities to begin studies in such fields as minimum viable population size for rare species, the dynamics of species area relationships and the establishment of realistic time scales for the management of "island" reserves, are evident within the data set.

The scoring, weighting and ranking system described was adopted in order to remove personal bias. It has not totally removed subjectivity but has attempted to quantify the subjectivity and to do so on a uniform basis. Ogle (1981) developed a numerical scoring system in order to determine the relative importance of forested wildlife habitats in Northland, New Zealand. Twenty-five habitats were ranked according to the criteria of four authors and significant agreement was found between the four sets of rankings. He concluded that all habitat ranking systems employing sound ecological criteria would produce rankings which differ only slightly. The only limitation to the choice of criteria is the availability of relatively uniform, sufficiently detailed and extensive information (Bolton and Specht 1983).

There are several advantages to using a scoring and ranking system of the type described in this report:

(1) the criteria used in the system are those that appear to be most widely used internationally, and which the current state of ecological knowledge suggests are important (Klopatch et al 1981, Margules and Usher 1981, Kirkpatrick 1983, Lloyd 1984, Game and Peterken 1984);

(2) they reflect to some extent, biogeographic principles which state the most important considerations for long-term conservation of species in isolated patches of habitat (Margules et al 1982);

(3) it is a scheme which can be applied to minimize individual observer biases in making subjective assessments (Bolton and Specht 1983);

(4) a ranked grouping of habitats permits regional planning decisions to be made - regardless of present land tenure; and

(5) as yet unlisted sites can be readily included in the future.

A schematic representation of the ranking process described is presented in Figure 1.

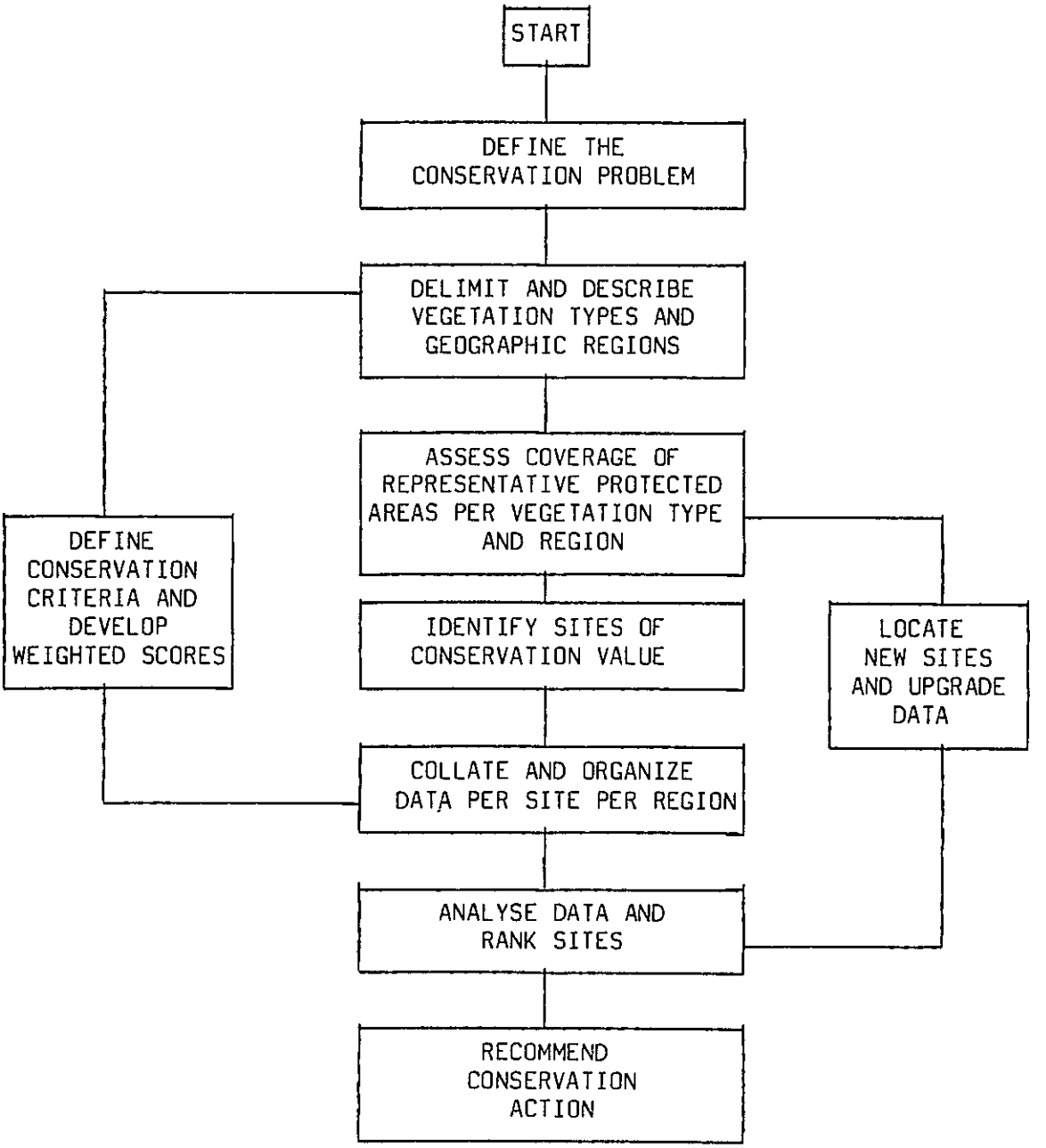


FIGURE 1. Schematic representation of the method for allocating conservation priorities.

DELIMITATION OF VEGETATION TYPES AND GEOGRAPHIC SUBDIVISIONS

Five major biome-types may be recognized in South Africa: fynbos, karoo, grassland, savanna and forest (Huntley 1984). Each biome has specific floristic, climo-edaphic and dynamic characteristics and environmental problems. It follows that the identification of conservation priorities should fall within this biome framework. However, a finer scale of resolution is necessary for a thorough appraisal of conservation priorities within a biome.

Acocks (1953) described and mapped five Veld Types constituting the fynbos biome, namely: Strandveld (Veld Type 34), Coastal Renosterbosveld (Veld Type 46), Coastal Macchia (Veld Type 47), Macchia (Veld Type 69) and False Macchia (Veld Type 70). He emphasized, however, that there was considerable variation in the structure and botanical composition of communities within the Veld Types which he used as his mapping units.

In a survey to determine the adequacy of existing conserved areas in relation to Acocks' Veld Types Edwards (1974) stated that it would be necessary to subdivide the Veld Types, in order to ensure adequate representation of the component ecosystems.

More recent information revealed the western and southern vegetation types in the fynbos biome as differing in floristic composition and climax communities (Acocks 1975; Taylor 1978; Kruger 1979a; Kruger 1979b; Boucher and Moll 1981). The differences appeared to be as important as the distinction between coastal and inland vegetation types.

The recently published vegetation map of the fynbos biome (Moll and Bossi 1984b) and description of the major vegetation types (Moll et al 1984), identify 23 vegetation types in the fynbos biome of which 15 are in the lowland category, and eight are in the mountain category. It is these lowland vegetation types, together with some of those in the mountain category (in the eastern regions and the inland valleys) which were used as the basis for assessing lowland conservation priorities in this report. They are grouped into five regions (see Figure 2), each separated from its neighbour by a topographic or climatic discontinuity, which is reflected in the range of vegetation types encountered (Table 1). Wetlands were not mapped and described as separate vegetation types by Moll and his co-workers, but as they are generally areas of recognized conservational and recreational value they are categorized as such in this analysis. They are of particular significance as coastal wetlands in the West, South-west and South coast regions.

TABLE 1. Location of the five geographic regions within the lowland areas of the fynbos biome and their component vegetation types

	Delimitation	Component vegetation types
Region 1 West coast	West Coast foreland from Olifants River in the north to False Bay in the south, bordered in the west by the Atlantic Ocean, and in the east by the crest of the mountain ranges	Wetlands West Coast Strandveld Sand Plain Lowland Fynbos Mosaic of West Coast Strandveld and Sand Plain Lowland Fynbos South Coast Strandveld West Coast Renosterveld Mesic Mountain Fynbos
Region 2 South-west coast	South coast foreland from Cape Hangklip to the Gouritz River, bordered in the north by the Riviersonderend Mountains, crossing the Breede River valley and extending eastwards along the southern edge of the Langeberg	Wetlands South Coast Strandveld Dune Fynbos Limestone Lowland Fynbos Elim Lowland Fynbos South West Coast Renosterveld South Coast Renosterveld Afromontane Forest Wet/Mesic/Dry Mountain Fynbos
Region 3 Central south coast	South coast foreland from Gouritz River to Storms River, extending inland to the foothills of the Outeniqua and Kouga Mountain ranges	Wetlands Dune Fynbos Mosaic of Dune Fynbos and Kaffrarian Thicket Afromontane Forest Valley Bushveld South Coast Renosterveld Wet/Mesic Mountain Fynbos
Region 4 South-east coast	South coast foreland from the Storms River to the Fish River, extending inland to the outliers of Grassy Fynbos in the Grahamstown area, and to the Suurberg	Dune Fynbos Kaffrarian Thicket Mosaic of Dune Fynbos and Kaffrarian Thicket South Coast Strandveld Mesic Grassy Fynbos Valley Bushveld Wet/Mesic Mountain Fynbos
Region 5 Inland valleys	Inland valleys in the Ceres/Worcester area	Mesic Mountain Fynbos Central Mountain Renosterveld Karroid Shrublands

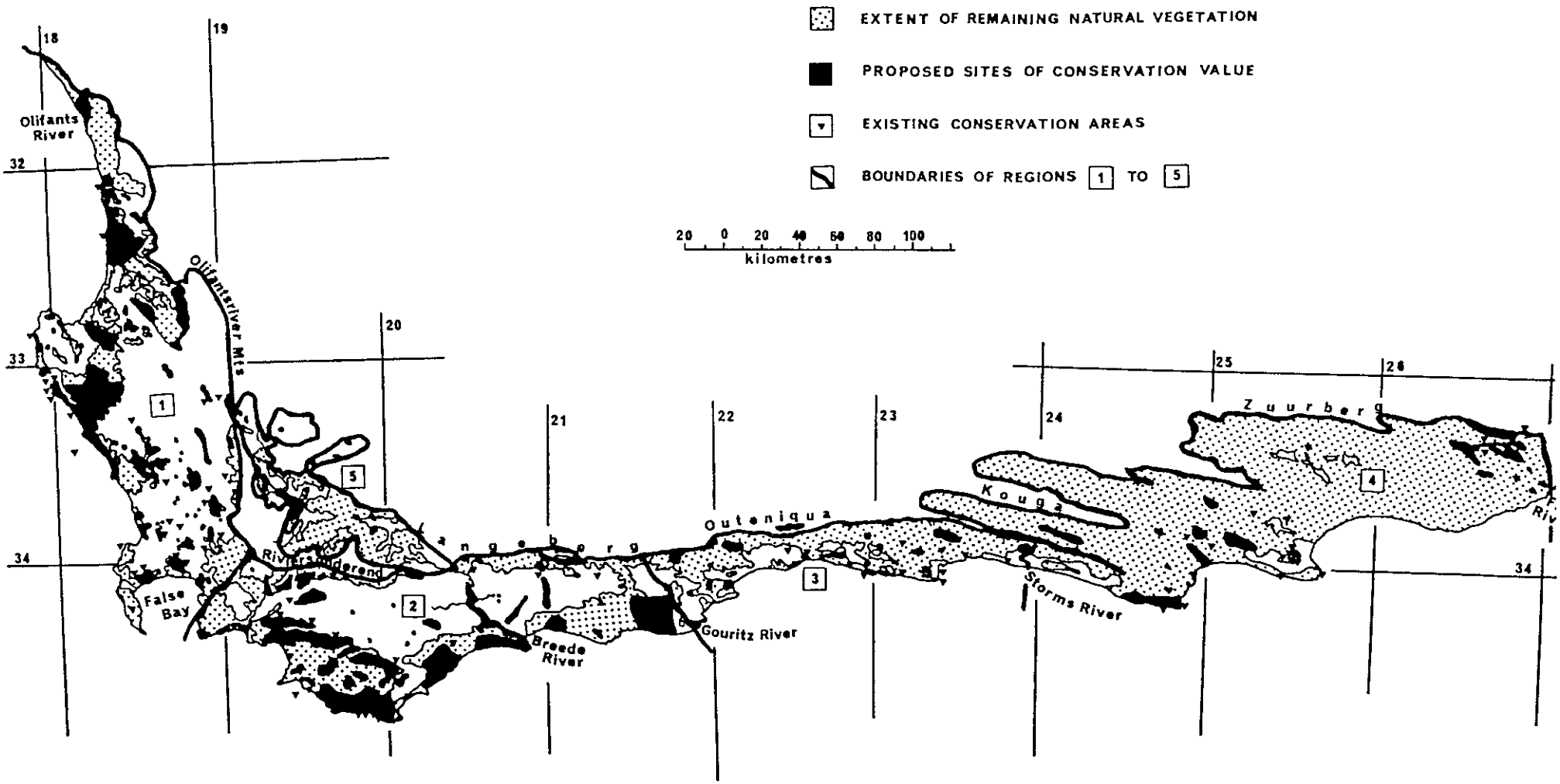


FIGURE 2. Map showing regional subdivisions, location of currently conserved areas and of proposed sites of conservation value.

DEFINITION OF REGIONAL CONSERVATION STATUS

There are 125 existing conservation areas in the lowland regions of the fynbos biome. This number excludes the ten island reserves which do not contribute significantly to fynbos communities. Earlier listings and categorization of these areas were based on Acocks' Veld Types, and were not comprehensive. In addition each of the five survey regions has slightly different socio-economic, land use and habitat factors, which influence the assessment of current conservation values. A reappraisal of the current conservation coverage of the five lowland regions is therefore necessary, using the most up-to-date vegetation classification system available.

Region 1. West coast

A variety of geological substrates of various ages contributes to the diversity of vegetation types present in this region. The oldest substrates are the Late Precambrian Malmesbury Group shales which are intruded by Cape granites and are overlain by Klipheuwel and Table Mountain Group sandstones and shales with Mesozoic to Cenozoic limestones, calcretes and sands on top.

Throughout most of this region there are, and have been in the past, major human influences on the environment. The region has been inhabited by hunter-gatherers since the Late Pleistocene and by herders for at least 2 000 years (Avery 1975). Nomadic Khoisan or Hottentot tribes used fire to stimulate vegetation regrowth for grazing purposes, a habit adopted by European man subsequent to his settlement here in 1652. In addition there has been extensive replacement of indigenous vegetation cover, particularly West Coast Renosterveld on the richer shale-derived soils, by ploughed crop-lands. Incessant crop rotation, ploughing of steep, erosion-prone sites and excessive use of fertilizers were all consequences of the boom in grain farming that began in the 1920's (Talbot and Talbot 1968). The net effect today, is that of the original West Coast Renosterveld vegetation communities, only a few remnants survive.

Sand Plain Lowland Fynbos and West Coast Strandveld vegetation communities, on sandy soils that are unsuited to wheat-growing, are in a better, but far from satisfactory state. In the south of the region, surviving remnants of these latter vegetation types are threatened by the fast expanding centres of the Cape Town Metropolitan Region.

The present conservation coverage of this region is summarized in Table 2. In addition Appendix 1 presents a detailed breakdown of the vegetation types for all existing protected areas in the region. The two must be considered together, because the figures in the final column of Table 2, which represent the percentage of the remaining area of each vegetation type currently protected, can be misleading. Reference to Appendix 1, shows that:

(1) although a total of 1 830 ha of Sand Plain Lowland Fynbos (1,4% of what remains) are currently protected, 1 800 ha of this total are in private ownership and in fact consists of one private nature reserve;

(2) similarly, although 2 484 ha of West Coast Renosterveld (18,2% of what remains) are currently protected, 1 000 ha are in private ownership (again one reserve), 922 ha are local authority reserves and a mere eight hectares (0,3%) fall within a provincial reserve.

Overall, of the 35 protected areas listed in Appendix 1, which total 48 795 ha: three are provincial reserves (1 048 ha or 2,1% of the protected area); 10 are managed by the Department of Environment Affairs (4 351 ha or 8,1%); 10 are local authority areas (13 122 ha or 26,7%); two are National Botanic Gardens (26 ha or 0,05%); one is committed to future National Park status (22 375 ha or 46%); and nine are private reserves (7 873 ha or 16,1%).

TABLE 2. Conservation coverage of Region 1 (to be read with Appendix 1)

Most reduced lowland vegetation types (Moll and Bossi 1984b)*	Remaining extent of vegetation type (ha)	Extent of existing protected areas within each vegetation type (ha)	Percentage conservation coverage %
WEST COAST STRANDVELD	192 287	24 123	12,5
SAND PLAIN LOWLAND FYNBOS	126 229	1 830	1,4
SOUTH COAST STRANDVELD	8 944	0	0,0
WEST COAST RENOSTERVELD	13 619	2 484	18,2

* NB - all these vegetation types had been reduced in area prior to the statistics produced by Moll and Bossi (1984b); the percentage conservation coverage would be considerably lower if it were calculated according to the original extent of each vegetation type.

Region 2. South-west coast

This region can be subdivided into:

(1) an inland belt, characterized by intensive agriculture on relatively widespread Bokkeveld Shales, and smaller expanses of conglomerates and silcretes where the remaining undisturbed predominantly South West Coast and South Coast Renosterveld vegetation communities are confined to small, scattered patches; and

(2) a coastal belt where extensive areas of natural vegetation remain, which are used for grazing, the wild flower trade and recreation. Substrates encountered here include: calcretes (Limestone Lowland Fynbos); shales and ferricretes (Elim Lowland Fynbos); and calcareous coastal sands (South Coast Strandveld). In addition scrub forest patches (Afromontane Forest) and wetland vegetation communities occurring on pans and along rivers are features of this region.

Table 3 presents data on the present conservation status of this region.

TABLE 3. Conservation status of Region 2

Most reduced lowland vegetation types (Moll and Bossi 1984b)*	Remaining extent of vegetation type (ha)	Extent of existing protected areas within each vegetation type (ha)	Percentage conservation coverage %
SOUTH COAST STRANDVELD	48 902	4 186	8,6
DUNE FYNBOS	43 921	475	1,1
LIMESTONE LOWLAND FYNBOS	202 747	13 192	6,5
ELIM LOWLAND FYNBOS	20 294	800	3,9
SOUTH WEST COAST RENOSTERVELD	19 984	660	3,3
SOUTH COAST RENOSTERVELD	150 035	2 894	2,7
AFROMONTANE FOREST	1 853	0	0

* See footnote to Table 2
** not mapped by Moll and Bossi 1984b

Appendix 2 presents a detailed inventory of information on existing protected areas for the region, showing that:

(1) only 800 ha of Elim Lowland Fynbos (3,9% of what remains) are currently conserved, and that the full 800 ha fall within one private reserve;

(2) 13 192 ha of Limestone Lowland Fynbos (6,5% of what remains) are currently conserved, of which 11 500 ha fall within the De Hoop Provincial Nature Reserve, and the bulk of the remainder in private reserves;

(3) only 500 ha of Sand Plain Lowland Fynbos are currently conserved, all of which lies within one privately owned property;

(4) only 660 ha of South West Coast Renosterveld (3,3% of what remains) are currently conserved, of which 600 ha fall within one private reserve, and only 60 ha fall within a provincial reserve (again the De Hoop Nature Reserve);

(5) 2 894 ha of South Coast Renosterveld (2,7% of what remains) are currently conserved, of which 2 786 ha fall within the Bontebok National Park, under the National Parks Board; and

(6) 4 186 ha of South Coast Strandveld (8,6% of what remains) are currently conserved, split mainly between provincial reserves (1 000 ha - on De Hoop Nature Reserve), Department of Environment Affairs (1 622 ha), and private landowners (1 534 ha).

Of the 36 protected areas listed in Appendix 2 (46 477 ha): three are provincial reserves (19 530 ha or 42% of the protected area); 15 are managed by the Department of Environment Affairs (10 579 ha or 22,8%); seven are local authority reserves (2 497 or 5,4%); one is a National Park (2 786 ha or 6,0%); and 11 are private reserves (11 085 ha or 23,9%).

Region 3. Central south coast

There has been considerable reduction of this region's lowland fynbos vegetation due to agricultural activities (including forestry) and the more recent development of extensive stretches of the coastline for townships. This development is mainly linked to recreation needs and has brought with it extensive invasions of the natural vegetation by woody alien plants. The coastal foreland narrows down from around 100 km in width in Region 2, to a relatively narrow band only 10 to 20 km wide. There is a range of vegetation communities from South Coast Renosterveld and patches of Valley Bushveld types encountered in the west, through Dune Fynbos and Mosaic of Dune Fynbos and Kaffrarian Thicket of the coastal strip, to Afromontane Forest inland, and ultimately to Mesic and Wet Mountain Fynbos communities in the foothills at the northern and eastern edges of the region.

The current conservation coverage of the component lowland ecosystems is shown in Table 4.

Appendix 3 presents a detailed inventory of information on existing protected areas for the region. It shows that:

(1) a total of 1 268 ha of Dune Fynbos (30,8% of what remains) are currently protected, of which 1 200 ha fall within one reserve managed by the National Parks Board;

(2) there is no South Coast Renosterveld within any protected area in this region;

(3) 2 103 ha of the Mosaic of Dune Fynbos and Kaffrarian Thicket (18,9% of what remains) are currently protected, 2 093 ha of which fall within three provincial reserves and are considered to be in a good state of preservation;

(4) there is one reserve owned by the Department of Environment Affairs, which contains an extensive block of Valley Bushveld (5 000 ha);

(5) protected Afromontane Forest communities in the area comprise 9 959 ha (10,9% of what remains).

TABLE 4. Conservation coverage of Region 3

Most reduced lowland vegetation types (Moll and Bossi 1984b)*	Remaining extent of vegetation type (ha)	Extent of existing protected areas within each vegetation type (ha)	Percentage conservation coverage %
DUNE FYNBOS	4 106	1 268	30,9
MOSAIC OF DUNE FYNBOS AND KAFFRARIAN THICKET	11 073	2 103	19,0
AFROMONTANE FOREST	91 259	9 959	10,9
VALLEY BUSHVELD	6 359	5 000	78,6
SOUTH COAST RENOSTERVELD	23 306	0	0,0

* See footnote to Table 2
** not mapped by Moll and Bossi 1984b

There are 22 protected areas in the region, totalling 49 753 ha made up as follows: five provincial reserves (13 063 ha or 26,2% of the protected area); six Department of Environment Affairs reserves (30 873 ha or 62%); two local authority reserves (134 ha or 0,3%); three areas under National Parks Board (5 418 ha or 10,9%); and seven private reserves (265 ha or 0,5%).

Region 4. South-east coast

Generally fynbos biome communities in the south-east Cape lowlands have not been destroyed on a scale even remotely comparable to the other three coastal lowland regions. This is largely because of the greater grassy component of the fynbos and renosterveld communities which are managed as rangelands for livestock grazing. In certain respects this form of land use is compatible with the conservation of these ecosystems in a natural or seminatural state.

However, the frequent burning of Grassy Fynbos (four- to five-yearly), has resulted in the elimination over vast areas of many seed regenerating species which require a longer rotation in order to successfully reproduce. Although land-use practices do not result in the total destruction of Grassy Fynbos systems, they do result in the elimination of certain fynbos elements. Therefore reserves are required where the fire regime can be manipulated to ensure the survival of these species.

In the south-east Cape, South Coast Renosterveld is confined to a small region on the Humansdorp flats with outliers in the Langkloof, Elandsrivier valley and the inland margin of the Suurberg. These vegetation communities are exceptionally species rich and demonstrate fully the complexity of south-east Cape vegetation. In the areas where the rainfall is above 500 mm per year (ie the entire Humansdorp flats), South Coast Renosterveld is being rapidly replaced by wheat fields and cultivated pastures. At present much of the South Coast Renosterveld is intact but its future protection should be viewed as a priority.

The conservation status of fynbos communities on the Recent Calcareous Sands in Region 4 is at least as critical, if not more so, than for the other three coastal lowland regions. There are two major dunefields which support(ed) Dune Fynbos: at Cape Recife and Oyster Bay. Vegetation in the former area has almost entirely been replaced by invasive aliens; in the latter, the situation is deteriorating at an alarming rate. Conservation status of Dune Fynbos communities in the south-east Cape is dismal and the establishment of reserves should be given top priority.

The rate of turnover of species as one moves from one area to the next of fynbos biome communities in the south-east Cape lowlands is not very high and nowhere comparable to the exceptional rates encountered in the western Cape lowland regions. The number of reserves required for the adequate conservation of the south-east Cape vegetation should be fewer than in the western region of the biome. For example the Suurberg Wilderness Area adequately conserves the Suurberg Grassy Fynbos and no other large reserves should be necessary in that mountain complex.

The current conservation coverage of this region is summarized in Table 5.

Appendix 4 presents a detailed inventory of information on existing protected areas for the region. Referring to Appendix 4 we see that:

(1) 8 080 ha of Mesic Grassy Fynbos (2,1% of what remains) are currently protected, 6 700 ha of which fall within the Suurberg State Forest, under the Department of Environment Affairs and are in good condition;

(2) only 41 ha of South Coast Renosterveld (0,2% of what remains) are currently protected;

(3) only 1 558 ha of Dune Fynbos/ and the Mosaic of Dune Fynbos and Kaffrarian Thicket (0,1% of what remains) are currently protected, of which 1 000 ha fall within the Alexandria Coastal Reserve (Department of Environment Affairs and are considered to be in a good condition.

Of the 30 protected areas listed in Appendix 4, totalling 42 167 ha: six are provincial reserves (1 347 ha or 3,2% of the protected area); three are managed by the Department of Environment Affairs (36 877 ha or 87,4%); 15 are local authority reserves (2 547 ha or 6,0%); and six are privately owned (1 396 ha or 3,3%).

TABLE 5. Conservation coverage of Region 4

Most reduced lowland vegetation types (Moll and Bossi 1984b)*	Remaining extent of vegetation type (ha)	Extent of existing protected areas within each vegetation type (ha)	Percentage conservation coverage %
DUNE FYNBOS/MOSAIC OF DUNE FYNBOS AND KAFFRARIAN THICKET	17 525	1 558	8,9
SOUTH COAST RENOSTERVELD	20 510	41	0,2
MESIC GRASSY FYBOS	383 630	8 080	2,1

* See footnote to Table 2

Region 5. Inland valleys

This subdivision is not a region in the true geographical sense. It reflects a loose grouping of sites which do not fit into the other four regions. The sites do not in fact consist of true lowland vegetation types and even if they did they would not occur at a mapable scale. They are included due to the occurrence of specialized riverine habitats and contain many typically lowland elements that are rare or threatened. Most of the situations of conservation interest in this region are low altitude ecotonal sites, at the interface between Mesic Mountain Fynbos, Central

Mountain Renosterveld and Karroid Shrublands. Other important landscape types are river terrace situations located predominantly on the Breede River, where specific rare vegetation communities are encountered on river gravels.

Table 6 presents data on the current conservation coverage of Region 5.

Appendix 5 presents a detailed inventory of information on existing protected areas for the region. Referring to these two tables we see that:

(1) a total of 2 669 ha of Karroid Shrublands (3,5% of what remains) are currently protected, 1 700 ha of which falls in one provincial nature reserve;

(2) 434 ha of Central Mountain Renosterveld (0,7% of what remains) are currently protected, 400 ha falling in one local authority reserve;

(3) 5 191 ha of Mesic Mountain Fynbos (2,1% of what remains) located at low altitudes (in ecotonal positions) are currently protected, a large proportion of which, 3 917 ha, are located in private nature reserves.

Of the 13 protected areas listed in Appendix 5, totalling 9 002 ha: three are provincial reserves (1 887 ha or 20,9% of the area protected); three are local authority areas (2 080 ha or 23%); one belongs to the National Botanic Gardens (154 ha or 1,7%); and six are private reserves, totalling more than 5 000 ha (or 55%).

TABLE 6. Conservation coverage of Region 5

Lowland vegetation types	Remaining area of vegetation type (Moll and Bossi 1984b)* (ha)	Area of each vegetation type currently protected (ha)	% of remaining extent of each vegetation type currently protected
CENTRAL MOUNTAIN RENOSTERVELD	59 712	434	0,7
MESIC MOUNTAIN FYNBOS	25 250	5 191	20,6
KARROID SHRUBLANDS	76 665	2 669	3,5

* See footnote to Table 2

Table 7 presents a summary of the numbers, extent and proportional management responsibility for the 125 existing protected areas within the lowland regions of the fynbos biome.

TABLE 7. A summary of the numbers, extent and proportional management responsibility for the 125 existing protected areas within the lowland regions of the fynbos biome

	Lowland Regions					Totals
	1	2	3	4	5	
Number of protected areas (minus islands)	28	34	22	29	12	125
Total extent (ha)	48 439	46 454	49 753	42 147	7 802	194 595
Average size (ha)	1 730	1 366	2 261	1 454	650	1 557
Number of CPA areas (% of total)	3(2,2)	3(42,0)	5(26,3)	5(3,2)	3(24,2)	19(18,9)
Number of DEA areas (% of total)	3(8,2)	12(22,7)	5(62,1)	3(87,5)	- -	23(42,3)
Number of NPB areas (% of total)	1(46,2)	1(6,0)	3(10,9)	- -	- -	5(15,7)
Number of LA areas (% of total)	10(27,1)	7(5,4)	2(0,3)	15(6,0)	2(11,3)	36(9,9)
Number of NBG areas (% of total)	2(0,5)	- -	- -	- -	1(2,0)	3(0,1)
Number of P areas (% of total)	9(16,3)	11(23,9)	7(0,5)	6(3,3)	6(62,6)	39(13,1)

IDENTIFICATION OF SITES OF CONSERVATION VALUE

The identification of sites of conservation value may be achieved in several ways. Individuals can be commissioned to survey vegetation with the aim of producing vegetation maps and identifying particular, representative sites. Alternatively, existing vegetation maps supported by air- and/or satellite photographs can be used. Thirdly, the practical experience and expertise of individuals who have been employed on vegetation studies and who have detailed field knowledge of the region may be consulted.

In this case, workshop situations were used to exploit all three of these alternatives, in order to draw up lists of sites of conservation value for each region (see Appendices 6 to 10). The lists are not exhaustive, but form part of an ongoing process of site identification and review. Several workshop sessions were held in each region in an iterative process of upgrading and increasing the data base each time. It is intended that this process should continue, so that the priority ranking of sites in each region is continually reviewed in the light of new knowledge. Reference to Figure 1 will show this built-in review process in the form of the feedback loop, "Locate new sites and upgrade data".

Table 8 presents a summary of information contained in Appendices 6 to 10.

TABLE 8. Summary of information on extent and number of proposed sites of conservation value in the five lowland regions

	Number of sites	Total extent (ha)	Undisturbed ecosystems (ha)	Average size of site (ha)
Region 1 West Coast	55	227 985	141 446 (62%)	4 145
Region 2 South-west Coast	42	214 183	193 428 (90%)	5 100
Region 3 Central-south Coast	22	71 203	71 143 (99%)	3 237
Region 4 South-east Coast	19	196 681	152 081 (77%)	10 351
Region 5 Inland Valleys	15	17 860	17 360 (97%)	1 190
TOTALS	153	727 912	575 458 (79%)	4 758

DEFINITION AND QUANTIFICATION OF CRITERIA FOR ALLOCATING CONSERVATION PRIORITIES

One of the first tasks undertaken at the initial planning meetings of the working groups was to determine which attributes contributed significantly to the conservation merits of each site. All suggestions were considered and debated to consensus as to their relative contribution to a composite merit rating. Several attributes were included only to be dropped at a later stage due to problems of subjectivity or being unsuited to the quantitative ranking system that evolved. In this respect two particular attributes were considered important but were finally discarded. They were the values ascribed to the aesthetic, recreational or cultural features of the site and the negative values ascribed to peripheral threats of various kinds. Apart from this the original list remained intact through consideration of all five regions.

A final decision on which factors (site attributes) to include and how to weight each component of the composite score was not taken until many variations had been tested on the initial data set (Region 1). The following arithmetic formula was developed and found to provide a logical ranking of sites in all five regions of the fynbos biome.

The formula strongly emphasizes the importance of the botanical component (plant communities and habitats) in quantifying conservation merit. This is seen as appropriate for most terrestrial biomes, but in the fynbos the bias is totally botanical, right down to the species level. The factors, "species richness" and "threatened species" include plants only in this case, because the biome has a very limited large faunal component and knowledge of the small faunal component, especially invertebrates, is too sketchy to provide a basis for scoring.

Conservation merit rating for a particular site = (1)

$$\text{Vegetation type rarity factor} \times \left[\text{habitat diversity} + \text{species richness (plants)} + \text{threatened species (plants)} + \frac{\text{size}}{2} + \frac{\text{shape}}{2} + \frac{\text{invasion}}{2} + \frac{\text{abuse}}{2} + \text{special attributes}\right]$$

The dominant factor in the rating is the vegetation type rarity factor which accounts for about 15 to 60% of the total score depending on the attributes of the site. The primary factors (habitat diversity, species richness, and threatened species) in combination contribute a similar but lesser amount, namely 10 to 55%. The secondary factors (size, shape, invasion and abuse) in combination contribute just more than half the previous portion of the score, namely 7 to 30%. The bonus score, termed special attributes (mainly reflecting proximity to other areas of natural vegetation) has the potential to contribute from 0 to 30% of the final score. It is acknowledged that these factors are not independent, but there is no practical way to measure the extent of covariance between them. Hence these estimates of proportional contribution to a final score for each site are offered only as very general indications.

In applying this evaluation system to more diverse biogeographic regions or to any large heterogeneous area, the dominant factor and primary attributes (vegetation type rarity, habitat diversity, species richness, threatened species) should remain valid. The secondary attributes (size, shape, invasive species, abuses) would need to be adapted to suit local circumstances. In the application of this scoring system to lowland sites in the fynbos biome, the primary attributes were ranked from one to five (worst to best) and the secondary attributes also from one to five, but each reduced by half in keeping with their lesser significance to conservation values. The numerical value and weighting of each component in the formula were determined as follows:

Vegetation type rarity factor

As mentioned above this factor is considered to be the overriding consideration in determining conservation priorities. This is translated into quantitative terms by allocating a weighting factor to each vegetation type, determined on the basis of its relative rarity, in general, and within the context of its geographical region. Where conservation sites comprise several vegetation types, the rarity factor allocated to each site reflects the proportional representation of its constituent vegetation types. A scale of rarity factor values from 1,5 to 3,75 was applied to the vegetation types. Rarity factor values are determined on the basis of the extent to which each vegetation type has been reduced from its estimated original area, as calculated from Moll and Bossi's (1984b) satellite mapping exercise.

Primary attributes

Habitat diversity - gross topographic and vegetative diversity, including aspects such as patchiness, heterogeneity and presence of ecotones within the site

Plant species richness - an index of the total number of plant species known or estimated to inhabit the site

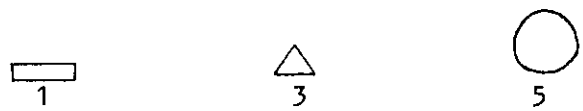
Threatened species - an index of the total number of rare, vulnerable and endangered species (sensu IUCN definition and South African Red Data Books) known to occupy the site

These attributes are quantitatively estimated and once the full range of estimates is known the site is allocated to a rank in keeping with its place in that range.

Secondary attributes

Size - total area of the site. For Region 1: less than 5 ha = 1, 6 to 25 ha = 2, 26 to 100 ha = 3, 101 to 500 ha = 4, more than 500 ha = 5. For other regions the size classes were adjusted slightly to suit the range of sizes in each region.

Shape -



Invasive species - the extent to which the site is invaded by alien woody plants (most invasion = 1, least invasion = 5)
Abuse - the extent to which land-uses, with obvious deleterious effects on conservation values, have affected the site eg overgrazing, construction or excavation.

Scores for these four criteria reflect the nature of the sites, their distribution and the significant environmental factors in the region. They are negatively weighted by reducing the value of all rank scores by half. It was agreed that this weighting reflected the relative importance of these factors, considering the range of variation with which they occurred on the sites examined.

Other criteria

Special attributes - originally designed to include a wide range of otherwise unaccountable "bonus" criteria (eg aesthetic, scenic, cultural, recreational, biotic). In practice it reflects only the proximity of the site to other areas of undisturbed vegetation. Additional attributes were considered and later dropped for a variety of reasons mentioned earlier.

Diamond (1975) has suggested that the number of species a reserve can support is a function of its size and its isolation. Large reserves and reserves located close to others can hold more species (McCoy 1983). Siegfried (1982) has pointed out the importance of establishing chains of reserve systems in this region in order to provide for the potential role of avifauna and other mobile elements in the maintenance of viable reserve systems. For these reasons, the proximity of a site to existing protected areas or other potential conservation areas was considered to be a special attribute.

The position and extent of each site was located on a map, as was the position of each existing protected area. Using this map for reference, a score from zero to 10 was added to the conservation rating as follows:

(1) extension of an existing protected area providing a larger area with varied habitats = 10;
(2) contiguous with a potential conservation area providing a larger area with varied habitats = 8;
(3) less than 25 km from a large existing protected area or potential conservation area = 6;
(4) more than 25 km and less than 125 km from other existing or potential conservation areas = 4;
(5) more than 125 km from existing and potential conservation areas, but still forming a link in a system of protected areas = 2;
(6) more than 125 km from other potential conservation areas (ie isolated completely) = 0.

COLLATION AND STORAGE OF SITE DATA

In this step, the information on each site is organized onto an information sheet and accompanying map (see Appendices 11 and 12 for an example of each). The data sheet carries information stating: the site number; name; ownership; grid reference/locality; total area; area of undisturbed ecosystems; major vegetation types and their proportions; disturbances (such as alien woody plants, heavy grazing, quarrying, road building); special attributes (proximity to other protected areas, biotic, cultural, historic, landscape); present land use; and any additional comments pertaining to feasible conservation action.

The map sheet is at 1:50 000 scale, unless the area is greater than 10 000 ha, in which case a scale of 1:250 000 is used. The proposed site is outlined on it or on a suitable overlay.

This forms the basis of a data bank for all sites of conservation merit, which can be added to at any stage. Individuals who are familiar with the site or can gain access to it may be assigned the task of completing the data sheet from current knowledge or by means of a short survey of the area.

SCORING OF SITES ON SELECTED CRITERIA

This step in the method, entails scoring sites on the selected criterion discussed above. A process of consensus within the working groups was used to arrive at the final scores allocated to each site for each criterion. Scores allocated to the 153 sites in the five regions are presented in Appendices 13 to 17.

Appendices 18 to 22 present the priority rankings of the 153 sites in each of the five regions to which they belong. The tables are arranged with the highest scoring sites at the top, with approximate scores indicated on each side. The dominant vegetation type of each area is identified by its horizontal position in the table.

RESULTS AND RECOMMENDATIONS

The results of this analytical survey of conservation priorities are summarized in the Figures, Tables and Appendices of this report. They are presented in detail, often as raw data, to enable the scoring and ranking process to be followed and adjusted at a later stage if necessary. The more descriptive data base (site information sheets and maps) is held as a confidential archive to be made available to bona fide conservation staff, scientists and planners as necessary. The data provide a valuable tool for research, monitoring and planning in the fynbos biome. The first recommendation of the contributors to this report is that an appropriate conservation authority, such as the Cape Department of Nature and Environmental Conservation, accept responsibility for the curation and updating of this body of information.

This report has been compiled over an extended period and has involved a large number of contributors. During the same period a Government sponsored committee under the chairmanship of Mr J A Fenn (Department of Environment Affairs) has been tasked similarly, to make recommendations concerning the conservation of lowland regions of the fynbos biome. There has been a substantial degree of interaction between these two groups and the data generated by this survey was made available and substantially used by that committee. As a result, the recommendations made here are not new, some have been made in interim reports and some by individual contributors working directly through their own nature conservation agencies. However, for the sake of completeness all of them are included here.

Four general recommendations for conservation action have emerged from the survey:

1. Conservation agencies, separately or jointly, should accept as a long-term goal, the need to protect and effectively conserve as much as possible of the area covered by the 153 sites of conservation value listed in this report (ie 727 912 ha or 10,4% of the extent of the fynbos biome).

2. All sites with scores above 50 deserve priority consideration. There are 80 such sites distributed as follows: 34 in Region 1; 31 in Region 2; four in Region 3; four in Region 4; and seven in Region 5. If it is not possible to achieve protection for all these sites, care should be taken to select a representative sample from the priority listing within each region (Appendices 18 to 22).

3. If the scores for existing reserves in Region 1 are compared with those for the additional sites of conservation value (Appendix 18) it will be noted that only five out of 32 sites scoring over 50 are existing reserves. This indicates that in terms of this report's criteria of conservation merit, there are many more deserving sites than those currently designated for conservation. Examination of the bottom end of the scale of conservation ratings (those scoring less than 30 in Appendix 18) shows a majority of existing reserves. The overall distribution of existing reserves in Appendix 18 indicates that their management objectives differ substantially from that of conserving representative samples of ecosystems and minimizing biotic extinctions. Examination of the areas involved indicates that the viability of many existing sites is threatened by their small size. It is recommended that the management objectives of these areas should be reviewed in a way that reflects their present function and relate to scientifically based conservation norms. Examples from Region 1 are:

22	Eensaamheid Geometric Tortoise Reserve/Nature Reserve	8 ha
16	Tienie Versfeld Flora Reserve	22 ha
13	Cape Flats Private Nature Reserve	8 ha
21	Bracken Nature Reserve	36 ha
29	Zandvlei Bird Sanctuary/Nature Reserve	1 ha
28	Rondevlei Bird Sanctuary	5 ha
14	Lamberts Bay Nature Reserve/Bird Sanctuary	20 ha
12	Edith Stephens Cape Flats Flora Reserve	3,5 ha

Comparisons between existing reserves and proposed sites for the other four regions of the biome were not made due to insufficient data being available for all the existing reserves.

4. The evidence shows that the conservation objective of preserving representative portions of the component ecosystems of the fynbos biome, has not been achieved. Therefore it is recommended that all conservation agencies that function in the region need to meet to find common purpose in repairing this failure. To have any chance of success, executive action will have to be fast and concerted or it will never catch up with the rate of depletion.

Some of these recommendations, like their precedents, may sound ridiculously impractical to budget bound conservation administrators, but the contributors to this report are fully aware of current financial constraints. However, the seriousness of the potential failure of conservation in the lowland regions of the fynbos does beg the question, as to whether a reassessment of future financial commitments is not in order by all appropriate conservation agencies.

There are wider implications to these recommendations than the simple financial ones. They involve consideration of a whole array of alternative strategies for conservaion. Some of these may already have been tried (and failed), others will require innovative policies and vigorous implementation if any real conservation gains are to be made. Examples that involve less money than outright purchase of land, include:

- cession of development rights on farms
- tax incentives for: land bequeathment, private nature reserves, improved conservation management
- land exchange
- new legislation: diversify the nature area concept, sites of scientific importance, encourage environmental impact procedures
- promote conservation extension effort, natural heritage programme, better enforcement of soil and water conservation laws
- promote local affirmative action in rural areas, nature conservancies, district or municipal commonages
- competitive public awareness and corporate responsibility campaigns.

The implications of these alternative strategies indicate some specific research needs:

(1) A description and analysis of the attitudes and values of land-owners towards the areas of natural veld they own, ie what motivates farmers to implement conservation or, as an alternative, benign neglect in certain areas? What, apart from profit, motivates the opposite?

(2) An examination of legislation in areas such as tax law, land ownership and agricultural subsidies which have potential to influence conservation activities indirectly.

(3) What potential is there in these lowland regions to motivate individuals, corporations or communities into initiating the conservation process at the local level, eg as private nature reserves or district and municipal commonages?

(4) What lessons are there to be learned from the case histories of areas that had earlier been proposed as conservation sites but never achieved that status?

APPENDICES

APPENDIX 1. Vegetative composition of 28 existing protected areas in in Region 1 - West coast

Name of protected area	Total reserve area*** ha	Total area of lowland eco-systems ha	Area Wet-lands ha	West Coast Strandveld Sand ha	Granite ha	Lime-stone ha	Sand Plain Lowland Fynbos ha	West Coast Renosterveld Granite ha	Shale ha	Mesic Mountain Fynbos ha	Coast-line km	Islands ha	Owner-ship	State of veld
Driftsands NR	650	500	10	490	.	.	.	.	.	.	.	.	CPA	Poor
Eensaamheid Tortoise Reserve	8	8	.	.	.	.	.	.	8	.	.	.	CPA	Good
Rocher Pan NR	390	300	80	220	.	.	.	.	.	.	3,0	.	CPA	Good
Total CPA	1 048	808	90	710					8		3,0			
Rietvlei Nature Area	530	450	450	.	.	.	.	.	.	.	0,2	.	DEA	Fair
Sandveld Forest Reserve a) Elandsbay	392	392	.	392	.	.	.	.	.	.	7,5	.	DEA	Poor
b) Ysterfontein	3 073	3 073	.	3 073	.	.	.	.	.	.	7,0	.	DEA	Poor
Deesen Island	222	*	.	.	.	.	.	.	.	.	9,0	222	DEA	*
Jutten Island	46	*	.	.	.	.	.	.	.	.	3,0	46	DEA	*
Malgas Island	8	*	.	.	.	.	.	.	.	.	2,0	8	DEA	*
Marcus Island	11	*	.	.	.	.	.	.	.	.	2,0	11	DEA	*
Meeuwen Island	7	*	.	.	.	.	.	.	.	.	2,0	7	DEA	*
Schaapen Island	41	*	.	.	.	.	.	.	.	.	2,5	41	DEA	*
Vondeling Island	21	*	.	.	.	.	.	.	.	.	2,0	21	DEA	*
Total DEA	4 351	3 915	450	3 465							37,2	356		
Columbine NR	263	200	100	100	.	.	.	.	.	.	5,5	.	LA	Good
Cape of Good Hope NR	7 675	210	.	200	.	10	.	.	.	7 000	35,0	.	LA	Good
Durbanville NR	6	2	.	.	.	.	.	.	2	.	.	.	LA	Poor
Jan Marais NR	23	.	.	.	.	.	.	.	.	.	.	.	LA	Fair
Kalbaskraal NR**	35	23	.	.	.	.	13	.	10	.	.	.	LA	Fair
Paarl Mountain NR	2 000	800	.	.	.	.	.	.	800	1 200	.	.	LA	Good
Rondevlei Bird Sanctuary	137	75	65	5	.	.	5	.	.	.	.	.	LA	Fair
Table Mountain NR	2 904	105	5	.	.	.	.	50	50	2 000	.	.	A	Fair
Tygerberg NR	68	60	.	.	.	.	.	.	60	.	.	.	LA	Fair
Zandvlei Bird Sanctuary	11	5	5	.	.	.	.	.	.	.	.	.	LA	Poor
Total LA	13 122	1 480	175	305		10	18	50	922	10 200	40,5			
Edith Stevens Cape Flats Wildflower Reserve	4	3	3	.	.	.	.	.	.	.	.	.	NBG	Poor
Tienie Versveld Wildflower Reserve	22	20	.	.	.	.	.	20	.	.	.	.	NBG	Fair
Total NBG	26	23	3					20						
Langebaan Nature Area	22 375	22 375	5 250	15 700	1 425	.	.	.	.	.	17,0	.	NPB	Good
Total NPB	22 375	22 375	5 250	15 700	1 425						17,0			
Boskloof/Schaperberg PNR	50	10	.	.	.	.	.	10	.	.	.	.	P	Poor
Cape Flats PNR	20	20	.	8	.	.	12	.	.	.	.	.	P	Good
Elandsberg PNR	2 600	1 000	.	.	.	.	.	.	1 000	1 500	.	.	P	Good
Hopefield PNR	1 887	1 800	.	.	.	.	1 800	.	.	.	.	.	P/LA	Good
Joosterberg PNR	59	35	.	.	.	.	.	35	.	.	.	.	P	Fair
Koopmanskloof PNR	60	42	.	.	.	.	.	42	.	.	.	.	P	Fair
Postberg PNR	2 701	2 500	.	400	1 000	1 100	.	.	.		13,0	.		Fair
Stalkrans PNR	257	230	.	.	.	.	.	230	.	.	.	.	P	Good
Wiesenhof PNR	239	167	.	.	.	.	.	167	.	.	.	.	P	Fair
Total Private	7 873	5 804	.	408	1 000	1 100	1 812	484	1 000	1 500	13,0	.		
GRAND TOTALS	48 795	34 405	5 968	20 588	2 425	1 110	1 850	554	1 930	11 700	110,7	356		

CPA = Cape Provincial Administration
DEA = Department of Environment Affairs
LA = Local Authority
NBG = National Botanic Gardens
NPB = National Parks Board
P = Private

* The DEA Island Reserve Areas have been included in the total reserve area section of the tabulation, but have not been included in the remainder of the table. Their conservation value lies primarily in the avifaunal components which they support. They cannot be rated in terms of mainland-based terrestrial ecosystems criteria.

** Sold to private landowner, who wishes to make it into a private reserve. A plea has been made for upgrading this site to provincial nature reserve status.

*** CPA, LA & P total reserve areas from 1983/84 CPA Annual Report No 40

APPENDIX 2. Vegetative composition of 34 existing protected areas in Region 2 - South-west Coast

Name of protected area	Total reserve area** (ha)	Total area of lowland eco-systems (ha)	Area Wet-lands (ha)	Dune Fynbos (ha)	South Coast Strand-veld (ha)	Elim Lowland Fynbos (ha)	Lime-stone Lowland Fynbos (ha)	South West Coast Renoster-veld (ha)	South Coast Renoster-veld (ha)	Mesic Mountain Fynbos (ha)	Islands (ha)	Coast-line (km)	Owner-ship	State of veld
De Hoop Nature Reserve	17 846	13 260	700	.	1 000	.	11 500	60	.	2 500	.	12,0	CPA	Good
Maanschynkop	850	0	.	.	.	.	.	.	.	850	.	.	CPA	Good
Orothamnus Reserve														
Salmonsdam NR	834	0	.	.	.	.	.	.	.	700	.	.	CPA	Good
Total CPA	**19 530**	**13 260**	**700**		**1 000**		**11 500**	**60**		**4 050**		**12,0**		
Blombosfontein	265	265	.	265	.	.	.	.	.	.	.	2,5	DEA	Fair
Geelkrans NR	80	80	.	80	.	.	.	.	.	.	.	2,0	DEA	Good
Kleinjongensfontein	549	130	.	130	.	.	.	.	.	.	.	2,5	DEA	Fair
Paardepoort (Babylons-toring) State Forest	808	0	.	.	.	.	.	.	.	808	.	.	DEA	Good
Stilbaai East	555	0	.	0	.	.	.	.	.	.	.	3,0	DEA	Poor
Walker Bay State Forest														
(a) Walker Bay	5 183	52	.	.	52	.	.	.	.	.	.	15,0	DEA	Poor
(b) Uilenkraal	409	40	.	.	40	.	.	.	.	.	.	8,0	DEA	Poor
(c) Hagelkraal/ Celt Bay	543	100	.	.	100	.	.	.	.	.	.	7,5	DEA	Poor
(d) Quoin Point	984	800	.	.	800	.	.	.	.	.	.	12,5	DEA	Fair
(e) De Mond NR	301	255	50	.	200	.	5	.	.	.	.	4,0	DEA	Good
(f) De Mond (State Forest)	617	220	.	.	200	.	20	.	.	.	.	4,0	DEA	Good
(g) Waenhuiskrans	262	230	.	.	230	.	.	.	.	.	.	3,7	DEA	Fair
Dyer Island	22	*	.	.	.	.	.	.	.	.	22	3,0	DEA	*
Quoin Rock	1	*	.	.	.	.	.	.	.	.	1	1,0	DEA	*
Total DEA	**10 579**	**2 172**	**50**	**475**	**1 622**		**25**			**808**	**23**	**68,7**		
Bredasdorp NR	86	0	.	.	.	.	.	.	.	60	.	.	LA	Fair
Caledon NR	214	0	.	.	.	.	.	.	.	170	.	.	LA	Fair
Fernkloof NR	1 446	0	.	.	.	.	.	.	.	1 400	.	.	LA	Good
Heidelberg NR	8	8	.	.	.	.	.	.	8	.	.	.	LA	Poor
Kleinmond Coastal Reserve	334	63	33	.	30	.	.	.	.	280	.	5,5	LA	Good
Pauline Bohnen NR	140	130	.	.	.	.	130	.	.	.	.	.	LA	Fair
Werner Frehse NR	269	100	.	.	.	.	.	.	100	.	.	.	LA	Poor
Total LA	**2 497**	**301**	**33**		**30**		**130**		**108**	**1 910**		**5,5**		
Bontebok National Park	2 786	2 786	.	.	.	.	.	.	2 786	.	.	.	NPB	Good
Total NPB	**2 786**	**2 786**							**2 786**					
Blue Lagoon PNR	70	60	.	.	60	.	.	.	.	.	.	1,5	P	Good
Brandfontein - Rietfontein PNR	6 500	6 000	50	.	400	1 300	4 250	.	.	.	.	17,0	?	Good
Brian Mansergh PNR	92	90	.	.	40	.	50	.	.	.	.	1,0	P	Good
Die Walle PNR	4	4	.	.	4	.	.	.	.	.	.	0,5	P	Good
Freshwater Sands PNR	830	580	.	.	580	.	.	.	.	.	.	3,4	P	Good
Heuningnes PNR	296	100	30	.	20	.	50	.	.	.	.	.	P	Good
Hillside PNR	736	600	.	.	.	.	.	600	.	.	.	.	P	Fair
Rhenosterkop PNR	765	432	10	.	400	.	22	.	.	.	.	.	P	Good
San Sebastian PNR	1 154	860	.	.	.	.	860	.	.	240	.	2,5	P	Fair
The Lagoon 2 PNR	36	30	.	.	30	.	.	.	.	.	.	0,6	P	Good
Vogelgat PNR	602	0	.	.	.	.	.	.	.	600	.	.	P	Good
Total P	**11 085**	**8 756**	**90**	**.**	**1 534**	**1 300**	**5 232**	**600**	**.**	**840**	**.**	**26,5**		
GRAND TOTALS	**46 477**	**27 275**	**873**	**475**	**4 186**	**1 300**	**16 887**	**660**	**2 894**	**7 608**	**23**	**112,7**		

* Islands - not included in totals for mainland terrestrial ecosystems

CPA = Cape Department of Nature and Environmental Conservation
DEA = Department of Environment Affairs
LA = Local Authority
NPB = National Parks Board
P = Private

** CPA, LA & P total reserve areas from 1983/84 CPA Annual Report No 40

APPENDIX 3. Vegetative composition of 21 existing protected areas in Region 3 - Central south coast

Name of protected area	Total reserve area* (ha)	Total area of lowland eco-systems (ha)	Area Wet-lands (ha)	Dune Fynbos (ha)	Mosaic Dune Fynbos & Kaffrarian Thicket (ha)	Limestone Lowland Fynbos (ha)	Afromontane Forest (ha)	Mesic/Dry/Wet Mountain Fynbos (ha)	Valley Bushveld (ha)	Coast-line (km)	Owner-ship	State of Veld
Garka NR	9 428	0	.	.	.	.	.	6 000		.	CPA	Good
Goukamma NR	2 270	2 170	270	.	1 900	.	.	.		12	CPA	Good
Keurbooms NR	760	20	10	.	.	.	10	680		.	CPA	Good
Robberg NR	175	150	.	.	145	5	.	.		7	CPA	Good
The Lakes Nature Conservation Station	430	204	146	10	48	.	.	.		.	CPA	Good
Total CPA	13 063	2 544	426	10	2 093	5	10	6 680		19		
Groendal Wilderness	21 000	10 000	.	.	.	.	5 000	10 500	5 000		DEA	Fair
Keurbooms	2 717	1 685	.	.	.	.	1 685	1 032	.	.	DEA	Fair
Kromrivier State Forest	4 116	81					81	1 571	.		DEA	Fair
Sinclair forest	1 828	1 828	.	.	.	.	1 828	.	.	.	DEA	Good
Whiskey Creek/ Ysternek	1 212	0	.	.	.	.	.	1 196	.	.	DEA	Fair
Total DEA	30 873	13 594					8 594	14 299	5 000			
Ebb and Flow NR	125	25	5	.	.	.	20	90	.	.	LA	Good
Van Kerwel NR	9	0	.	.	.	.	.	9		.	LA	Poor
Total LA	134	25	5				20	99				
The Lakes	2 100	2 100	900	1 200	.	.	.	.	.	.	NPB	Good
Tsitsikamma (Coast)	2 840	1 000	.	.	.	.	1 000	1 840	.	60	NPB	Good
Tsitsikamma (Forest)	478	328	.	.	.	.	328	150	.	.	NPB	Good
Total NPB	5 418	3 428	900	1 200			1 328	1 990		60		
Blydskap PNR	20	.	.	.	.	.	.	.	.	.	P	
Boebok PNR	103	.	.	.	.	.	.	103	.	.	P	Good
Kanon PNR	43	43	.	43	.	.	.	.	.	.	P	Good
Palmerhain PNR	7	7	.	.	.	.	7	.	.	.	P	Good
Pletterberg Bay Country Club	67	.	.	.	.	.	.	67	.	.	P	Fair
Samland PNR	10	10	.	.	10	.	.	.	.	.	P	Good
Skuilte PNR	15	15	.	15	.	.	.	.	.	.	P	Good
Total P	265	75		58	10		7	170				
GRAND TOTALS	49 753	19 666	1 331	1 268	2 103	5	9 959	23 238	5 000	79		

CPA = Cape Provincial Administration
DEA = Department of Environment Affairs and Tourism
LA = Local Authority
NPB = National Parks Board
P = Private

* CPA, LA & P total reserve areas from 1983/84 CPA Annual Report No 40

APPENDIX 4. Vegetative composition of 29 existing protected areas in Region 4 - South-east Coast

Name of protected area	Total reserve area** ha	Total area of lowland eco-systems ha	Mosaic of Dune Fynbos & Kaffrarian Thicket ha	South Coast Renosterveld ha	Afromontane Forest ha	Valley Bushveld Kaffrarian Thicket ha	Mesic Grassy Fynbos ha	Coast-line km	Islands ha	Owner-ship	State of veld
Cape St Francis Nature Reserve	36	3	3	.	.	.	.	.	.	CPA	Fair
Cycad Nature Reserve	189	69	.	.	.	69	120	.	.	CPA	Good
Seekoerivier Nature Reserve	66	40	20	20	.	.	.	.	.	CPA	Fair
1820 Settlers Wild-flower Garden	61	.	.	.	.	.	61	.	.	CPA	Good
Thomas Baines Nature Reserve	975	825	.	.	.	825	150	.	.	CPA	Good
St Croix, Brenton & Jahleel Eiland Reserve	20	*	.	.	.	.	.	.	20	CPA	*
Total CPA	**1 347**	**957**	**23**	**20**		**894**	**331**		**20**		
Alexandria Coastal Reserve	15 813	5 000	1 000	.		4 000	.	.	.	DEA	Good
Beggars Bush-Bathurst State Forest	276	.	.	.	.	.	276	.	.	DEA	Good
Suurberg State Forest	20 788	10 128	.	.	9 628	500	6 700	.	.	DEA	Good
Total DEA	**36 877**	**15 128**	**1 000**		**9 628**	**4 500**	**6 976**				
Cape Recife Nature Reserve	336	221	221	.	.	.	.	.	.	LA	Poor
Glenhurd	18	1	.	.	.	.	.	.	.	LA	Poor
Grahamstown Nature Reserve	76	.	.	.	.	.	76	.	.	LA	Good
Kabega Park Wild Flower Reserve	10	0	.	.	.	0,5	0,5	.	.	LA	Poor
Ledger Searle Memorial Park	10	.	.	.	.	.	.	.	.	LA	Poor
Linkside	17		.	.	.	.	1	.	.	LA	Poor
Linton-Grange (Wild Flower Reserve)	21	.	.	.	.	.	2	.	.	LA	Poor
Loerie Nature Reserve	765	.	.	.	.	.	459	.	.	LA	Fair
Maitland Mines Nature Reserve	47	103	.	.	103	.	.	.	.	LA	Good
Sardinia Bay Nature Reserve	320	56	56	.	.	.	.	.	.	LA	Fair
Setlaarspark Nature Reserve	54		.	.	.	.	0,5	.	.	LA	Poor
Sylvic Nature Reserve	78	8	8	.	.	.	.	.	.	LA	Poor
Uitenhage Nature Reserve	488	411	.	21	.	390	.	.	.	LA	Good
Van Staden's Wild Flower Reserve	286	34	.	.	34	.	204	.	.	LA	Fair
Yellowwoods Nature Res	21	.	.	.	.	.	15	.	.	LA	Fair
Total LA	**2 547**	**834**	**285**	**21**	**137**	**390,5**	**758**				
University of Port Elizabeth PNR	716	.	.	.	.	.	.	.	.	P	Fair
Langebosch PNR	109	.	.	.	.	.	.	.	.	P	Fair
Robbehoek PNR	55	.	.	.	.	.	.	.	.	P	Fair
Rebelsrus PNR	394	250	250	.	.	.	.	.	.	P	Fair
Anne Robinson PNR	30	15	.	.	.	15	15	.	.	P	Good
Gradita PNR	92	92			92						Good
Total P	**1 396**	**357**	**250**		**92**	**15**	**15**				
GRAND TOTALS	**42 167**	**17 256**	**1 558**	**41**	**9 857**	**5 799,5**	**8 080**		**20**		

CPA = Cape Provincial Administration
DEA = Department of Environment Affairs
LA = Local Authority
P = Private

* Islands - not included in totals for mainland terrestrial ecosystems

** CPA, LA & P total reserve areas from 1983/84 CPA Annual Report No 40

APPENDIX 5. Vegetative composition of 13 existing protected areas in Region 5 - Inland Valleys

Name of protected area	Total Reserve Area* (ha)	Area Natural (ha)	Area Wetlands (ha)	Karroid Shrublands (ha)	Central Mountain Renosterveld (ha)	Dry Mountain Fynbos (ha)	Mesic Mountain Fynbos (ha)	Owner-ship	State of Veld
Hartebeesriver Nat Res	30	24	.	.	24	.		CPA	Poor
Romansrivier Nat Res	30	10	.	.	10	.	10	CPA	Good
Vrolijkheid Nat Res	1827	1700	.	1700	.	.		CPA	Good
Total CPA	1887	1734		1700	34		10		
Ceres Wildflower Garden	15	10	.	.	.	.	10	LA	Fair
Dassieshoek Nat Res	865	400	.	.	400	.	400	LA	Good
Total LA	880	410			400	400	410		
Karoo Botanic Gardens	154	129	.	129	.	.	.	NBG	Good
Total NBG	154	129		129					
Jonaskop PNR	1871	1871	.	.	.	.	1871	P	Good
De Wilgen PNR	347	347	.	347	.	.	.	P	?
Nuwe Hoogte PNR	493	493	.	493	.	.	.	P	?
Sarahsrivier PNR	**	**	.	.	.	.	.	P	?
Patryskloof PNR	1637	1600	.	.	.	.	1600	P	Good
Doringkloof PNR	532	500	.	.	.	.	500	P	Good
Total P	4880	4811		840			3971		
GRAND TOTALS	7801	7084		2669	434	400	4391		

CPA = Cape Provincial Administration
LA = Local Authority
NBG = National Botanic Gardens
P = Private
** Size not determined
? State of veld not known
* CPA, LA & P total reserve areas from 1983/84 CPA Annual Report No 40

APPENDIX 6. Vegetative composition of 55 proposed sites of conservation value in Region 1 - West Coast

Proposed site	Total area (ha)	Total area of lowland eco-systems (ha)	Area Wet-lands (ha)	West Coast Strandveld				West Coast Renosterveld		Sand Plain Lowland Fynbos (ha)	Mesic/ Dry Mountain Fynbos (ha)	Coast-line (km)
				Sand (ha)	Granite (ha)	Shale (ha)	Lime-stone (ha)	Granite (ha)	Shale (ha)			
1. Olifants River Estuary	6 719	2 031	1 951	80	.	.	.	.	.	.	.	12,5
2. Verloren Vlei Coastal Lake	38 000	27 500	1 500	2 000	.	.	.	.	.	24 000	2 000	6,3
3. Wadrift Salt Pan	2 000	1 925	325	1 600	.	.	.	.	.	.	.	7,0
4. Berg River Estuary	8 000	4 000	4 000	.	.	.	.	.	.	.	.	.
5. Lambert's Bay Commonage	3 000	2 800	.	2 800	.	.	.	.	.	.	.	3,5
6. Langebaan and Hopefield Sandveld Park	95 325	78 010	625	42 250	500	.	.	.	.	34 635	.	87,5
6a. Langebaan Bokpunt Park*	*50 650	50 650*	* 625	33*900	500*	.	.	.	.	15 625*	.	*87,5
6b. Bokbaai*	* 4 800	3 250*	.	.	50*	.	.	.	.	3 200*	.	*11,0
6c. Hopefield Sandveld*	*40 000	37 000*	.	*9 000	.	.	.	.	.	28 000*	.	.
7. Rietvlei	528	500	500	.	.	.	.	.	.	.	.	0,2
8. Klein Zoar/Paarden Eiland	14	8	8	.	.	.	.	.	.	.	.	.
9. Zeekoevlei Coastal Park	1 600	664	400	.	.	.	.	.	.	264	.	4,5
10. False Bay Coastal Park	5 450	5 450	2 100	1 700	.	.	.	.	.	1 650	.	11,0
10a.*Wolfgat	* 300	300*	.	.	.	.	.	.	.	300*	.	* 4,0
10b.*Swartklip	* 350	350*	.	* 200	.	.	.	.	.	150*	.	* 5,0
10c.*Kuils River Inundation Area	* 4 300	4 300*	*2 000	*1 300	.	.	.	.	.	1 000*	.	* 2,0
10d.*Blackheath	* 100	100*	.	* 50	.	.	.	.	.	50*	.	.
11. Harmony Flats	105	100	.	.	.	.	.	.	100	.	.	.
12. Bottlary Hills	900	600	.	.	.	.	.	550	50	.	.	.
13. Tygerberg Hills	1 200	710	.	.	.	.	.	.	710	.	.	.
14. Skaperberg	425	200	.	.	.	.	.	.	200	.	.	.
15. Kraaifontein Forest Reserve	150	150	.	.	.	.	.	.	10	140	.	.
16. Klapmutskop	225	225	.	.	.	.	.	225	.	.	.	.
17. Klipheuwelkop (Quarry Site)	8	8	.	.	.	.	.	.	8	.	.	.
18. Klipheuwel Radio Mast	72	60	.	.	.	.	.	.	12	48	.	.
19. Paarl Mountain	1 900	350	.	.	.	.	.	.	350	.	1 350	.
20. Eensaamheid Extension	22	20	.	.	.	.	.	.	10	10	.	.
21. Kuilerberg Koppie	100	80	.	.	.	.	.	.	40	40	.	.
22. Blouberg Koppie	600	292	.	12	.	.	.	.	180	100	.	2,3
23. Paardeberg	4 000	0	.	.	.	.	.	.	.	.	3 800	.
24. Vlakfontein	280	230	.	.	.	.	.	.	.	230	.	.
25. Helderfontein	75	75	.	.	.	.	.	75	.	.	.	.
26. Dasserberg Conserv Area	6 600	3 175	.	.	.	.	.	1 675	.	1 500	.	.
26a. Klein Dasserberg*	* 1 500	1 500*	.	.	.	.	.	750*	.	750*	.	.
26b. Riverlands*	* 1 500	800*	.	.	.	.	.	.	.	800*	.	.
26c. Mamre/Pella & Dasserberg*	* 3 601	1 194*	.	* 19	.	.	.	925*	.	250*	.	.
26d. Pella Research Site*	* 259	269*	.	* 19	.	.	.	.	.	250*	.	.
27. Groerberg	2 800	200	.	.	.	.	.	200	.	.	2 400	.
28. Contreberg	388	388	.	.	.	.	.	388	.	.	.	.
29. Mamreweg	2 350	1 700	.	.	.	.	.	.	100	1 600	.	.
30. Malmesbury Commonage (NE)	80	75	.	.	.	.	.	.	75	.	.	.
31. Malmesburg Commonage (SE)	240	230	.	.	.	.	.	200	.	30	.	.
32. Klipfontein	170	140	.	.	.	.	.	40	.	100	.	.
33. Voëlvlei	870	850	.	.	.	.	.	.	850	.	.	.
34. Riebeeck Kasteel Mountain	1 800	400	.	.	.	.	.	.	400	.	1 200	.
35. Porseleinberg (Riebeeck Kasteel Southern Hills)	1 000	600	.	.	.	.	.	.	600	.	.	.
36. Koringberg	1 200	1 000	.	.	.	.	.	.	1 000	.	.	.
37. Heuningberg	750	550	.	.	.	.	.	.	550	.	100	.
38. Saron	4 000	1 500	.	.	.	.	.	.	1 500	.	2 100	.
39. Piketberg Mountain	22 000	300	.	.	.	.	.	.	.	300	21 700	.
40. Darling Hills	1 000	1 000	.	.	.	.	.	1 000	.	.	.	.
41. Piketberg East Foothills	2 400	1 000	.	.	.	.	.	.	1 000	.	1 200	.
42. Witklip	35	20	.	.	20	.	.	.	.	.	.	.
43. Wemmershoek Vlei	120	60	.	.	.	.	.	.	.	60	40	.
44. Languedoc	700	.	.	.	.	.	.	.	.	.	700	.
45. Joosterberg	110	80	.	.	.	.	.	.	80	.	.	.
46. Olifantsberg	2 000	500	.	500	.	.	.	.	.	.	1 500	.
47. Saldanha Navy Area	900	400	.	225	175	.	.	.	.	.	.	12,0
48. Duthie Reserve	4	.	.	.	.	.	.	.	.	.	.	.
49. De la Gift	50	40	.	.	.	.	.	.	.	40	.	.
50. Groenrivier	60	25	.	.	.	.	.	.	20	5	.	.
51. Skerpheuwel (Assegaibos)	660	.	.	.	.	.	.	.	.	.	500	.
52. Sir Lowry's Pass	950	.	.	.	.	.	.	.	.	.	900	.
53. Simonsberg	2 000	.	.	.	.	.	.	.	.	.	1 800	.
54. Botmaskop	250	.	.	.	.	.	.	.	.	.	200	.
55. Trekosserkraal	1 800	1 425	.	375	.	550	500	.	.	.	.	8,8
TOTALS	227 985	141 646	11 409	51 542	695	550	500	4 353	7 845	64 752	41 490	155,6

* These sites are subdivisions of bigger regions - therefore are not included in the totals at the bottom of the table.

APPENDIX 7. Vegetative composition of 42 proposed sites of conservation value in Region 2 - South-west coast

Proposed Site	Total area (ha)	Total area of lowland eco-systems (ha)	Area Wet-lands (ha)	South Coast Strand-veld (ha)	South Coast/ South West Coast Renveld (ha)	Dune Fyn-bos (ha)	Sand Plain Low-land Fynbos (ha)	Lime-stone Low-land Fynbos (ha)	Elim Low-land Fyn-bos (ha)	Afro-montane Forest (ha)	Valley Bushveld/ Kaffra-rian Thicket (ha)	Wet/Dry/ Mesic Mountain Fynbos (km)	Coast-line (ha)
1. Franschhoek Pass/ Theewaterskloof Dam	1 800	400	400	.	.	.	.	.	.	.	.	1 100	.
2. Klipfontein	375	350	.	.	350	.	.	.	.	.	.	.	.
3. Upper Bot River Valley	600	600	.	.	600	.	.	.	.	.	.	.	.
4. Simonskop	3 450	0	.	.	3 000	.	.	.	.	.	.	450	.
5. Caledon Swartberg and Drayton Siding	7 000	0	.	.	.	.	.	.	.	.	.	6 500	.
6. Isolated Renosterveld remnants in Caledon & Bredasdorp districts	705	705	.	.	705	.	.	.	.	.	.	.	.
6a.*Squiredale	* 5	* 5	.	.	* 5	.	.	.	.	.	.	.	.
6b.*Fairfield	* 500	* 500	.	.	* 500	.	.	.	.	.	.	.	.
6c.*Skietpad	* 100	* 100	.	.	* 100	.	.	.	.	.	.	.	.
6d.*Rietfontein	* 100	* 100	.	.	* 100	.	.	.	.	.	.	.	.
7. Bromberg/Hesselwaskloof	2 200	300	.	.	300	.	.	.	.	.	.	.	.
8. Bontebok Park Extension	550	500	.	.	500	.	.	.	.	.	.	1 800	.
9. Sparrebos	5	5	.	.	.	.	.	.	.	5	.	.	.
10. Silcrete hills between Bredasdorp & Swellendam	4 350	4 350	.	.	4 350	.	.	.	.	.	.	.	.
10a.*Adamskop/Rooivlei	* 350	* 350	.	.	* 350	.	.	.	.	.	.	.	.
10b.*Plaatjieskraal/ Luipaardskop	* 3 000	* 3 000	.	.	* 3 000	.	.	.	.	.	.	.	.
10c.*Oudekraalskop	* 1 200	* 1 000	.	.	* 1 000	.	.	.	.	.	.	.	.
11. Lower Breede and Slang River Valleys	8 500	8 500	.	.	7 500	.	.	.	.	.	1 000	.	.
12. Duiwenhoks River	3 500	3 000	.	.	2 000	.	.	.	.	.	1 000	.	.
13. Heidelberg hills	1 500	1 500	.	.	1 000	.	.	.	.	.	500	.	.
14. Corente River hills	8 000	500	.	.	500	.	.	.	.	.	.	7 000	.
15. Rooiels Nature Area	4 750	550	.	450	.	.	.	100	.	.	.	4 000	27,0
16. Bot River Lagoon	1 488	1 488	1488	.	.	.	.	.	.	.	.	.	.
17. Kleinriviersvlei	1 150	1 150	1150	.	.	.	.	.	.	.	.	.	1,0
18. Mountains between Caledon & Bredasdorp	55 000	1 020	.	.	.	.	650	250	120	.	.	53 000	.
18a.*Babylonstoren/Shaw's Pass/ Steenboksberg	*25 000	* 20	.	.	.	.	.	.	* 20	.	.	*25 000	.
18b.*Klein River mountains	* 5 000	* 0	.	.	.	.	.	.	.	.	.	* 5 000	.
18c.*Soetmuisberg/Uitvlug/ Die Poort	* 4 000	* 1 000	.	.	.	.	* 650	* 250	* 100	.	.	* 2 700	.
19. Danger Point	900	800	.	800	.	.	.	.	.	.	.	.	12,0
20. Uilenkraal Grootbos	50	50	.	.	.	.	.	.	.	50	.	.	.
21. Uilenkraals River estuary	260	260	260	.	.	.	.	.	.	.	.	.	0,5
22. Awila	1 600	1 400	.	.	.	.	500	900	.	.	.	.	.
23. Soetanysberg Nature Area	40 000	23 600	600	8 000	.	.	6 000	6 000	3 000	.	.	6 000	60,0
24. Elim/Viljoenshof	5 000	500	.	.	.	.	.	.	500	.	.	4 000	.
25. Elim hills	2 000	2 000	.	.	.	.	.	.	2 000	.	.	.	.
26. Zandvlakte/Heuningrug	1 850	1 850	.	.	.	.	250	850	750	.	.	.	.
27. Soetendalsvlei	1 500	1 500	1 500	.	.	.	.	.	.	.	.	.	.
28. Karsrivier flood plain	1 500	1 500	1 500	.	.	.	.	.	.	.	.	.	.
29. Overberg Armament Testing Range	42 000	34 000	.	3 000	.	.	3 000	28 000	.	.	.	4 000	.
30. Diepkloof	2 000	500	.	.	500	.	.	.	.	.	.	500	.
31. Puntjie	8 000	6 800	.	.	.	1 300	2 500	3 000	.	.	.	.	16,0
32. Jongensfontein	100	100	.	.	.	.	.	.	.	100	.	.	.
33. Ystervarkpunt	2 500	2 300	.	.	.	.	1 500	600	.	.	200	.	5,0
34. Albertinia Downs/ Aasvoëlberg	**	**	.	.	.	.	.	.	.	.	.	**	.
TOTALS	214 183	102 078	6 898	12 250	21 305	1 300	14 400	39 700	6 370	155	2 700	88 350	121,5

* These sites are subdivisions of bigger regions - therefore are not included in the totals at the bottom of the table.
** This region has not been surveyed in any detail - information incomplete

APPENDIX 8. Vegetative composition of 22 proposed sites of conservation value in Region 3 - Central south coast

Proposed Site	Total area (ha)	Total area of lowland eco-systems (ha)	Area Wetlands (ha)	South Coast Renos-terveld (ha)	Dune Fynbos (ha)	Afro-montane Forest (ha)	Valley Bushveld (ha)	Wet/Dry/ Mesic Mountain Fynbos (ha)
1. Stormsrivier	13 500	200	.	.	.	200	.	13 300
2. Lilysvlei	1 083	1 077	.	.	.	1 077	.	6
3. Attakwaskloof Nature Reserve	10 500	.	.	.	.	.	.	10 500
4. Petrus Brand Nature Reserve	1 893	1 292	.	.	.	1 292	.	601
5. Keurboomsrivier Nature Reserve	2 717	1 685	.	.	.	1 685	.	1 032
6. Extension to Goukamma	1 600	1 600	.	.	1 000	600	.	.
7. Voorbaai	300	300	.	200	20	40	40	
8. Brandwag	1 500	320	.	300	.	20	.	1 170
9. Sandkraal	1 310	1 310	.	.	830	480	.	.
10. Klein Kraaibosch	10	10	.	.	.	10	.	.
11. Keytersnek	1 200	1 200	.	.	900	300	.	.
12. Millwood	5 500	200	.	.	.	200	.	5 300
13. Swartvlei Peninsula	150	150	.	.	150	.	.	.
14. Kaaimansrivier	30	.	.	.	.	.	.	30
15. Doringrivier Nature Reserve	8 660	960	.	960	.	.	.	7 700
16. Kranshoek	150	100	.	.	100	.	.	.
17. Perdepoort	1 500	.	.	.	.	.	.	1 500
18. Outeniquadrift	400	400	.	.	.	.	400	.
19. Cloete's Pass/ Kleingoliathsberg	5 000	3 000	.	3 000	.	.	.	2 000
20. Great Brak/ Little Brak region	2 700	2 700	.	1 500	.	.	1 200	.
21. Herbertsdale	10 000	10 000	.	10 000	.	.	.	.
22. Gouritzrivier Valley	1 500	1 500	.	.	.	.	1 500	.
TOTALS	71 203	28 004	.	15 960	3 000	5 904	3 140	.43 139

APPENDIX 9. Vegetative composition of 19 proposed sites of conservation value in Region 4 - South-east coast

Proposed Site	Total area (ha)	Total area of lowland eco-systems (ha)	South Coast Renos-terveld (ha)	Mosaic of Dune Fynbos & Kaffra-rian Thicket (ha)	Valley Bushveld (ha)	Kaffrarian Thicket / Afro-montane Forest (ha)	Mesic/ Dry/ Grassy Fynbos (ha)	Coast-line (km)
1. Oyster Bay Dune Coast	30 000	8 000	.	4 000	.	4 000	.	.
2. Papiesfontein-Heather Cliff (Gamtoos)	10 000	7 400	2 000	.	.	400	5 000	.
3. Tsitsikamma Flats	5 000	2 500	.	.	.	500	2 000	.
4. Van der Kemp se Kloof	900	900	.	.	225	.	675	.
5. Churchill Dam	4 800	4 300	.	.	.	.	4 300	.
6. Linderhof	470	470	60	.	.	60	350	.
7. Jeffrey's Bay	5 000	4 000	.	.	1 000	3 000	.	.
8. Humansdorp Coastal Flats	10 000	5 000	4 000	.	.	1 000	.	.
9. Langkloof area	15 000	15 000	3 000	.	.	.	12 000	.
10. Hankey-Loerie	9 500	8 500	500	.	.	.	8 000	.
11. Elands River Valley	10 000	10 000	2 000	.	.	.	8 000	.
12. Posfontein	2 000	2 000	.	.	.	.	2 000	.
13. Fish Point	830	830	.	.	.	.	830	.
14. Thetford	257	257	.	.	.	.	257	.
15. Heather Glen	1 250	1 250	.	.	.	.	1 250	.
16. Grahamstown Heights	80 000	70 500	.	.	.	500	70 000	.
17. Swartwatersberg	4 000	4 000	.	.	.	.	4 000	.
18. Salem	7 500	7 000	.	.	.	.	7 000	.
19. Rietrivier	174	174	.	174	.	.	.	.
TOTALS	196 681	152 081	11 560	4 174	1 225	9 460	125 662	

APPENDIX 10. Vegetative composition of 15 proposed sites of conservation value in Region 5 - Inland Valleys

Proposed site	Total area (ha)	Total area lowland ecosystems (ha)	Wetlands (ha)	Karroid Shrublands (ha)	Central Mountain Renosterveld (ha)	Central Mountain Renosterveld/ Mesic Mountain Fynbos Transition (ha)
1. La Rhone Estate	100	100	.	.	.	100
2. Leeurivier/Die Heuwel Eikelaan	400	400	.	.	300	100
3. Brandvlei Extension	3 500	3 500	500	1 000	1 000	1 000
4. Brandvlei Valley	3 000	3 000	.	1 000	1 000	1 000
5. Langvlei	500	500	100	100	100	200
6. Kliphoogte	500	500	.	500	.	.
7. Nuwehoogte (portion of Sandberg)	490	490	.	250	.	240
8. Sanddrif/Drew	150	150	.	50	.	100
9. Voorhuis	2 600	2 600	250	500	1 700	150
10. Buffelskraal Wes	100	100	.	.	50	50
11. Naudesia/ Vandutjieskraal	220	220	.	.	.	220
12. Kanetvlei	1 300	1 300	.	650	.	650
13. Ceres Valley/Gydo Pass	3 500	3 000	.	250	1 000	1 750
14. Ceres Valley/ Theronsberg Pass	1 000	1 000	.	.	1 000	.
15. Badsberg	500	500	100	.	200	200
TOTALS	17 860	17 360	950	4 300	6 350	5 760

APPENDIX 11

AREA NO: 1 NAME: FRANSCHHOEK PASS - THEEWATERSKLOOF DAM

OWNERSHIP: The greater part of the area is already under the control of the Directorate of Forestry but part is privately owned. Purgatory Outspan belongs to the Divisional Council of Paarl.

LOCALITY: (a) 3319CC
(b) Between the southern end of Franschhoek Pass (Purgatory Outspan) and Theewaterskloof Dam.

TOTAL AREA: (a) ±1 800 ha
(b) ±1 500 ha

VELD/HABITAT-TYPES: The vegetation in the area is Mesic Mountain Fynbos (±1 100) on the lower mountain slopes and flats. Extensive Prionium serratum marshlands (±400 ha) are present especially along the Du Toits River.

DISTURBANCES: The greater part of the area is relatively undisturbed but infestations of alien Acacia species and Pinus pinaster occur on approximately 200 ha. Plantations of Pinus radiata have been established on a small part of the area and ploughed fields are present.

SPECIAL ATTRIBUTES:

(a) Biotic - the area contains the last remaining remnant of relatively undisturbed fynbos and low-lying sandy flats in this area. The Prionium serratum marshland represents a community which is also becoming very rare. Three locally endemic plant species are known from the lower end of Franschhoek pass, viz Erica chrysocodon and E purgatoriensis, which are confined to a two hectare marsh in Purgatory Outspan. E hibbertia occurs on rocky outcrops at Amandel River and in Purgatory Outspan.
(b) Cultural/Historic - none known
(c) Landscape/Aesthetics This area presents a unique opportunity to conserve an undeveloped area and the imposing surrounding mountains in a single unit.

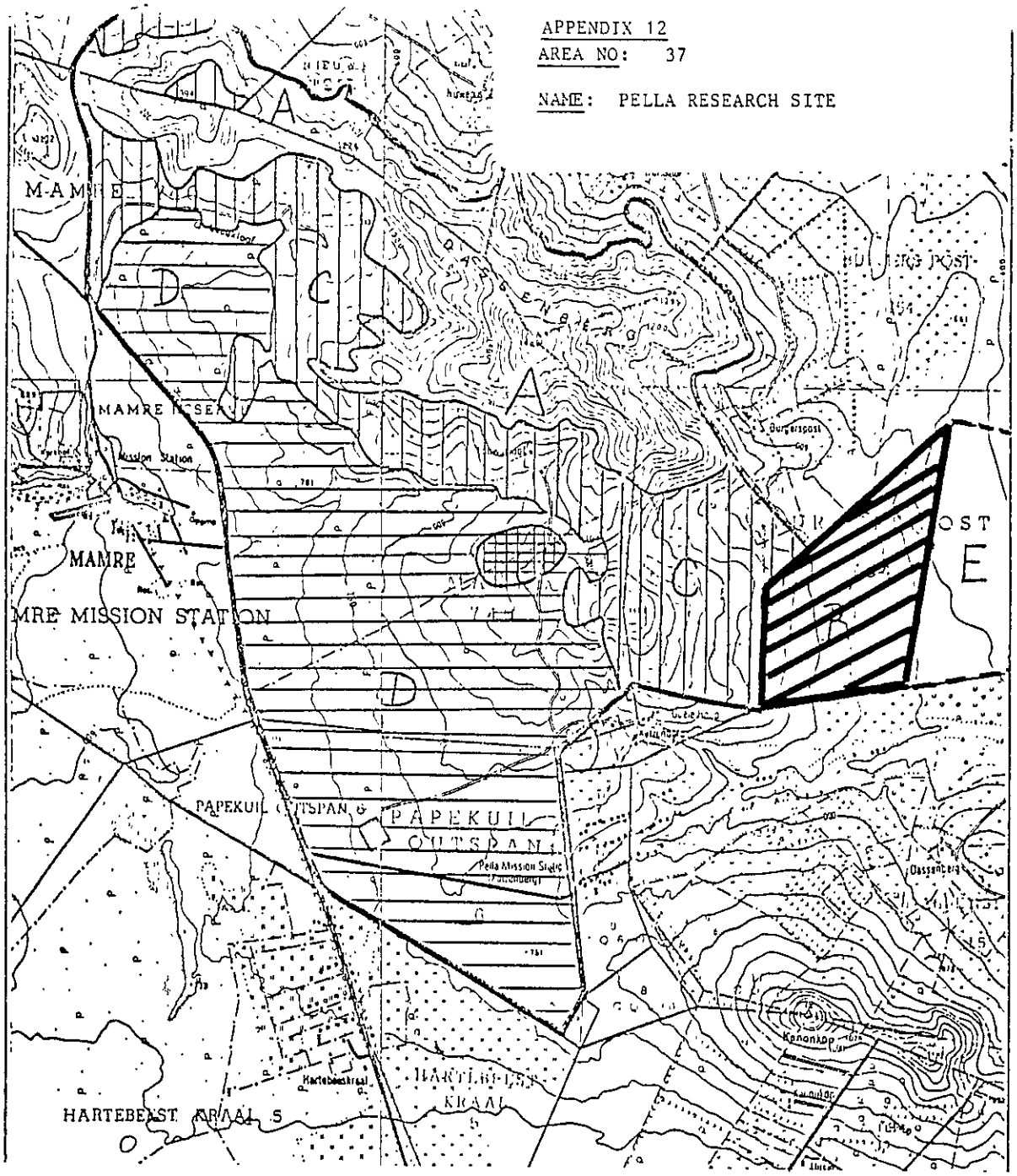
PRESENT LAND USE: Privately owned land is used for cattle grazing while the state owned land is not used, except for a small area of Pinus radiata plantation. A 10 ha site at Purgatory Outspan is used as a picnic area. Part of the Theewaterskloof Tunnel system extends through the area.

ADDITIONAL COMMENT: Nil

C J BURGERS

APPENDIX 12
AREA NO: 37

NAME: PELLA RESEARCH SITE



PROPOSED SITE NUMBER 37 : PELLA RESEARCH SITE

COASTAL FYNBOS

Skaal 1:50 000	Geteken	Goedgekeur
Foku: 3318 AD ∝ BC ∝ CB ∝ DA	Distrik	Verwysings no.

APPENDIX 13. Scores for conservation value of 15 proposed sites in Region 1 - West Coast

Site Number	Size	Shape	Habitat diversity	Species richness	Threatened Flora	Invasion	Abuse	Rarity factor	Special attributes	Score
1.	5	5	3	3	2	4	3	3	0	50
2.	5	5	5	5	2	3	2	3	2	61
3.	5	4	3	3	1	4	3	2,25	10	44
4.	5	3	3	3	1	3	2	3	4	45
5.	5	4	2	2	1	4	3	1,5	6	26
6.	5	4	5	5	3	3	3	3,0	10	72
6a.	5	3	5	5	2	3	3	2,25	10	53
6b.	5	4	4	4	2	5	4	2,0	8	46
6c.	5	5	4	4	3	3	3	2,75	10	62
7.	4	3	3	3	1	2	2	3,0	3	41
8.	2	1	1	3	1	1	1	3	0	23
9.	5	5	3	3	2	3	3	2,25	2	38
10.	5	4	4	4	2	2	3	2,25	8	46
10a.	4	2	3	3	2	2	4	2,75	8	47
10b.	4	2	3	3	2	2	4	2,25	8	40
10c.	5	5	3	2	1	2	3	2,25	8	38
10d.	5	4	3	3	2	2	4	2,0	8	39
11.	3	5	2	3	5	4	3	3,25	0	57
12.	5	3	3	4	2	2	3	3,5	2	56
13.	5	3	3	3	2	4	4	3,25	10	62
14.	4	3	3	3	1	2	2	3,25	0	41
15.	4	3	2	1	2	1	1	2,75	0	26
16.	4	4	2	3	1	2	4	3,5	0	46
17.	2	3	1	3	2	4	3	3,25	0	39
18.	3	4	2	3	3	4	3	3,25	10	59
19.	5	4	4	4	2	3	4	3,1	10	66
20.	2	4	3	3	4	4	3	3,25	10	64
21.	3	4	3	3	3	2	3	3,25	6	55
22.	5	4	4	3	3	3	2	2,25	0	38
23.	5	5	4	4	4	2	2	3,25	4	66
24.	4	3	2	3	4	4	3	2,75	4	48
25.	3	5	2	2	3	5	4	3,5	2	56
26.	5	4	4	5	5	2	2	3,25	8	75
26a.	5	3	3	3	2	2	4	3,25	8	57
26b.	5	5	4	4	5	3	3	2,75	10	68
26c.	5	5	3	3	2	3	2	3,0	8	55
26d.	4	4	2	3	2	5	5	2,75	8	52
27.	5	5	3	3	1	2	4	3,0	6	51
28.	4	4	1	1	1	3	3	3,25	6	39
29.	5	4	3	3	4	2	2	2,9	4	52
30.	3	3	1	3	2	5	5	3,25	0	46
31.	4	4	3	3	3	4	2	3,0	0	48
32.	4	3	3	3	3	4	3	2,75	0	44
33.	5	3	4	4	4	4	3	3,25	10	74
34.	5	4	3	4	2	4	4	3,25	2	46
35.	5	4	3	4	2	4	4	3,25	2	59
36.	5	4	3	3	2	4	3	3,25	0	52
37.	5	4	4	4	2	4	3	3,25	0	59
38.	5	4	3	3	3	3	2	3,25	0	52
39.	5	4	4	4	3	3	4	3,0	8	65
40.*	3	3	2	3	2	4	3	3,5	4	51
41.	5	3	3	3	3	3	3	3,1	8	58
42.	2	3	2	2	3	4	2	2,0	0	25
43.	3	4	3	3	3	2	2	2,9	4	46
44.	5	3	4	4	2	2	4	2,8	10	58
45.	3	4	2	2	3	4	4	3,25	0	47
46.	5	4	3	4	2	4	4	2,9	4	43
47.	5	4	3	3	3	4	3	2,0	6	40
48.	1	2	2	3	2	3	3	3,0	4	38,5
49.	3	2	2	2	2	4	3	2,5	6	36
50.	3	3	3	3	3	1	2	3,0	10	55,25
51.	5	3	3	4	2	3	4	3,0	8	59,5
52.	5	3	3	3	3	3	3	3,0	6	54
53.	5	3	4	4	2	3	3	3,0	6	57
54.	3	2	2	2	1	2	3	3,0	8	38
55.	5	5	4	4	1	1	2	2,25	4	39

* Insufficient information exists for this area (Darling Hills); score should not be regarded as final.

APPENDIX 14. Scores for conservation value of 41 proposed sites in Region 2 - South-west coast

Site number	Size	Shape	Habitat diversity	Species richness	Threatened flora	Invasion	Abuse	Rarity factor	Special attributes	Score
1.	4	4	4	3	2	3	4	2,80	10	57,35
2.	3	4	2	3	2	4	2	3,5	4	51,25
3.	4	3	3	3	3	4	2	3,50	4	58,25
4.	4	2	3	3	2	5	2	3,50	4	54,75
5.	5	4	4	4	4	4	4	2,75	4	60,38
6a.	1	4	1	2	1	5	2	3,50	2	37,00
6b.	3	3	2	2	2	5	3	3,50	6	51,50
6c.	2	4	2	2	2	5	2	3,50	4	47,75
6d.	2	3	2	3	2	4	3	3,50	2	47,50
7.	4	2	3	3	2	4	3	3,10	10	54,95
8.	3	3	2	3	3	5	3	3,50	10	62,50
9.	1	4	1	1	2	2	2	3,75	6	34,13
10a.	3	3	3	3	3	5	2	3,50	4	58,25
10b.	5	2	4	4	5	5	2	3,50	6	76,00
10c.	4	2	4	4	3	5	3	3,50	6	69,00
11.	5	2	4	4	3	4	2	3,50	4	51,25
12.	5	4	4	4	3	4	2	3,50	6	70,75
13.	4	3	3	4	2	4	3	3,5	6	62,00
14.	5	2	3	3	2	4	3	2,75	10	51,25
15.	5	3	5	5	4	4	3	2,75	10	69,13
16.	4	3	5	5	3	3	3	3,0	6	64,50
17.	4	3	4	4	2	3	3	3,00	6	55,50
18.	5	2	5	5	4	4	4	3,00	8	72,50
18a.	5	3	5	5	3	4	3	3,40	6	75,70
18b.	5	5	5	5	3	5	4	3,00	10	77,50
18c.	5	4	4	5	3	4	4	3,00	10	71,50
19.	4	4	3	3	2	4	3	2,00	2	33,00
20.	1	3	2	3	1	2	2	3,75	4	36,00
21.	4	3	4	3	2	2	3	3,00	4	49,00
22.	4	4	4	4	4	3	4	2,00	4	43,00
23.	5	4	5	5	5	4	4	3,00	10	80,50
24.	5	5	4	4	4	4	3	3,40	6	75,70
25.	4	3	4	4	4	4	2	3,40	6	68,90
26.	4	2	4	4	4	4	3	3,00	6	61,50
27.	4	4	4	3	1	5	4	3,00	6	55,50
28.	4	3	3	3	2	4	3	3,00	4	49,00
29.	5	4	5	5	5	4	4	2,70	10	73,45
30.	4	3	4	3	4	5	2	3,00	10	64,00
31.	5	4	5	4	2	4	4	3,00	4	62,50
32.	2	2	2	3	2	5	2	3,75	2	48,88
33.	4	5	4	4	3	5	3	3,00	2	60,50
34.	*	*	*	*	*	*	*	*3,00	2	*

*Impossible to rank at this stage (Albertinia Downs/Aasvoëlberg).

APPENDIX 15. Scores for conservation value of 22 proposed sites in Region 3 - Central south coast

Site No	Size	Shape	Habitat diversity	Species richness	Threatened flora	Invasion	Abuse	Rarity factor	Special attributes	Score
1.	5	4	4,0	5,0	4,0	2,0	4,0	1,5	10	40,75
2.	3	3	2,0	4,0	4,0	4,0	5,0	1,5	8	34,25
3.	5	4	3,5	5,0	5,0	3,0	3,5	1,5	6	37,87
4.	5	4	4,0	4,0	5,0	3,0	4,0	1,5	8	28,25
5.	3	3	4,0	3,0	1,0	3,0	3,0	1,5	10	31,75
6.	3	2	2,0	3,5	4,0	3,0	2,0	3,0	10	53,50
7.	3	3	3,5	4,0	3,5	3,0	2,0	2,0	4	38,50
8.	3	4	5,0	4,0	4,0	4,0	3,0	1,5	4	34,00
9.	3	3	4,0	5,0	3,0	3,0	2,0	1,5	2	28,25
10.	1	1	3,0	3,0	2,0	2,0	4,0	1,5	4	22,00
11.	3	3	4,0	4,0	3,0	4,0	2,0	3,0	4	55,00
12.	4	2,5	3,0	3,0	2,0	3,0	3,5	1,5	8	29,40
13.	2	3,5	5,0	4,0	3,0	3,0	2,0	3,0	10	61,75
14.	1	1,5	2,0	2,0	2,0	2,0	2,0	1,5	2	37,00
15.	4	3	4,0	4,0	5,0	3,5	2,5	1,5	6	35,25
16.	1	1	3,5	3,0	4,0	3,0	2,5	1,5	8	13,25
17.	3	2	3,0	3,0	4,0	4,0	3,0	1,5	4	29,00
18.	3	3	3,0	4,0	2,5	4,0	3,0	2,5	6	46,00
19.	3	4	3,0	3,5	4,0	2,0	3,0	1,5	6	30,75
20.	5	4	3,0	3,0	3,0	3,0	3,0	2,2	2	38,30
21.	5	4	3,0	3,0	3,0	4,0	4,0	2,0	2	37,00
22.	5	4	4,0	4,0	3,0	5,0	4,0	2,5	4	54,00

APPENDIX 16. Scores for conservation value of 19 proposed sites in Region 4 - South-east coast

Site No	Size	Shape	Habitat diversity	Species richness	Threatened flora	Invasion	Abuse	Rarity factor	Special attributes	Score
1.	5	2	4	3,0	5	1	1,0	3,0	10	59,5
2.	3	2	4	4,0	4	4	2,0	2,2	4	42,5
3.	3	1	4	3,0	4	3	2,0	2,2	0	34,1
4.	2	3	3	3,0	1	4	4,0	2,2	4	33,7
5.	3	5	3	3,0	4	2	4,0	2,2	2	39,4
6.	2	2	3	2,0	2	4	4,0	2,2	4	32,6
7.	3	1	4	3,0	2	3	3,0	2,0	4	32,0
8.	3	3	2	3,0	2	3	3,0	2,3	4	33,9
9.	4	2	5	5,0	4	2	2,0	2,2	6	47,8
10.	3	5	4	3,5	4	4	4,0	2,2	8	50,9
11.	3	3	4	3,0	3	2	2,0	2,4	4	40,0
12.	3	5	2	4,0	3	4	3,5	2,2	2	38,9
13.	2	3	2	2,0	3	4	2,0	2,2	4	31,5
14.	1	3	2	2,0	3	4	3,0	2,2	4	31,5
15.	3	4	4	3,5	2	2	3,5	2,2	6	40,7
16.	5	3	5	5,0	5	1	1,5	2,2	8	52,6
17.	3	4	5	4,5	4	4	4,0	2,2	4	48,0
18.	3	2	3	3,0	2	2	2,0	2,2	6	33,5
19.	2	4	1	4,0	4	4	3,0	3,0	4	50,5

APPENDIX 17. Scores for conservation value of 15 proposed sites in Region 5 - Inland valleys

Site number	Size	Shape	Habitat diversity	Species richness	Threatened flora	Invasion	Abuse	Rarity factor	Special attributes	Score
1.	1	3	1	2	2	4	3	2,75	2	30,88
2.	3	3	2	3	2	2	3	2,50	4	34,35
3.	5	3	4	3	3	4	3	3,50	10	71,25
4.	5	3	3	4	2	4	4	3,00	2	53,00
5.	3	4	4	4	2	4	4	3,50	4	65,25
6.	3	3	1	1	2	3	3	3,00	4	34,00
7.	3	3	2	3	2	2	3	3,00	0	37,50
8.	5	3	2	3	4	4	3	3,25	4	57,63
9.	5	5	4	3	3	3	4	3,50	0	64,75
10.	1	4	2	3	3	5	4	2,75	0	41,25
11.	2	3	1	2	2	4	4	2,75	2	33,63
12.	4	3	2	3	4	5	5	3,00	4	56,50
13.	5	4	3	4	2	3	4	2,75	4	50,75
14.	4	3	1	1	2	3	4	2,50	4	31,50
15.	3	3	2	3	2	4	2	3,50	4	49,50

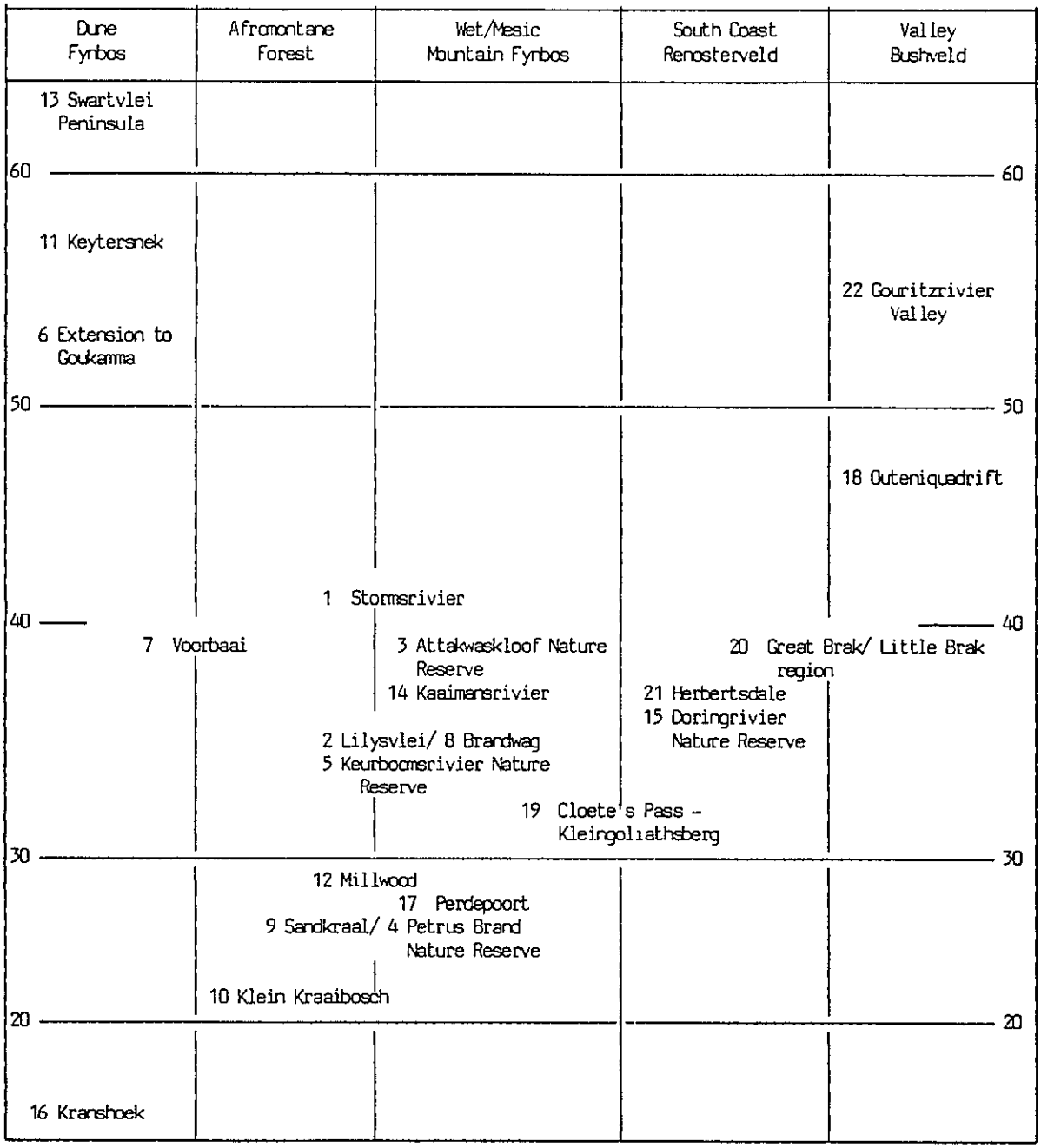
APPENDIX 18. Priority ranking of 55 proposed sites of conservation value and 28 existing protected areas in Region 1. The table is arranged with highest scoring areas at the top with approximate scores indicated on each side. The dominant vegetation type of each area is identified by its horizontal position in the table. Existing protected areas are underlined in parenthesis

Coastal Wetlands	West Coast Strandveld	Sand Plain Lowland Fynbos	West Coast Renosterveld	Mesic Mountain Fynbos and riverine wetlands
		26 Dasserberg Conservation Area	33 Voëlvlei	
	6 Langebaan and Hopefield Park		(Elandsberg)	
		26(b) Riverlands		
			19 Paarl Mountain/23 Paardeberg	
			39 Piketberg Mountain	
			20 Eensaamheid Extension	
			(Kalabaskraal)	
	6(c) Hopefield Sandveld		13 Tygerberg Hills	
				51 Skerpheuwel
60	2 Verloren Vlei			60
			18 Klipheuwel Radio Mast	
			35 Porseleinberg	
			37 Heuningberg	
			41 Piketberg Eastern Foothills	
			44 Lanquedoc	
	(Rocher Pan)			53 Simonsberg
		11 Harmony/26(a) Klein Dasserberg/(Tygerberg)		
			12 Bottelary Hills	
			25 Helderfontein	
		50 Groenrivier		
		26(c) Mamre-Pella and Dasserberg/21 Kuilerberg	Koppie/52 Sir Lowry's Pass	
	6(a) Langebaan-Bokpunt Park		(Durbanville)	
		26(d) Pella/29 Mamreweg	36 Koringberg/38 Saron	
	1 Olifants River Estuary		40 Darling Hills/27 Groerberg	
50				50
			(Eensaamheid)	
		24 Vlakfontein/31 Malmesbury Commonage SE		
		10(a) Wolfgat	45 Joosterberg	
10 False Bay Coastal Park/6(b) Bokbaai/16 Klapmuts			Kop/30 Malmesbury Commonage NE/34 Riebeckkasteel	Mountain
43 Wemmershoek Vlei/4 Berg Estuary		(Tienie Versfeld)		
	3 Wadrift Salt Pan		32 Klipfontein	46 Olifantsberg
		(Cape Flats)		7 Rietvlei
			(Brackenfell)	14 Skaperberg
	10(b) Swartklip			
40	47 Saldanha Navy Area			40
	10(d) Blackheath			
			17 Klipheuwel Quarry Site/48 Duthie Reserve/55 Trekosseenkraal	
		49 De la Gift	28 Contreberg	54 Botmaskop
	10(c) Kuils River Inundation/9 Zeekoeivlei/(Cape of Good Hope)		22 Blouberg Koppie	
	(Postberg)			
(Zandvlei)				
30				30
	(Sandveld)	15 Kraaifontein Forest Reserve		
	5 Lamberts Bay Common			
	42 Witklip			
	(Columbine)			
8 Klein Zoar	(Elandsbay)			
20		(Rondevlei)		20
	(Lamberts Bay)			
(Isoetes)				

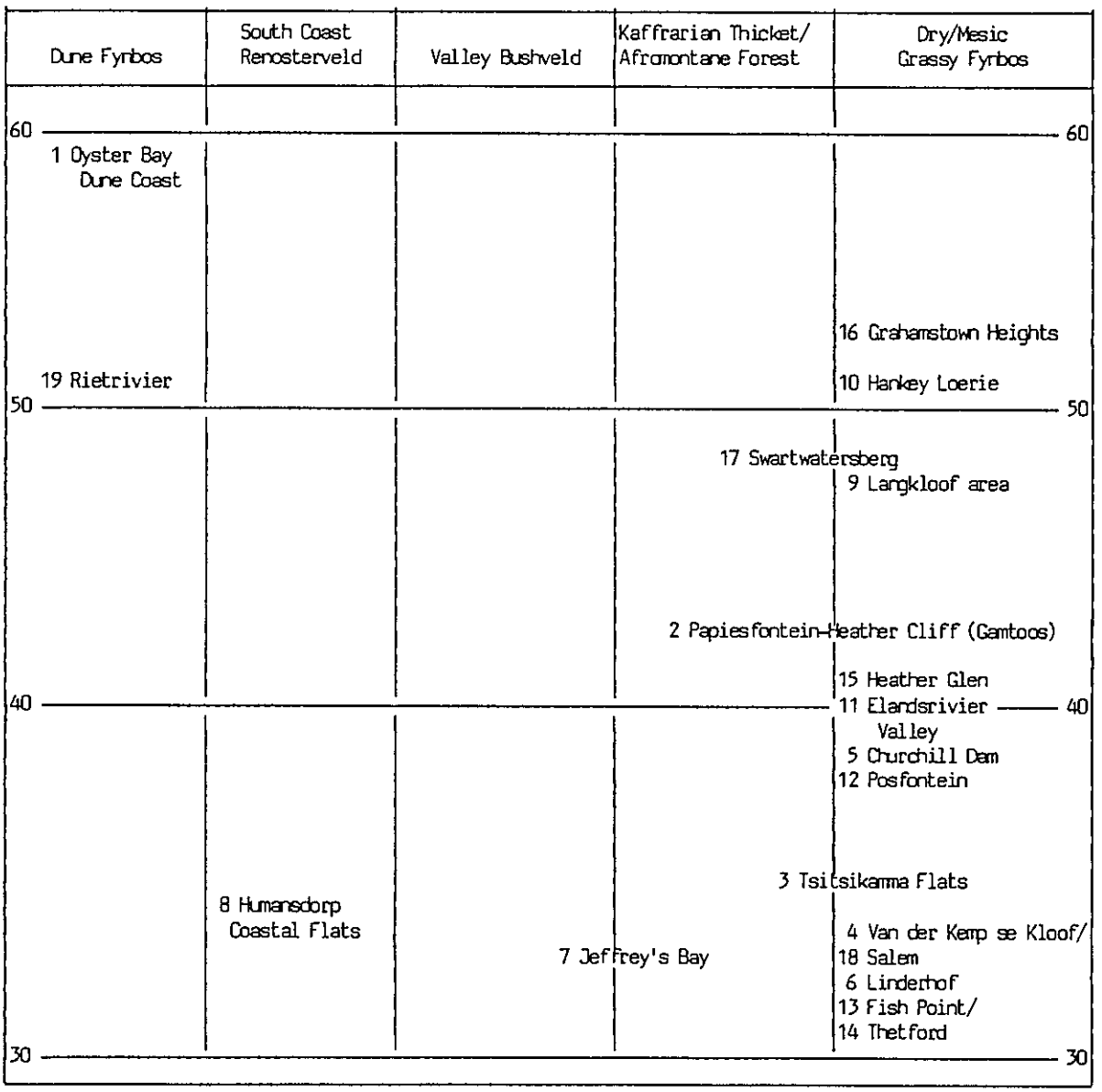
APPENDIX 19. Priority ranking of 42 proposed sites of conservation value in Region 2. The table is arranged with highest scoring areas at the top with approximate scores indicated on each side. The dominant vegetation type for each area is identified by its horizontal position in the table

Coastal and riverine wetlands	South Coast Strandveld	Elim/ Sand Plain/ Limestone Lowland Fynbos	South West Coast and South Coast Renosterveld	Mesic Mountain Fynbos	Afromontane Forest
		23 Soetanysberg Nature Area			
80					80
		18c Soetmuisberg/ Uitvlug/Die Poort	10b Plaatjieskraal/Luipaardskop		
		24 Elim/Viljoenshof			
		18a Babylonstoring/ Shaws Pass/Steerboksberg		18b Klein River Mountains	
		29 Overberg Armament Testing Range	12 Duiwerhoks	18 Mountains between Caledon and Bredasdorp	
70					70
			10c Oudekraalskop	15 Rooiels Nature Area	
16 Bot River Lagoon		25 Elim Hills		18 Mts between Caledon & Bredasdorp	
				30 Diepkloof	
		31 Puntjie			
		26 Zandvlakte/Heuningrug			
		33 Ystervarkpunt	8 Bontebok Park Extension/ 13 Heidelberg Hills	5 Caledon Swartberg & Drayton Siding	
60					60
			3 Upper Bot River Valley		
			10a Adamskop-Rooivlei		
			1 Franschhoek Pass Theewaterskloof Dam		
17 Kleinriviersvlei					
		27 Soetendalsvlei			
			7 Bromberg		
			6b Fairfield 4 Simonskop		
		25 Elim Hills	2 Klipfontein/11 Lower Breede &		
		26 Zandvlakte/ Heuningrug	Slang River Valleys		
			14 Corente River Hills		
50			13 Heidelberg Hills		50
21 Uilenkraals River Estuary					
28 Karsrivier Flood Plain			6c Skietpad		
			6d Rietfontein		32 Jongensfontein
		22 Awila			
40					40
			6a Squiredale		20 Uilenkraal Grootbos
	19 Danger Point				9 Sparrebos

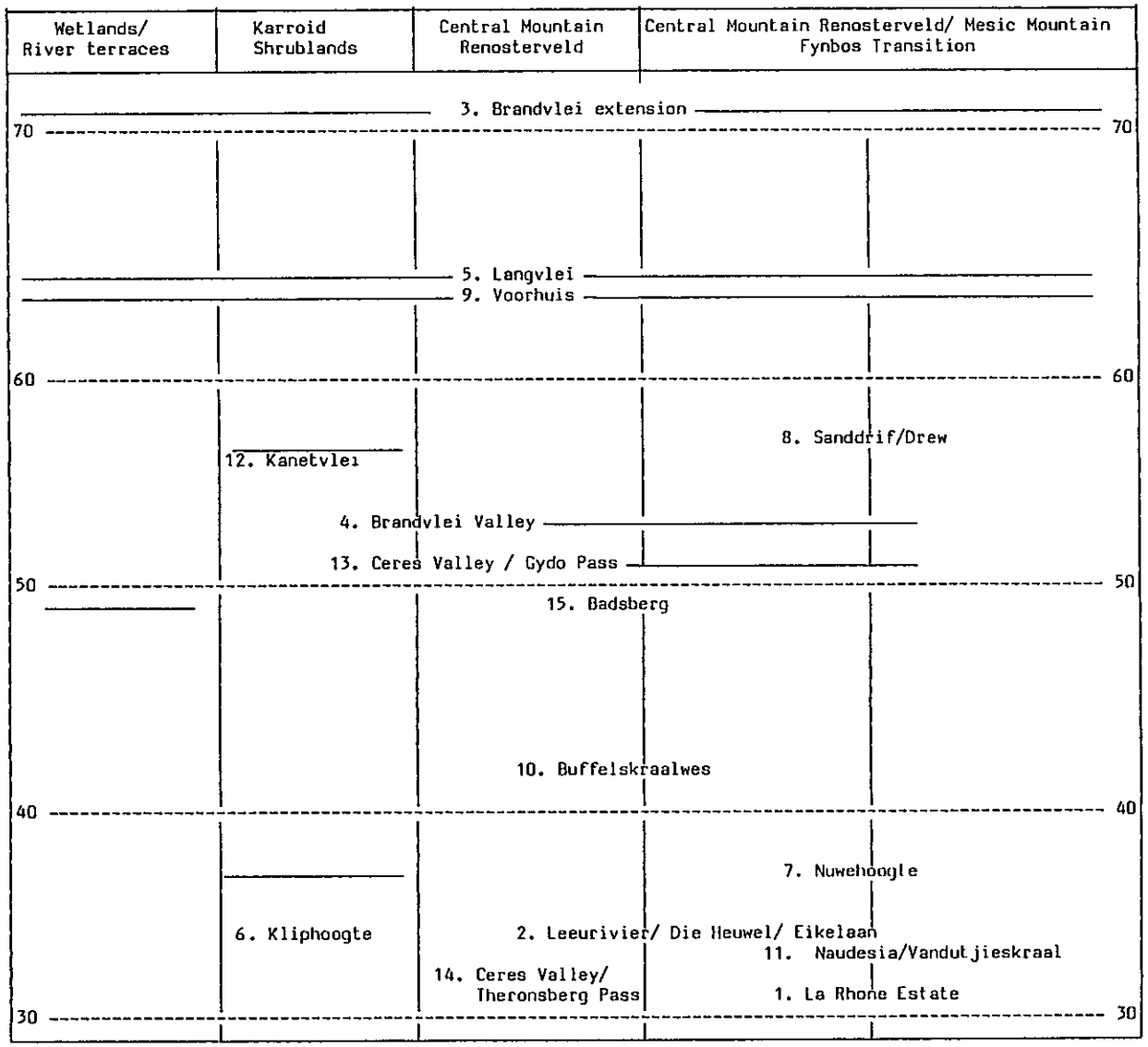
APPENDIX 20. Priority ranking of 22 proposed sites of conservation value in Region 3. The table is arranged with highest scoring areas at the top with approximate scores indicated on each side. The dominant vegetation type for each areas is identified by its horizontal position in the table



APPENDIX 21. Priority ranking of 19 proposed sites of conservation value in Region 4. The table is arranged with highest scoring areas at the top with approximate scores indicated on each side. The dominnt vegetation type for each areas is identified by its horizontal position in the table



APPENDIX 22. Priority ranking of 15 proposed sites of conservation value in Region 5. The table is arranged with highest scoring areas at the top with approximate scores indicated on each side. The dominant vegetation type for each areas is identified by its horizontal position in the table



REFERENCES

Acocks J P H 1953. Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa 28, 1-192.

Acocks J P H 1975. Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa 40.

Adamson R S 1927. Some problems of vegetation in South Africa. South African Journal of Science 24, 37-49.

Avery G 1975. Discussion on the age and use of tidal fish-traps (visvywers). Archaeological Bulletin 30, 105-113.

Bigalke R C 1973. Forestry and animal conservation. South African Forestry Journal 85, 17-20.

Bolton M P and Specht R L 1983. A method for selecting nature conservation reserves. Australian National Parks and Wildlife Service, Canberra. Occasional Paper Number 8.

Bolus H and Wolley-Dodd A H 1904. A list of the flowering plants and ferns of the Cape Peninsula, with notes on some of the critical species. Transactions of the Southern African Philosophical Society 14, 207-373.

Bond P and Goldblatt P 1984. Plants of the Cape Flora: a descriptive catelogue. Journal of South African Botany, Supplementary Volume 13, pp 455.

Boucher C and Moll E J 1981. South African Mediterranean Shrublands. In: di Castri F, Goodall D W and Specht R L (eds), Mediterranean-type shrublands. Ecosystems of the world. Elsevier, Amsterdam, pp 233-248.

Campbell B M and Moll E J 1976. The ecological status of Table Mountain, South Africa. Botany Department, University of Cape Town.

Codd L E 1968. The conservation status of ecosystems in South Africa. South African Journal of Science 64, 446-448.

Compton R H 1924. Kirstenbosch, South African botany and nature reserves. South African Journal of Science 21, 79 (Presidential Address, Section C).

Cowling R M 1980. The coastal dune ecosystems of the Humansdorp district - a plea for their conservation. The Eastern Cape Naturalist 70, 25-28.

Diamond J M 1975. The island dilemma : lessons of modern biogeographic studies for the design of natural reserves. Biological Conservation 7, 129-146.

Edwards D 1974. Survey to determine the adequacy of existing conserved areas in relation to vegetation type. Koedoe 17, 2-37.

Esterhuysen E E 1966. Cape fynbos today. Botanika Notiser 119, 158.

Game M and Peterken G F 1984. Nature reserve selection stragegies in the woodlands of central Lincolnshire. Biological Conservation 29(2), 157-182.

Hall A V 1978. Endangered species in a rising tide of human population growth. Transactions of the Royal Society of South Africa 43, 37-49.

Hall A V and Boucher C 1977. The threat posed by alien weeds to the Cape flora. Proceedings of the Second National Weeds Conference of South Africa, Stellenbosch, 1977. pp 35-45, Balkema, Cape Town.

Hall A V, de Winter M, de Winter B and Oosterhout S A M 1980. Threatened plants of southern Africa. South African National Scientific Programmes Report No 45, CSIR. 244 pp.

Huntley B J 1984. Characteristics of South African biomes. pp 1-17. In: Booysen P de V and Tainton N M (eds) Ecological effects of fire in South African ecosystems. Springer-Verlag, Berlin.

Huntley B J and Ellis S 1984. Conservation status of terrestrial ecosystems in Southern Africa. Proceedings of the 22nd Working Session, Commission on National Parks and Protected Areas, Victoria Falls, Zimbabwe. IUCN, Gland, Switzerland, pp 13-22.

Kirkpatrick J B 1983. An iterative method for establishing priorities for the selection of nature reserves: an example from Tasmania. Biological Conservation 25(2), 127-134.

Klopatch J M, Kitchings J T, Olson R J, Kuman K D and Mann L K 1981. A hierarchical system for evaluating regional ecological resources. Biological Conservation 20(4), 271-290.

Kruger F J 1977. Ecological reserves in the Cape Fynbos: toward a strategy for conservation. South African Journal of Science 73, 81-85.

Kruger F J 1979a. South African heathlands. In: Specht R L (ed), Heathlands and related shrublands. A. Descriptive studies. Ecosystems of the world. Elsevier, Amsterdam, pp 19-80.

Kruger F J 1979b. Plant ecology. In: Day J, Siegfried W R, Louw G N and Jarman M L (eds), Fynbos Ecology: a preliminary synthesis. South African National Scientific Programmes Report No 40. CSIR. pp 88-126.

Kruger F J 1980. Conservation: South African heathlands. In: Specht R L (ed) Heathlands of the world. Elsevier, Amsterdam.

Lloyd C S 1984. A method for assessing the relative importance of sea-bird breeding colonies. Biological Conservation 28(2), 155-173.

Margules C, Higgs A J and Rafe R W 1982. Modern biogeographic theory: are there any lessons for nature reserve design? Biological Conservation 24(1), 113-126.

Margules C and Usher M B 1981. Criteria used in assessing wildlife conservation potential: a review. Biological Conservation 21(2), 79-110.

McCoy E D 1983. The application of island biogeographic theory to patches of habitat: how much land is enough? Biological Conservation 25(2), 127-134.

McLarty R 1952. Foreword. In: Gardner Flora of Western Australia 1,1.

Milewski A V and Esterhuysen E 1977. Habitat of Restionaceae endemic to western Cape coastal flats. Journal of South African Botany 43(4), 233-241.

Moll E J 1982. Proceedings of the symposium on coastal lowlands of the western Cape. University of the Western Cape, March 19/20 1981.

Moll E J and Bossi L 1984a. Assessment of the extent of the natural vegetation of the fynbos biome of South Africa. South African Journal of Science 80, 355-358.

Moll E J and Bossi L 1984b. Vegetation map of the fynbos biome. Director of Survey and Mapping, Mowbray.

Moll E J, Campbell B M, Cowling R M, Bossi L, Jarman M L and Boucher C 1984. A description of major vegetation categories in/and adjacent to the fynbos biome. South African National Scientific Programmes Report Number 83. CSIR. 29 pp.

Ogle C C 1981. The ranking of wildlife habitats. New Zealand Journal of Ecology 4, 115-123.

Pillans N S 1924. Destruction of indigenous vegetation by burning in the Cape Peninsula. South African Journal of Science 21, 348-350.

Rycroft H B 1955. Saving our flora. Journal of the Botanical Society of South Africa 41/42, 13-15.

Siegfried W R 1982. Trophic structure of some communities of fynbos birds. In: Moll E J (ed) Proceedings of the symposium on coastal lowlands of the western Cape. University of the Western Cape, March 19/20 1981.

Talbot W J and Talbot A M 1968. Greater Cape Town Region. Cape Provincial Administration Planning Report Number 4, viii, 1-112.

Taylor H C 1978. Capensis. In: M J A Werger (ed) Biogeography and ecology of southern Africa. Junk, The Hague, pp 171-229.

van der Merwe 1962. The position of nature conservation in South Africa. Koedoe 5, 1-122.

Wicht C L 1945. Report of the committee on the preservation of vegetation of the south-western Cape. Special Publication of the Royal Society of South Africa, 1-56.

ALLEN K L (Dr)	Loerie Avenue, SEDGEFIELD, 6573
ASHTON E R (Mrs)	Parks and Forests, Cape Town City Council P O Box 1694, CAPE TOWN, 8000
BALCHIN T (Mr)	Trenanny, Flamingo Avenue, SEDGEFIELD, 6573
BAYER M B (Mr)	Karoo Botanic Gardens, P O Box 152, WORCESTER, 6850
BOSHOFF A F (Dr)	The Lakes Nature Conservation Station, Department of Nature and Environmental Conservation, Private Bag X6546, GEORGE, 6530
BOSSI L (Ms)	Department of Botany, University of Cape Town, Private Bag, RONDEBOSCH, 7700
BOUCHER C (Mr)	Botanical Research Unit, Department of Agriculture, P O Box 471, STELLENBOSCH, 7600
BREYTENBACH G J (Mr)	Saasveld Forestry Research Centre, Private Bag X6515, GEORGE, 6530
BRINK E (Mrs)	Botanical Research Unit, Department of Agriculture, C/O Albany Museum, P O Box 101, GRAHAMSTOWN, 6140
BROWN S (Mrs)	C/O Department of Botany, University of Cape Town, Private Bag, RONDEBOSCH, 7700
BURGERS C (Mr)	Department of Nature and Environmental Conservation, Cape Provincial Administration, Private Bag X5014, STELLENBOSCH, 7600
BURNS M (Mr)	East Cape Forestry Region, Department of Environment Affairs, Private Bag X432, KING WILLIAMSTOWN, 5600
COBBY J (Mr)	The Regional Director, East Cape Forestry Region, Department of Environment Affairs, Private Bag X432, KING WILLIAMSTOWN, 5600
COETZEE P (Mr)	Nature Conservation Officer, Dias Divisional Council, P O Box 318, PORT ELIZABETH, 6000
COURT G D (Mrs)	Department of Plant Sciences, Rhodes University, GRAHAMSTOWN, 6140
COWLING R (Dr)	C/O Department of Botany, University of Port Elizabeth, P O Box 1600, PORT ELIZABETH, 6000
DU PLESSIS J (Mr)	The Lakes Nature Conservation Station, Department of Nature and Environmental Conservation, Private Bag X546, GEORGE, 6530

FENN J A (Mr)	Regional Director: Western Cape Forest Region, Department of Environment Affairs, Private Bag X9005, CAPE TOWN, 8000
FORESTER J (Ms)	Karoo Botanic Gardens, P O Box 152, WORCESTER 6850
GELDENHUYS C J (Mr)	Saasveld Forestry Research Centre, Private Bag X6515, GEORGE, 6530
HALL A V (Prof)	Bolus Herbarium, University of Cape Town, Private Bag, RONDEBOSCH, 7700
HANEKOM N (Mr)	National Parks Board, Tsitsikamma, Storms River Mouth, P O Storms River, 6308
JACKSON S (Ms)	Department of Plant Sciences, Rhodes University, GRAHAMSTOWN, 6140
JACOT-GUILLARMOD A (Dr)	Institute of Fresh Water Studies, Rhodes University, GRAHAMSTOWN, 6140
JARMAN M L (Mrs)	FRD, CSIR, C/O Department of Organic Chemistry, University of Cape Town, Private Bag, RONDEBOSCH, 7700
JOUBERT P A (Mr)	National Parks Board, Tsitsikamma, Storms River Mouth, P O Storms River, 6308
LAIDLER D (Mr)	Department of Nature and Environmental Conservation, Cape Provincial Administration, Private Bag X5014, STELLENBOSCH, 7600
LANE S (Ms)	Department of Environment Affairs, Private Bag X9005, CAPE TOWN, 8000
LOW A B (Mr)	Curator: Cape Flats Nature Reserve C/O Department of Botany, University of the Western Cape, Private Bag X17, BELLVILLE, 7530
LUBKE R (Prof)	Department of Plant Sciences, Rhodes University, GRAHAMSTOWN, 6140
MIDGLEY J J (Mr)	Saasveld Forestry Research Centre, Private Bag X6515, GEORGE, 6530
OLIVER E (Mr)	Botanical Research Unit, Department of Agriculture, P O Box 471, STELLENBOSCH, 7600
OLIVIER M C (Dr)	Department of Botany, University of Port Elizabeth, P O Box 1600, PORT ELIZABETH, 6000
PALMER A R (Mr)	Department of Nature and Environmental Conservation Cape Provincial Administration, Private Bag X1006, GRAHAMSTOWN, 6140

REYNEKE P (Mr)	Department of Environment Affairs, Private Bag X9005, CAPE TOWN, 8000
SEYDACK A H W (Mr)	Department of Environment Affairs, Private Bag X12, KNYSNA, 6570
SOUTHWOOD A J (Mr)	Department of Environment Affairs, Private Bag X12, KNYSNA, 6570
TAYLOR H C (Mr)	Botanical Research Unit, Department of Agriculture, P O Box 13, CLANWILLIAM, 8135
TYLER D (Mrs)	Robertson Bird Club, c/o P O Box 88, ROBERTSON, 6705
VAN SCHOOR D J (Mr)	Department of Nature and Environmental Conservation Cape Provincial Administration, Private Bag X1006, GRAHAMSTOWN, 6140
VAN ZYL M L (Mrs)	Wildlife Society of South Africa, c/o 8 Theron Avenue, WORCESTER, 6850
VLOK J H J (Mr)	Saasveld Forestry Research Centre, Private Bag X6515, GEORGE, 6530
WEST O (Dr)	P O Box 414, PLETTENBERG BAY, 6600
WILKEN M (Mrs)	Skreeubos, Boknesstrand, via Alexandria, 6185
WILKEN St E (Mr)	Skreeubos, Boknesstrand, via Alexandria, 6185

RECENT TITLES IN THIS SERIES

90. Pipeline discharges of effluents to sea. D A Lord, F P Anderson and J K Basson (editors). October 1984. 108 pp.

91. Monitoring in South African grasslands. M T Mentis. September 1984. 55 pp.

92. Conservation of threatened natural habitats. A V Hall (editor). November 1984. 185 pp.

93. Limnological criteria for management of water quality in the Southern Hemisphere. R C Hart and B R Allanson (editors). December 1984. 181 pp.

94. Water quality criteria for the South African coastal zone. J A Luscher (editor). December 1984. 42 pp.

95. National Programme for Weather, Climate and Atmosphere Research Annual Report 1984/85. C W Louw (compiler). December 1984. 28 pp.

96. A guide to the literature on research in the grassland biome of South Africa. N M Tainton. December 1984. 77 pp.

97. South African Red Data Book - Birds. R K Brooke. December 1984. 213 pp.

98. Directory of southern African conservation areas. T Greyling and B J Huntley (editors). December 1984. 311 pp.

99. *The effects of crude oil pollution on marine organisms. A C Brown. February 1985. 33 pp.

100. *SANKON: Opsommingsverslag oor mariene navorsing 1984. SANKON. Februarie 1985. 53 pp.

101A Verslag van die Hoofprogram vir Navorsingsondersteuning. Februarie 1985. 30 pp.

101E Report of the Main Research Support Programme. February 1985. 30 pp.

102. National Programme for Remote Sensing. Report: 1984. P J van der Westhuizen. February 1985. 50 pp.

103. Bibliography of marine biology in South Africa. A supplement to the 1980 edition. A C Brown. March 1985. 83 pp.

104. The plant communities of Swartboschkloof, Jonkershoek. D J McDonald. March 1985. 54 pp.

105. Simulation modelling of fynbos ecosystems: systems analysis and conceptual models. F J Kruger, P M Miller, J Miller and W C Oechel (editors). March 1985. 101 pp.

106. The Kuiseb environment: the development of a monitoring base line. B J Huntley (editor). March 1985. 138 pp.

107. Annotated bibliography of South African indigenous evergreen forest ecology. C J Geldenhuys. May 1985. 125 pp.

108. Review of metal concentrations in southern African coastal waters, sediments and organisms. H F-KO Hennig. August 1985. 140 pp.

109. Coastal dunes of South Africa. K L Tinley. September 1985. 293 pp.

110. The limnology of Hartbeespoort Dam. NIWR. September 1985. 269 pp.

111. Management of invasive alien plants in the fynbos biome. I A W Macdonald, M L Jarman and P Beeston (editors). October 1985. 140 pp.

112. The SANCOR Marine Pollution Research Programme 1986-1990. October 1985. 16 pp.

113. Alien and translocated aquatic animals in southern Africa: a general introduction, checklist and bibliography. M N Bruton and S V Merron. October 1985. 59 pp.

114. A synthesis of field experiments concerning the grasslayer in the savanna regions of southern Africa. T G O'Connor. October 1985. 126 pp.

115. South African marine pollution survey report 1979-1982. B D Gardner, A D Connell, G A Eagle, A G S Moldan, R J Watling. December 1985. 81 pp.

116. Basic needs in rural areas. A report on a seminar held in Cape Town on 19 February 1985. December 1985. 103 pp.

117. South African Red Data Book: Plants - fynbos and karoo biomes. A V Hall and H A Veldhuis. 144 pp.

118. Invasive alien plants in the terrestrial ecosystems of Natal, South Africa. I A W Macdonald and M L Jarman (editors). 88 pp.

119. Invasive alien organisms in South West Africa/Namibia. C J Brown, I A W Macdonald and S E Brown. 74 pp.

120. The impact of climate and weather on the activities of the building and construction industry in South Africa. G du Toit de Villiers (compiler). 40 pp.

121. Ecological research on South African Rivers - a preliminary synthesis. J H O'Keeffe. 121 pp.

*Out of print.