

AN ASSESSMENT OF THE VALUE OF A SMALL NATURE RESERVE,  
WITH PARTICULAR REFERENCE TO THE PALMIET NATURE RESERVE,  
WESTVILLE, NATAL

M.J. Cottrell, B.A. (Natal), P.C.E. (London)

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## ABSTRACT

This study investigates the value of small nature reserves of less than 100 ha. The biological, recreational and educational values of small nature reserves in general are assessed and management for multiple-use activities is considered. A specific example, the 35 ha urban reserve, the Palmiet Nature Reserve in Westville, Natal, is evaluated in terms of the biological communities, visitor attitudes and their reasons for going into this Reserve, use by educational institutions, management and problems.

Recommendations for improving the potential of the Palmiet Nature Reserve for both conservation and multiple-use activities are suggested. Changes in the Nature Conservation Ordinance in Natal to accommodate local nature reserves are recommended. Finally the justification for establishing small nature reserves is considered.

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PREFACE

"Men are easily inspired by human ideas, but they forget them again just as quickly. Only Nature is eternal, unless we senselessly destroy it. In fifty years' time nobody will be interested in the results of the conferences which fill today's headlines".

Serengeti Shall Not Die (Grzimek, 1965)

As with the conferences mentioned in the above extract, the contents of this thesis are likely to be forgotten in fifty years time. This study is a preliminary survey, relying mainly on secondary sources, namely a review of relevant literature. The appraisal and consolidation of this literature and the attitude surveys which were conducted in the Palmiet Nature Reserve are the chief contributions that this thesis makes to the topic under consideration.

This study must therefore be regarded as an introduction to the topic, hopefully as a forerunner to a more quantitative assessment of human impacts, and biological and other values of small nature reserves. Further research on the attitudes of people to small nature reserves needs to be undertaken over a wider spectrum of the population than the actual users of a small reserve, as in the present study. It is hoped that such research will be forthcoming in future years.

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M. J. COTTRELL.

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## CHAPTER 1

INTRODUCTION

Small nature reserves feature prominently in lists of conservation areas in South Africa and in many overseas countries. The status of these conservation areas is often queried, for much research, including that of Terborgh (1974) and Diamond (1975), has shown that the number of biotic species decreases and the extinction rate of species increases relative to the decreasing size of a nature reserve. Such evidence favours the establishment of large nature reserves which are able to accommodate an acceptable diversity of species with a lower prospect of facing extinction.

To qualify for inclusion in the United Nations List of National Parks and Equivalent Reserves (I U C N , 1971 and 1972), a conservation area should be legally protected against the human exploitation of its natural resources and against the deleterious influences of human activities apart from those deemed necessary for conservation management and tourism. In addition size criteria, although considered to be somewhat arbitrary by the International Commission on National Parks, are imposed. For inclusion on this list this Commission of the International Union for the Conservation of Nature and Natural Resources (I U C N . ) recommends reserves of a minimum size of 2000 ha except in densely populated countries (population exceeding 50 people per km<sup>2</sup>) such as the Netherlands and Britain, where a minimum size of 500 ha is recognised.

In compiling lists of conservation areas in Southern Africa, both Edwards (1974) and Huntley (1977) have reservations about small nature reserves. Edwards considers that small nature reserves are ecologically susceptible to peripheral land use development and are unable to support adequate gene pools necessary for the maintenance of many species of wildlife. His list highlights nature reserves of "less than 100 ha whose future viability is doubtful, due to their smallness" (Edwards, 1974. P.9). In his review, Huntley includes only areas of 500 ha and larger controlled by official conservation bodies.

The uncertain status accorded to small nature reserves offers scope for the investigation of their biological value and the possible educational and recreational uses that can be made of these areas. Such an appraisal may be of assistance to conservation authorities involved with the establishment, proclamation and justification of small reserves.

It is necessary to define the context in which the words nature reserve and small nature reserve are used in this thesis and to indicate briefly the prevalence of small nature reserves and some of the reasons for their establishment.

#### Definition of Nature Reserve

Dasmann (1973) ranks conservation areas in the following categories :

National Parks have a high conservation status, being managed by the highest competent authority in the country, a relatively large size and natural ecosystems which are not materially altered by human

exploitation or occupation. They are open to visitors for inspirational, educative, cultural and recreative purposes. National Parks should have at least 1000 ha of fully protected area and should therefore be zoned to accommodate different usage. Combinations of such zones may include strict natural areas, where ecosystems are protected in an undisturbed state without human interference; managed natural areas, where a species or a biotic community require human management for their perpetuation and wilderness areas, where ecosystems are protected and development and motorised transport are not permitted.

Equivalent Reserves are those reserves called by other names but which comply with the criteria for national parks; for example, the national nature reserves in Britain.

Provincial Parks may satisfy the criteria for national parks, but are controlled by a lesser government body such as a province, state, canton or department.

Strict Nature Reserves are natural areas, unmodified by man, for the protection of biotic communities and for scientific research. They are not open to the general public. Their conservation status may be as high as or higher than that accorded to national parks. Examples are the Zapovedniki of the U.S.S.R. (Pryde, 1972, Bannikov and Krinitskii, 1975 and Shtil'mark, 1976).

Managed Nature Reserves are areas where the flora and fauna may be managed and modified to provide near optimum conditions for a species

or a group of species. They are usually open to visitors. A variety of names is attached to these areas, for example: game reserve, wildlife refuge or sanctuary.

In this study the term nature reserve falls into Dasmann's category of a managed nature reserve.

Further definitions are appropriate in order to expand this concept :

A true nature reserve implies an area which is natural and as self-perpetuating as possible (Moll and Campbell, 1976). And in the context of an urban nature reserve:

A nature reserve is a natural area which is managed in such a way as to maintain the area in as natural a state as possible (Moll, 1975).

Extending these definitions and linking them to Dasmann's managed nature reserve concept, the term nature reserve, as used in this thesis, is defined as follows :

A nature reserve is an area which is set apart and which is as natural and self-perpetuating as possible, but which may be managed to achieve this aim.

Such a definition covers management which promotes the ideal of a naturally functioning ecosystem but, where limiting factors prevent this, it also includes unobtrusive human intervention in the form of a

TABLE 1.1

ANALYSIS OF NATURE RESERVES INTO SIZE CLASSES IN SOUTH AFRICA AND BRITAIN

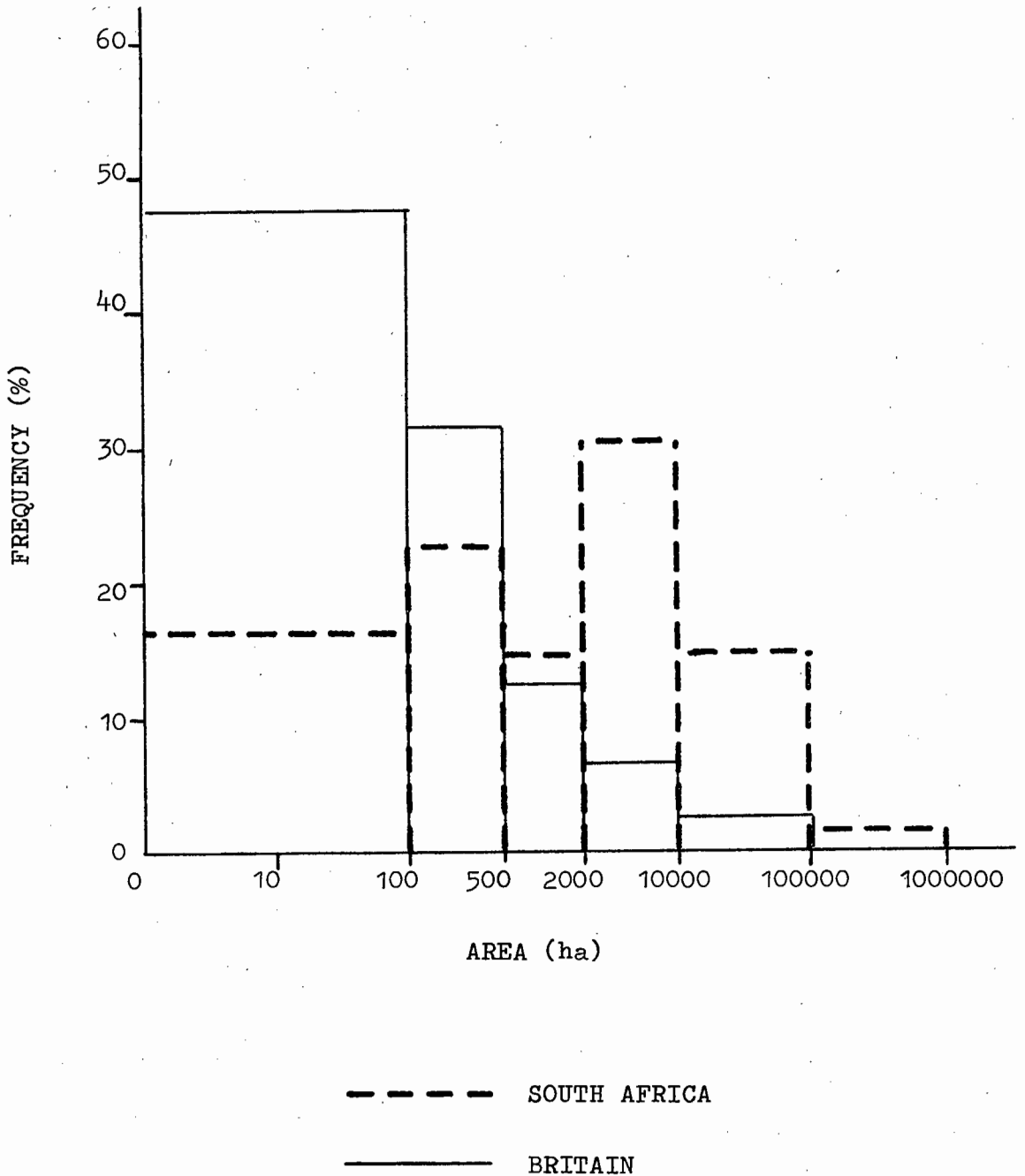
SIZE CLASSES (ha)	SOUTH AFRICA		BRITAIN	
	No. of Reserves (See Note 1)	%	No. of Reserves (See Note 2)	%
< 100	14	16,8	61	43,6
100 - 500	19	22,9	46	32,9
500 - 2 000	12	14,5	21	15,0
2 000 - 10 000	25	30,1	9	6,4
10 000 - 100 000	12	14,5	3	2,1
100 000 +	1	1,2	-	-
TOTALS	83	100,0	140	100,0

NOTES ON SOURCES

1. Proclaimed national, provincial and local nature reserves, as given by Edwards (1974), with size classes modified to accommodate the criteria for the inclusion of conservation areas in the U.N. List of National Parks and Equivalent Reserves (IUCN, 1971 and 1972).
2. Based on list of national nature reserves in Nature Conservancy Council Report (Nature Conservancy, 1975). The national parks of Britain do not satisfy the criteria for inclusion in the U.N. List, whereas the national nature reserves qualify as equivalent reserves.

FIGURE 1.1

COMPARISON OF FREQUENCY SIZE DISTRIBUTION OF  
NATURE RESERVES IN SOUTH AFRICA AND BRITAIN



Refer to data in Table 1.1

management policy directed towards maintaining as wide a diversity of biological components as possible. Factors which prevent an entirely naturally functioning ecosystem include size, location, human impact or the needs of a particular habitat or species.

#### Definition of Small Nature Reserve

The large number of small nature reserves in lists of conservation areas in South Africa and Britain is illustrated in Table 1.1 and Figure 1.1.

Using the minimum sizes accepted by the United Nations List of National Parks and Equivalent Reserves (I U C N , 1971 and 1972) as 2000 ha in South Africa and 500 ha in Britain, it can be seen that approximately half (54,2%) the number of conservation areas in South Africa is less than 2000 ha and that approximately three quarters (76,5%) of those in Britain are less than 500 ha in extent.

It is difficult to define precisely what constitutes a small nature reserve, with sizes ranging from a few hectares to areas in excess of a thousand hectares all possibly being classified as small. In view of the doubt expressed by Edwards (1974) concerning the ecological viability of nature reserves smaller than 100 ha and considering that many fall within this size class, it is appropriate to assess the value of conservation areas which are less than 100 ha in size. For the purpose of this study therefore:

A small nature reserve is defined as one that is less than 100 ha in extent.

TABLE 1.2

## NUMBER OF NATURE RESERVES OF LESS THAN 100 ha IN SOUTH AFRICA

CATEGORY OF NATURE RESERVE	SOUTH AFRICA			CAPE			NATAL			O.F.S.			TRANSVAAL		
	TOTAL NO.	< 100 ha	% < 100 ha / TOTAL	TOTAL NO.	< 100 ha	% < 100 ha / TOTAL	TOTAL NO.	< 100 ha	% < 100 ha / TOTAL	TOTAL NO.	< 100 ha	% < 100 ha / TOTAL	TOTAL NO.	< 100 ha	% < 100 ha / TOTAL
NATIONAL PARKS	9	-	-	7	-	-	-	-	-	1	-	-	1	-	-
PROVINCIAL	92	23	25,0	20	7	35,0	41	8	19,5	7	1	14,3	24	7	29,2
DIVISIONAL COUNCIL (PROCLAIMED)	7	1	14,3	7	1	14,3	-	-	-	-	-	-	-	-	-
MUNICIPAL (PROCLAIMED)	57	23	40,4	44	20	45,5	-	-	-	-	-	-	13	3	23,1
MUNICIPAL (NOT PROCLAIMED)	165	47	28,5	1	1	100,0	10	7	70,0	-	-	-	2	-	-
S.A. BANTU TRUST	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
NATIONAL BOTANIC GARDENS (NATURAL AREA)	9	6	66,7	5	3	60,0	1	1	100,0	2	2	100,0	1	-	-
PRIVATE (PROCLAIMED)	188	61	32,4	25	9	36,0	-	-	-	2	-	-	509	11	2,2
TOTALS	724	81	11,2	109	41	37,6	52	16	30,8	12	3	25,0	551	21	3,8

SOURCES: These are listed in Appendix 1.

A full list of nature reserves of less than 100 ha is given in this appendix.

Reference to Table 1.1 shows that 16,8% of the proclaimed national, provincial and local nature reserves in South Africa and 43,6% of the national nature reserves in Britain are less than 100 ha in extent. Of the 44 declared local nature reserves in Britain, 29 or 65,9% fall into this category (Nature Conservancy, 1975). Thirteen of those remaining fall into the 100 - 500 ha and two into the 500 - 2000 ha size classes.

A survey of South African nature reserves of less than 100 ha, listed in Appendix 1 and summarized in Table 1.2, indicates that 28,5% of the proclaimed national, provincial and local nature reserves are smaller than 100 ha. The discrepancy between this figure and the 16,8% given in Table 1.1 (Edwards, 1974) is due to the fact that Edwards excluded nature reserves which he did not consider to be reasonably permanent areas managed specifically for conservation. Although the above percentage accounts for proclaimed reserves, the overall survey includes all proclaimed nature reserves, regardless of their conservation status, as well as those local reserves where provision for proclamation does not exist. The exceptions are noted at the conclusion of Appendix 1.

When the local nature reserves that are not proclaimed and the natural areas within the National Botanic Gardens are included, the percentage of reserves in South Africa smaller than 100 ha increases to 32,4% but drops to 11,2% with the addition of the proclaimed private nature reserves on account of the large number of these reserves in the Transvaal greater than 100 ha. If all categories of nature reserve are included, the Cape

Province has the highest proportion of reserves less than 100 ha with 37,6% of the total and also the highest proportion (35,0%) of the provincial nature reserves in this size class.

Most of the nature reserves of less than 100 ha listed in Appendix 1 are situated within or close to urban areas. It is often difficult to set aside large areas for nature conservation in cities, towns and highly developed areas on account of the high monetary value of land and a general shortage of space for various urban functions. Consequently particular attention needs to be given to the role, function and problems of small nature reserves in the urban environment.

Small nature reserves have been established for various reasons :

1. Areas set aside to conserve rare and threatened species. These are often single species reserves. Examples, established by the Cape Department of Nature and Environmental Conservation, are the Eddie Rubenstein Nature Reserve (12 ha) at Hermanus to conserve Orothamnus zeyheri (Marsh Rose) and the Eensaamheid Geometric Tortoise Nature Reserve (3,6 ha) at Paarl to afford protection to the rare Testudo geometrica. (Hey, 1976). The Wharram Quarry Nature Reserve (6 ha) in Yorkshire, England, serves the important function of preserving 135 species of calcicolous flora, including two rare examples (Usher, 1973).
2. The endowment, bequest or gift of land for nature conservation purposes. The Natal Parks, Game and Fish Preservation

Board has acquired several small nature reserves through this means. Examples are the Doreen Clark Nature Reserve (5 ha), the Kenneth Stainbank Nature Reserve (78 ha when originally donated in 1963, now extended to 214 ha) and the North Park Nature Reserve (52 ha), all situated in Pietermaritzburg or Durban.

3. Attempts by conservation authorities to promote conservation awareness within local communities. Since the early nineteen fifties the Cape Nature Conservation Department has encouraged the establishment of proclaimed municipal and divisional council nature reserves (Neethling, 1976). Fifty-two local reserves have been established in the Cape Province, of which 22 are less than 100 ha in size and are listed in Appendix 1.
4. Public pressure and interest. Several municipal nature reserves have been established through the efforts of individuals and organisations to preserve areas of particular local significance. An individual pressed for the establishment of Fernkloof Nature Reserve (1446 ha) in Hermanus (Rourke, 1976a). A Rotary Club assisted with the development of King William's Town Nature Reserve (59 ha). The Johannesburg Council for Natural History was responsible for the proclamation of the Melville Koppies Nature Reserve in Johannesburg (68 ha) and the Wildlife Society of Southern Africa for the establishment of Ilanda Wilds, Amanzimtoti (21 ha) and the Palmiet Nature Reserve in Westville (35 ha).

### THE PALMIET NATURE RESERVE

The Palmiet Nature Reserve is a municipal nature reserve situated in the centre of the residential town of Westville, a distance of 11,5 km from the central business district of Durban. It was established in 1972 and extended in 1974 to its present size of 35 ha. The aerial photograph (Figure 3.1) shows that, apart from an area to the north, the Reserve is almost completely surrounded by urban development. It occupies the northern side of the rugged valley of the Palmiet River, with several prominent cliffs which enhance the aesthetic beauty of the area and offer a wider diversity of habitats.

The altitude varies from 100 to 210 metres and the Reserve falls within the Acocks classification of Coastal Tropical Forest of Natal (Acocks, 1975). Past human disturbance and the presence of invasive pest plants tends to downgrade the quality of the flora in portions of the Reserve. However, the fairly wide range of habitats and the influence of a fire management policy results in a large number of plant species. Four distinctive plant communities may be identified: the lithophytic species; grassveld with bush clumps; scrub, including a high proportion of alien species; and forests which are best developed along the river, on steep slopes and cliff-tops where they receive the greatest measure of protection from fire. The grassveld types are mainly poorer secondary species. The number of indigenous trees recorded totals 133, but this figure is probably low as all areas of the Reserve have not been thoroughly searched.

Mammals are not well represented and are seldom seen. They are confined to Ceropithecus aethiops (Vervet Monkey) and small numbers of Cephalophus monticola (Blue Duiker), Genetta rubiginosa (Genet), Mungos mungo and Atilax paludinosus (Banded and Water Mongeese). Insects, frogs and reptiles, mainly snakes and lizards, are plentiful, while the avifauna, with some 112 recorded species to date, is rich (Cooper, 1973).

Perhaps the greatest value of the Palmiet Nature Reserve is its potential for education. This is highlighted by its location in an urban area within the rapidly expanding metropolitan Durban region and the proximity of the campus of the University of Durban-Westville which adjoins portion of the northern boundary. The university implements research and education programmes in the Reserve and several schools use it for field work.

There are 17 schools situated within a 3 km radius of the Reserve. Guided trails are offered to the general public and a guide book is available.

Youth groups use the Reserve for various nature orientated and outdoor activities. In terms of numbers, the greatest use is for recreational purposes. Since the Reserve opened in September 1972 a total of almost 38 000 visits have been recorded to the end of 1976, or approximately 10 000 per annum allowing for visitors who fail to record their presence (Appendix 3).

Its situation in an urban area results in many problems related to the interaction between the occurrence of human settlement in close proximity to the natural element. African herbalists remove bark, bulbs, roots and plants for medicinal purposes and domestic dogs hunt and disturb wildlife. Monkeys and snakes create a nuisance on surrounding properties. Encroachment and insensitive development of adjacent properties, municipal servitudes and a proposed link road are threats which affect the Reserve at present or will do so in the future.

The lack of adequate finance and of legal proclamation hinder the overall conservation effort and development in the Reserve. All local nature reserves in Natal are similarly affected as there is no satisfactory legislation which permits proclamation in terms of the Provincial Ordinance and the payment of subsidies on capital expenditure as is the case in the Cape Province.

The Reserve is administered for the Borough of Westville by a committee of the Highway Centre of the Wildlife Society of Southern Africa. A management Committee of 12 members, which includes ecologists, nature conservationists and educationists, implement the management policy in an honorary capacity. The Palmiet Nature Reserve is an interesting example of a positive contribution towards nature conservation made by a local authority, a conservation society and individuals of a local community.

## OBJECTIVES OF THE STUDY

Having established that small nature reserves feature in lists of conservation areas in many countries, the purpose of this study is now considered. There is a fourfold aim :

1. To investigate the value of small nature reserves of less than 100 ha in general and the Palmiet Nature Reserve in particular, and to assess the best use or uses that can be made of small nature reserves.
2. To consider some of the problems related to small nature reserves particularly those in urban areas administered by local authorities.
3. To recommend possible strategies for the management of the biological communities and the human impact thereon and for the development of an effective educational outreach in the Palmiet Nature Reserve. It is possible that many of these strategies could be applied to or adapted in other small nature reserves.
4. To arrive at a conclusion as to whether there is any justification for proclaiming small nature reserves, particularly in urban areas.

## APPROACH TO THE STUDY

Literature research forms the framework of the evaluation of small nature reserves in general, especially with regard to their size, viability

problems, uses and the management strategies suggested for the Palmiet Nature Reserve. An educational and recreational investigation, a mail survey of local nature reserves in South Africa and interviews with nature conservationists and municipal officials supplement the literature study.

Information related specifically to the Palmiet Nature Reserve is based upon field research, analysis of data resulting from questionnaires and interviews, minutes and reports of the Management Committee and upon personal experience of the management policies of this Reserve. In view of this personal involvement, care has been taken to present an objective appraisal by using, where possible, opinions expressed in surveys, interviews and literature sources.

## CHAPTER 2

THE VALUE OF SMALL NATURE RESERVES

The term value is defined by Helliwell (1973) as "worth, desirability or utility rather than the value of something in exchange for something else, as in commerce." Used in this way value is as close in meaning to the word pleasantness and amenity as it is to money. It is in terms of Helliwell's definition that value is used in this chapter, for it is extremely difficult to assess the value of a nature reserve in monetary terms.

The purpose of this chapter is to consider the value of small nature reserves by investigating their use for biological conservation, recreation, education and for multiple-use combinations of all or some of these categories. Prior to embarking upon this appraisal other values, such as cultural, aesthetic and economic, are briefly considered in this introduction.

Strenuous efforts are made to preserve examples of mankind's past cultural heritage. Pre-neolithic man had close affinities with nature and it seems appropriate to preserve representative portions of this past heritage. Whereas fairly natural landscapes are often preserved in inaccessible areas unsuited to human development, there is also a need to leave remnants in highly developed areas where farming and urbanization have replaced the natural environment. Such witness areas, which have educational and recreational values, serve to indicate to future generations something of the appearance of the former natural

landscape. On account of intensive land-use, nature reserves in these areas are usually small.

Closely linked to the cultural heritage is the aesthetic value of nature reserves. This value is controversial when used to justify the conservation of wildlife. In comparing overcrowded, degraded and unproductive African lands adjacent to many Natal reserves, Hanks (1976) rejects the aesthetic value of wildlife in favour of economic and ecological values. Attwell (1971) stresses that aesthetic, biological, ecological and economic concepts should receive the same consideration in the planning and development of natural areas. The aesthetic value of nature reserves may be seen in the context of urban open space aesthetics, with planners such as McHarg (1971) advocating that there is a need for nature in the city. McHarg condemns the urban sprawl that characterizes most cities and has shown that careful planning allows for the retention of much natural landscape. Such natural areas in urban landscapes usually fall into the small size category as previously defined.

Small nature reserves are difficult to assess in terms of economic value, a consideration which Hanks (1976) deems necessary in justifying wildlife conservation. In stressing the need for wise land-use planning to combat environmental degradation and for conservation education, Hanks regards the preservation of small natural areas as a waste of money. National parks and large nature reserves earn considerable income from visitors. Knobel (1971) shows that the tourist income from four out of five South

African national parks is greater than the potential income, estimated by the Department of Agricultural Economics and Marketing, if the parks were converted to agricultural use. The income from national parks is increasing by approximately 20% per annum which would be difficult to match under agricultural production. However, Robertson (1977) points out that the income from the Kruger National Park under irrigated agricultural land use would exceed that derived from tourism. By contrast, small nature reserves are generally not financially viable. According to Neethling (1976) only 20% of the local reserves in the Cape Province charge entrance fees as the cost of collection is, in most cases, prohibitive.

Recreational values such as satisfaction and aesthetics are as difficult to assess in economic terms as nature conservation. However several studies involving the willingness of the visitor to pay for the recreational experience, the distance he is prepared to travel and the expected demand in relation to entrance charges are given by Usher (1973), Knetsch and Davies (1972) and Usher, Taylor and Darlington (1970), but these have not been pursued in this study in view of the emphasis placed on the term value at the commencement of this chapter. The economic assessment of recreation based on visitor spending is rejected by Leopold (1969) who feels that enjoyment and appreciation of aesthetic qualities rather than expenditure of money or time is the concern of the visitor. Leopold, and others subsequently, indicate a quantitative method of assessing the aesthetic qualities of landscape particularly where threatened development

is planned. There is little evidence of such methods having been widely used in South Africa.

The biotic, recreational, educational and multiple-use values of small nature reserves are now considered.

#### THE BIOLOGICAL VALUE OF SMALL NATURE RESERVES

In considering whether small nature reserves are biologically valuable it is necessary to review that literature which speculates on the status and desirable size of conservation areas. An important aspect must relate to the purpose of the nature reserve : what wildlife is being conserved, for many organisms occupy small territories or can meet their needs within small portions of ecosystems. Usher (1973, citing Farrar, 1962) states that regardless of size, any area of land can be treated as an ecosystem provided all organisms in the soil and the atmosphere are included. However, different species require different minimum sized areas in order to survive and therefore the probability of more species surviving in larger reserves is greater (Diamond 1975). As a primary purpose of nature conservation is to include and to maintain as wide a diversity of ecosystems, biotic species and physical factors as possible, it is obvious that larger nature reserves are better able to meet this aim.

Size and diversity are commonly mentioned in lists of suggested criteria for the selection of nature reserves (Hooper, 1971) and feature among

the nine criteria which Ratcliffe (1971) considers. In dealing with size, Ratcliffe (1971), Edwards (1974) and Edwards and Scheepers (1976) observe that no part of a small nature reserve is free from the problems of edge effects caused by surrounding development and land-use pressures. To minimize such effects they recommend large conservation areas but do not specify an optimum size which ensures that the habitat core is unaffected by peripheral influences.

It is difficult to speculate on the smallest size a nature reserve can be if it is to be considered ecologically viable and able to support an acceptable diversity of biotic species. As mentioned in Chapter 1 of this study, Edwards (1974) suggests that reserves of less than 100 ha are ecologically and genetically suspect, although he recognises that they are important in satisfying local conservation efforts. Huntley (1976) excludes nature reserves of less than 500 ha in his list of conservation areas in Southern Africa. The United Nations List of National Parks and Equivalent Reserves (I U C N 1971 and 1972) excludes conservation areas less than 2000 ha, except in densely populated countries where the minimum size accepted is 500 ha. Although the nature reserve list adheres strictly to these size criteria, the I. U. C. N International Commission on National Parks feels that the criterion of size is very arbitrary for the recognition of a nature reserve, and that reserves should be judged on their merits. For example, not included in the list is the 56 ha Old Winchester Hill National Nature Reserve, which is cited by the I. U. C. N Commission as worthy

of inclusion on account of its interesting and unusual features. The Department of Nature and Environmental Conservation in the Cape Province imposes a minimum limit of 100 ha on local fauna nature reserves (Neethling, 1976) and the limit appears to be applied in the Transvaal as six of the seven provincial reserves of less than 100 ha are specialized flora reserves. Moore and Hooper (1975), recording bird species in 433 British forests of varying size, conclude that nature reserves in Britain should be 100 ha or more, where possible, if species diversity amongst birds is required. The low species diversity of some biota in many small nature reserves can be ascribed to the lack of variety in habitats, a factor which Bunning (1977) suggests appears to be the reason for the absence of many resident breeding species of birds in the 68 ha Melville Koppies Nature Reserve in Johannesburg. Working in New Jersey in forest patches ranging from 0,01 to 24 ha and in a 44 ha portion of a more extensive forest, Galli, Leck and Foreman (1976) showed that the number of species of birds increased significantly from the smallest to the largest area, with the 24 ha plot recording an average of 25 species based on 8 censuses. The authors recommend larger forest patches as being essential to maintain a wide diversity of avifauna. The sampling of birds, trees, mushrooms, bryophytes, insects and other components in the same forest patches seem to indicate that a nature reserve of approximately 40 ha or more is required to contain the normal species diversity level for many components of the ecosystem (pers. comm. Foreman, R.T.T. 1976, Rutgers University, New Jersey).

Obviously this minimum size limit is relevant for New Jersey and must vary according to what component of the ecosystem is being conserved and according to climatic and other physical factors.

Increasingly heavy demands on resources and subsequent alteration to the surrounding habitat have caused many nature reserves to resemble islands (Diamond, 1975 and Terborgh 1974 and others). The sampling of species in what may be termed ecological islands by Moore and Hooper (1975) and Galli, Leck and Foreman (1976) achieved similar results to work which has been done on geographical islands. This has resulted in many biogeographical studies of islands, including those of Diamond and Terborgh, being applied to nature conservation considerations : for example the relationship between the size of a nature reserve and such factors as species diversity, species survival and extinction, and the design of nature reserves. These studies are relevant in an appraisal of the biological value of a small nature reserve where size is a critical limiting factor. However in making such comparisons and in applying data, Terborgh (1974) warns that islands are analogous but not equivalent to isolated natural areas on continents. Whereas geographical islands receive few immigrants, small continental natural areas are constantly exposed to pressure from the invasion of species from adjacent areas, with higher expected extinction rates compared to similar sized natural islands. Slatyer (1975) also cautions island-nature reserve comparisons, but points out that most geographical islands have restricted habitat

diversity which reduces the species diversity, whereas if nature reserves are carefully selected for their diversity of habitats it should be possible to include a wider and more representative diversity of species. He adds that species invading from surrounding areas are often alien with consequent adverse effects on nature reserves, a problem not as relevant in the case of islands which are surrounded by water.

Terborgh (1974) mentions that large reserves are needed to prevent extinction of species and to preserve natural vegetation, animals at the top of the trophic pyramid and sedentary species with poor colonizing ability. Working on avifaunal extinction rates on various land-bridge islands, which were once part of the mainland, he suggests that nature reserves need to be larger than 100 000 ha if the extinction of species is to be prevented, although it is possible to protect endemic and rare habitats in smaller reserves.

Based on biogeographical work on islands, Diamond (1975 and 1976) shows that the number of species in a reserve increases with an increase in the size of the area, that the extinction rate of species increases as the size decreases and that different species require different minimum areas to survive. A large nature reserve is therefore more desirable than a small reserve as it holds more species at equilibrium and has lower extinction rates. Diamond (1975) suggests that some species may not survive in reserves as large as 1 million ha but that they would face certain extinction in a series of smaller reserves, even if these totalled the area of the single large reserve. A single large reserve supports a

larger abundance of species than the equivalent area of scattered reserves, but more species will survive if the scattered reserves are in close proximity to one another. The only advantage cited of scattered nature reserves compared to a single large one is the better chance of survival that species have in the event of epidemiological disasters (May 1975).

Using island biogeographical research, Usher (1973) showed the relationship between species diversity and the size of nature reserves. A comparison of the herpetofauna of the West Indian islands, water birds in the East Indies and the flora in 12 Yorkshire nature reserves showed a similar species-area trend, but the linear correlation was not as marked as in the case of the results obtained on the island sites owing to the fact that the nature reserves were selected for the biological diversity.

Bannikov and Krinitskii (1975) note that many ecosystems and biological communities seldom survive without some form of modification in small areas and stress that it is important to preserve diversity and an adequate gene pool of species in large areas, particularly where rare species occur. Recreation in nature reserves is seen in conflict with conservation and the Russian Zapovednik or strict nature reserve, which restricts human entry in many cases to scientists, is preferable to the tourist orientated national park for the preservation of ecosystems. These authors recommend nature reserves exceeding one million ha for the adequate preservation of hoofed animals and major predators. Reserves adjacent to undeveloped land, free of human exploitation, should be at least 5000 to 10 000 ha,

but where these are surrounded by a developed anthropocentric landscape the minimum size should be 100 000 ha in temperate climates and 500 000 ha in extreme arid or arctic conditions.

It is of interest to note that the Kruger National Park at 1 948 528 ha more than meets this size criterion. However Edwards (1974) considers that the conservation of ecosystems in South Africa is inadequate with only 13 reserves over 10 000 ha.

In planning a system of biosphere or ecosystem reserves in Australia, the minimum suggested size was 4000 ha with areas larger than 20 000 ha suggested for the conservation of macropods (Specht, 1975). The Red Kangaroo (Megaleia rufa) is mentioned by Slatyer (1975) as needing up to 100 ha per animal and nearer 500 ha where lower population densities occur. Specht (1975) suggests that ecological reserves should be large enough to maintain an adequate gene pool, to minimize human impact and to include diverse environments to provide a variety of habitats for mobile animals and to cater for the continued conservation and evolution of plant and animal species in times of short and long term environmental stress. Edwards (1974) and Simmons (1974) also stress that large gene pools are needed to ensure genetic variety to allow for adaptation to environmental variation and change if a species is to survive. Berry (1974) mentions that the reduction in gene-flow caused by environmental changes around a reserve results in the reduction of breeding individuals. The loss of

genetic viability is not as great in small reserves if they are sufficiently close to one another according to Hooper (1971).

The problem of small nature reserves in relation to species-area relationships in Australia is highlighted by Slatyer (1975). In a number of small reserves established in the last few decades only some individuals of those species which live longest have survived while other species have persisted for only a few generations. Some woody plants are not regenerating while others are increasing in relative abundance. Decreases have occurred in bird and marsupial populations. Slatyer observes that the progressive extinction of species is due to an adjustment to a level which is appropriate to the small size and habitat features of the reserves. The need for large reserves for species diversity is highlighted by Hooper (1971) and Moore and Hooper (1975) in pointing to the fact that it is necessary to increase an area approximately ten times in order to double the number of species.

Mention has been made (Chapter 1) of the establishment of small nature reserves in South Africa for the purpose of preserving rare species, many of which face the threat of extinction. Milewski and Esterhuysen (1977) draw attention to three species of Restionaceae endemic to the western coastal flats of the South Western Cape, one of which, Restio acockii appears to be extinct. The distribution of R. micans and Chondropetalum acockii is very restricted and they are threatened by urban and agricultural development and the spread of alien species. The authors recommend that the threatened species could possibly be saved by the establishment of a

10 to 15 ha nature reserve, provided that it embraces variations of drainage, slope and depth of sand and that adequate gene pools are maintained by preserving other remaining populations.

A problem of preserving some rare species in small nature reserves is the increased possibility of deleterious influences from surrounding areas. Edwards (1974) reveals that the future of Isoetes, preserved in the small 3,6 ha Edith Stephens Cape Flats Flora Reserve is extremely doubtful because of encroaching housing development. A recently proclaimed 76 ha provincial nature reserve, an effort to preserve the threatened Beachwood mangroves in Durban, is extremely susceptible to influences beyond the control of the reserve on account of the fact that the inputs of fresh and saline water, essential to the maintenance of the ecosystem, originate outside the limits of the proclaimed area. The lack of adequate gene pools, where the numbers of a species have dwindled, is another problem which reduces the ability of the rare species to adapt to environmental change, a fact to which Rourke (1976b) ascribes the extinction of a member of the protea family, Mimetes stokoei. Du Plessis (1976) reports the reduction in numbers of the rare cycad Encephalartos paucidentatus in a small Barberton nature reserve. Where a rare species is confined to a single isolated reserve, Hooper (1971) suggests that a large population is necessary if genetic change is to be avoided. If scattered in several sites Hooper states that they should be within normal dispersal distances otherwise they will have to be constantly reintroduced from artificially maintained populations. The small size of

a nature reserve mitigates, in many cases, against the successful preservation of rare species.

### Conclusion

The evidence given in this survey of literature is unanimous in suggesting that small nature reserves are not ecologically viable in terms of species diversity, susceptibility to species extinction and vulnerability to peripheral development and land use activities. While 40 ha is the smallest size suggested for an area which displays an adequate species diversity for many components of the ecosystem, most authorities recommend conservation areas in excess of 10 000 ha and over one million ha where the establishment of ecosystem reserves is considered. As the biological value of small nature reserves is not high, the value of such areas for human use is now considered.

### RECREATIONAL USES OF SMALL NATURE RESERVES

Recreation implies the action of recreating, refreshing or reinvigorating oneself or another by some pleasant occupation, pastime or amusement (Shorter Oxford English Dictionary, 1973). Rodney (1974) adds the concept of leisure. He sees recreation as an activity that brings enjoyment and satisfaction to the individual.

TABLE 2.1

RECREATIONAL AND NATURE STUDY ACTIVITIES AT VARIOUS NATURE AND FOREST RESERVES

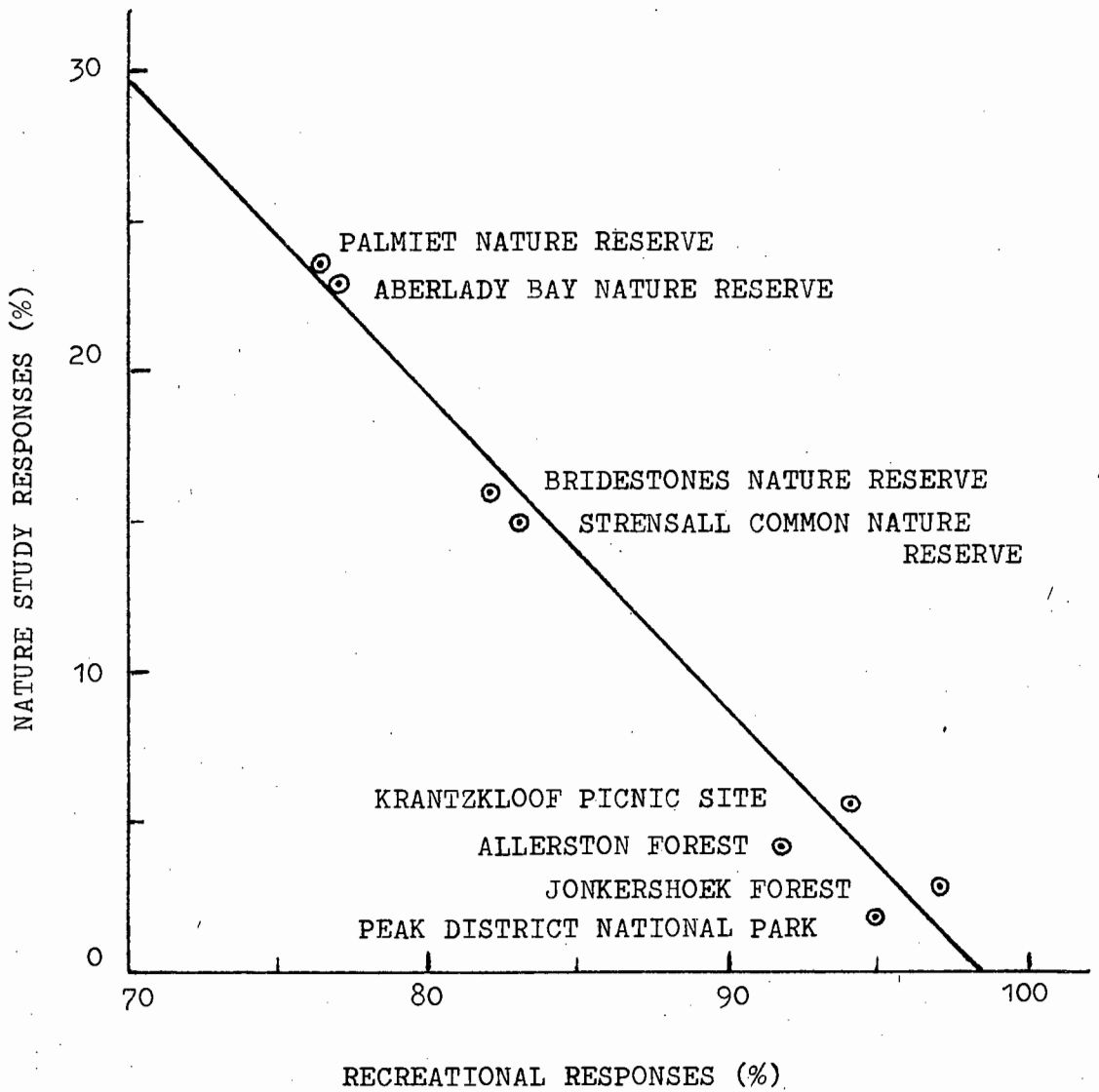
A R E A	SIZE (ha)	ACTIVITY OF VISITORS (%)	
		RECREATION	NATURE STUDY
1. Jonkershoek State Forest, Stellenbosch, Cape.	10 987	97,0	3,0
2. Peak District National Park, Derbyshire.	140 437	94,9	1,9
3. Krantzklouf N/R (Picnic Site), Natal.	456	94,0	5,6
4. Allerston Forest, Yorkshire.	*	91,7	4,2
5. Strensall Common N/R, Yorkshire.	22	83,0	15,0
6. Bridestones N/R, Yorkshire.	253	82,0	16,0
7. Aberlady Bay N/R, East Lothian, Scotland.	583	77,0	23,0
8. Palmiet N/R, Westville, Natal.	35	76,4	23,6

\* Size not known.

SOURCES AND NOTES

1. Van der Pas (1974).
2. Peak Park Planning Board (1969). The percentages of the response to each activity totalled 176,1% as more than one choice of activity was possible. The data has been recalculated to total 100% for purposes of comparison with the other areas presented.
3. Survey recorded in Appendix 2 of this thesis.
4. Usher, Taylor and Darlington (1970) citing Mutch (1968).
5. & 6. Usher, Taylor and Darlington (1970).
7. Usher, (1967).
8. Survey recorded in Appendix 4 of this thesis.

FIGURE 2.1

RECREATIONAL AND NATURE STUDY RESPONSESAT SELECTED NATURE AND FOREST RESERVES

Recreation may be divided into three categories (modified from Usher, 1973 citing Burton, 1967) :

- Cultural : This may include visits to theatres, museums and participation in amateur plays, concerts and exhibitions.
- Sport : This may include organised, competitive and traditional games such as football, cricket, hockey, golf and water skiing.
- Informal : This may include walking, canoeing, non-competitive fishing, camping, picnicking and informal nature study.

Some of the activities in the third group are listed by Cadieux (1976) as outdoor recreation, which he defines as recreational activity which often takes place in a natural environment and which is closely associated with nature and the utilisation of natural resources.

In this thesis, the term recreation refers to those informal activities mentioned in the third category, which take place in a natural environment.

Several visitor surveys conducted in nature and forest reserves in South Africa and Britain highlight the importance of recreation, in terms of usage, compared to those activities associated with nature study. (Refer to Table 2.1 and Figure 2.1). In all the surveys more than three quarters of the respondents were participating in recreational activities. A pattern emerges whereby the nature reserves as opposed to forest areas tend to

attract a higher proportion of visitors with an interest in nature study, although the low number of survey samples and possible variations in interview techniques mitigate against the formulation of a positive conclusion. Apart from the Palmiet Nature Reserve, the highest score in the nature study category is that at Aberlady Bay Nature Reserve where, according to Usher (1973), the main management objective is to conserve the fauna, flora and habitats in order to provide an area of high educational value. This could have the effect of encouraging an interest in nature study. The quality and status of the natural habitat must have an obvious influence. Allerston Forest is a Forestry Commission area where internal roads are used, resulting in 54,5% of the visitors recording that they drive for pleasure (Usher, Taylor and Darlington, 1970, citing Mutch, 1968). Although only 7% of the area of Jonkershoek is planted forest, a large proportion of visitors use the roads, largely in the planted area, for driving since this category, with which is included enjoyment of the outdoors and sightseeing, scored 73% in the survey (Van der Pas, 1974). Peak National Park is not a nature reserve in the strict sense, but an area of natural beauty which is preserved for the enjoyment of the public and which includes forestry areas and private lands such as farms and villages. The usage emphasis here would therefore tend towards recreation.

Planted forests and areas similar to the British national parks are well suited to multipurpose usage with an emphasis on recreation. The foregoing surveys demonstrate that nature reserves have a role to play in catering for some of the recreational needs as defined in this study. In

this regard, small nature reserves, particularly if situated in or near urban complexes, can fulfil an important role.

The rapid increase in recreational activities, with resultant pressures on natural areas, can be ascribed to many factors, including rapid population increase, the growth of cities, the artificiality of urban life, shorter working hours resulting in an increase in leisure time, higher standards of education, greater wealth and improved mobility, roads and access (Abbott, 1976 citing Case, 1960; Sudia and Simpson, 1973 and Knetch and Davis, 1972). As urbanisation increases, Taylor (1970) suggests that people need nature to withstand the stresses of modern life.

While greater affluence and mobility have enabled recreationalists to travel great distances in order to satisfy their needs, many urban dwellers are unable to do so. Abbott (1976) mentions the lower income groups, the aged, the infirm and the younger members of the community in pressing for the retention of natural areas in towns and cities. The Town and Regional Planning Commission policy for an overall recreation plan for Natal envisages the retention of easily accessible areas near cities for nature-orientated recreation and contemplative enjoyment (Phelan and Little, 1976). On account of the high cost and the shortage of land in urban areas such natural sites will, of necessity, tend to be small.

The present fuel crisis has further emphasized the role of urban natural areas for recreational purposes. An analysis of the visitor statistics at

TABLE 2.2

VISITORS TO SELECTED NATAL NATURE RESERVES: 1971/72-1975/76

NATURE RESERVE	* Km	1971/72	1972/73	1973/74	1974/75	1975/76	INCREASE/DECREASE 4 YEARS 1972/73-1975/76	
Kenneth Stainbank	14	X	7500	7799	8782	10804	+3304	+44,05%
Giants Castle	210	12322	12794	9619	10990	10362	-2432	-19,01%
Royal Natal National Park	275	49792	50003	43893	49979	45734	-4269	- 8,54%
Umfolozi	270	16048	18730	19845	16912	17504	-1226	- 6,55%
Hluhluwe	280	50413	48459	41305	45989	49054	+ 595	+ 1,23%

\* Distance from Durban.

X Data not available.

SOURCE: Annual Reports of the Natal  
Parks, Game and Fish Preservation  
Board, Pietermaritzburg.

selected Natal nature reserves (Table 2.2) since the imposition of fuel restrictions in 1973 seems to confirm this trend. The Kenneth Stainbank Nature Reserve in Durban shows an increase of 44% over the four year period 1972/73 to 1975/76, although part of this can probably be attributed to the fact that it was opened in 1967 and that the initial growth rate is inflated due to more people discovering the Reserve. The reserves more distant from major cities showed a decrease initially and all, except Hluhluwe, record negative changes over the four year period. Hluhluwe also records a decrease of 2,7% if the comparison is extended over the five year period to 1971/72.

#### Recreational Impacts on Nature Reserves

Biological conservation and recreation are assumed to be in direct conflict by many authorities. Bannikov and Krititskii (1975) stress this, particularly in relation to higher status conservation areas such as strict nature reserves and the Russian Zapovedniki, where human activities should be minimal. Small conservation areas, on account of the lower status accorded them for reasons of their size, are therefore more acceptable for the promotion of some recreational activities.

Large numbers of visitors to nature reserves and many recreational activities may exert impacts, often with serious deleterious effects on biotic communities and ecosystems. Much research has been done on the effects of human trampling but as yet no conclusive results are able to quantify the extent to which predetermined human pressures exert

adverse environmental changes on varying ecosystems (Liddle, 1975 and Usher, 1973). Liddle (1975), working in Britain, suggests a maximum carrying capacity of 1280 people walking single file on a path 25cm wide on moderately dry sand dune vegetation in summer if a 100% recovery is required. Both Liddle and Usher (1973) conclude that knowledge of the biological responses to trampling and other forms of disturbance, leading to quantification for application in management, is lacking.

The three chief ecological effects of trampling are summed up by Goldsmith (1974, citing Speight, 1973) :

1. The bruising and reduction or elimination of vegetation, although some species may increase in abundance; reduction in the height of the vegetation and its flowering frequency.
2. Compaction of soil and reduction of its water-holding capacity.
3. Disturbance of animal life with the decline in the numbers of some species or their movement elsewhere.

A study to determine a predictive soil compaction model covering varying soil types and moisture levels for use in camp-sites was undertaken by Morris (1972) in the United States of America in an attempt to establish the carrying capacity of such areas for recreation. Morris recognised the need to consider many other aspects besides soil compaction, including such factors as vegetative cover, micro-climate, soil fauna and the type of recreation and concluded that much research is needed to develop a

detailed model for determining the carrying capacity.

Kok (1975) indicates how management practices and visitors in terms of roads, traffic, firebreaks, fences and other structures, litter, noise, pollution, vandalism, feeding animals and leaving vehicles exert influences, often adverse, on ecosystems and animal behaviour in nature reserves.

The mere presence of visitors, power-boating, angling and the provision of fire wood and artificial waterholes are added by Attwell (1971) and waste disposal and plant and animal souvenir collecting by Tinley (1971). Bayfield (1973), investigating the deterioration of paths in hilly areas, shows how people wander from paths and widen them on steep inclines and in rough and wet terrains.

Accepting the fact that many types of recreation and biological conservation are in conflict, to what extent can recreation be tolerated in a nature reserve? This problem is particularly pertinent to small nature reserves.

Ecological carrying capacity is defined as the maximum land use pressure that an area will tolerate without showing ecological deterioration (Abbott, 1976 citing Barkham, 1973 and Goldsmith, 1974). Morris (1972, citing Wagar, 1966) describes recreational carrying capacity as the level of use at which the quality remains constant. Quality may be measured in terms of the quality of the biological communities as well as of user satisfaction with regard to such varied and debatable factors as aesthetic enjoyment,

solitude and companionship : factors which often contrast and are difficult to measure. In the biological context, the carrying capacity of nature reserves is determined by the ability of the biological communities to withstand recreational pressures without showing signs of degradation or destruction which, according to Sudia and Simpson (1973), occurs when there is no regeneration, restoration, rehabilitation or equilibration of the communities. Sudia and Simpson (1973) and Liddle (1975) stress that recreational management involves both the maintenance and regeneration of the biological communities.

The carrying capacity must vary in accordance with the size and status of the reserve, the vulnerability of the ecosystems represented and the extent to which it is necessary to maintain the natural and aesthetic appearance of the reserve (Goldsmith, 1974). The loss of a plant species through recreation is unacceptable in a high status conservation area, whereas in a small, biologically less valuable reserve the loss may not be considered with the same degree of seriousness. However the presence of eroded paths and bare patches in reserves orientated towards recreational activities is aesthetically unattractive, regardless of the size or status of the reserve.

Usher, Taylor and Darlington (1970) suggest limits on recreational use in relation to the size of nature reserves, with reserves of less than 6 - 8 ha used only occasionally for recreation on account of the deleterious impact on the biological communities. They consider reserves of 20 - 40 ha to be large enough to accommodate recreational activities. A carrying

capacity of four persons per hectare at any one time to preserve the natural quality of forests in France is recommended by Bonnaire (1973, cited by Adler et al, 1974) and discussed more fully in Chapter 4. Sudia and Simpson (1973) point out that carrying capacity is not related to the size of the reserve, but to the capacity of those areas developed for human use, such as trails, roads and accommodation. It is desirable for a large wilderness area to have a low human carrying capacity and therefore the lack of development is in keeping with this aim.

The compatibility of many recreational activities when pursued in nature reserves needs to be considered. In a report, the National Audubon Society prepared a list of compatible and incompatible activities for the Mont St. Hilaire Nature Reserve near Montreal in Canada (Adler et al, 1974). The Reserve is the property of McGill University, but the general public is admitted. It is used for educational and nature study purposes and therefore the suggested compatible uses are largely orientated in this direction, the two exceptions being hiking and snow skiing. Other compatible uses include guided and self-guided nature walks, wildlife study and nature-orientated hobbies including photography, art and writing, ecological research, conservation programmes, educational land use projects and the training of teachers and youth leaders. Nicholson (1970) includes many of the above activities but adds canoeing and climbing. He rejects those activities which increasingly require elaborate base and access facilities, for example sailing and skiing,

and also adds hunting, shooting, fishing and gliding as incompatible activities. The comprehensive Audubon list of incompatible activities for Mont St. Hilaire includes hunting and fishing and adds the collection of specimens, camping, picnicking and outdoor cooking, exercising dogs, recreational water activities including swimming, ball games, motorised traffic except to and from the parking lot, horse-riding, cycling, snow-mobiling and indiscriminate walking through an area. The report accepts picnicking and camping in a public park but suggests that they have no place in a natural area devoted to research and nature education on account of control or policing difficulties and the litter problem.

The compatibility of camping, picnicking and horse riding in a nature reserve is debatable. Abbott (1976, citing Seeley, 1973) contains them in a list of recreational activities which may be considered compatible in a natural area. In this list, camping is referred to as easy access camping. Picnicking and camping are permitted in some Natal nature reserves, horse trails feature in one reserve and motorised travel for game viewing is common in many reserves.

#### Survey of the Picnic Site at Krantzkloof Nature Reserve

In an attempt to assess the value of a picnic site in a nature reserve, a survey (see Appendix 2) was undertaken in the Krantzkloof Nature Reserve at Kloof. This is a Natal Parks Board nature reserve situated 27 km from Durban and is 456 ha in extent. Although the reserve is larger than 100 ha, its situation, largely within a gorge, results in

most visitors being confined to a very small portion of it. No other nature reserve less than 100 ha in the Durban metropolitan area offers picnic facilities.

The aim of the survey was to investigate the extent to which the users of the picnic area participate in activities other than picnicking and the extent to which they wander from the site. As would be expected in a survey conducted in a picnic site, 85,2% of the groups interviewed were picnicking, with 29,8% of these participating in no other activity. Of all the groups interviewed, 72,9% walked beyond the site, with 65,2% doing so for one hour and less and the remainder for more than one hour. Of the picnickers, 69,4% walked for one hour and less. This serves to dispel a subjective impression that the majority of picnickers do not move from the actual picnic area. By comparison a weekend survey in Aberlady Bay Nature Reserve (Usher, 1967) showed that 49% of the visitors stayed in or near the car park, mainly picnicking, or walked a very short distance. Of the remaining 51%, 28% walked a greater distance and 23% were engaged in wildlife interests.

The fact that the Krantzkloof picnic site is situated in a nature reserve did not encourage, to any degree, the participation in nature study or observation, with only 12,3% of those interviewed responding in this category. When reduced to a percentage of all responses made, allowing for the fact that many groups record more than one reason for visiting the Reserve, the figure drops to 5,6%. When plotted in relation to other

surveys (Figure 2.1), the pattern which emerges is that the visitors surveyed at Krantzkloof picnic site are more closely allied, in terms of their response to nature study, to the forest areas and the Peak National Park. One group mentioned the lack of bird life, which was true of the picnic site when occupied by large numbers of visitors, but not of the surrounding area.

Of the groups interviewed 30,3% went to Krantzkloof to relax and to get away from the city, while 13,1% specifically commented on the peace and quiet, which was hard to conceive in a fairly crowded picnic site. By contrast one group complained that the site was too developed and that radios, cars and smoke detracted from the enjoyment. Only one group complained that there were too many people. Sightseeing and photography were the only other significant activities recorded, with 16,4% falling into these categories.

In assessing the value of the picnic site at the Krantzkloof Nature Reserve, it is seen as a place of refuge and relaxation in natural surroundings for urban dwellers, with 58,5% of the respondents coming from Durban and 19,2% coming from the neighbouring industrial town of Pinetown. Flat or hotel dwellers (36,0% of those interviewed) particularly value such sites. Several respondents mentioned that it was near to Durban (27 km), an important consideration since the imposition of fuel restrictions. The lack of picnic sites in metropolitan Durban was mentioned. A high proportion of respondents visit the picnic site regularly, with nearly 40% (38,5%) having been more than five times. Ten groups (8,2%) estimated

that they had frequented the site more than 50 times while only 21,3% had never visited the Reserve previously. The survey showed that most respondents claim to visit natural areas fairly often, with three quarters (76,3%) visiting such areas more than three times a year and nearly half (48,4%) visiting at least once a month. Almost 70% (68,1%) of the groups spent between three and seven hours picnicking at the Krantzkloof site or within a short distance from it.

It is debateable as to whether a nature reserve should cater for picnicking as a form of recreation. While the survey at Krantzkloof shows that not much activity is directed towards nature study or observation, almost 70% (69,2%) of the picnickers surveyed walked beyond the picnic site into the nature reserve although only 30,6% walked for more than one hour. In walking in natural areas they must ultimately develop an appreciation for such areas and for the need to preserve them.

It is desirable that picnic sites should not impinge upon prime natural areas within a nature reserve. They are best located near the entrance or on the periphery of the reserve. In this respect the picnic area at Krantzkloof is ideally situated, adjacent to a public road through the Reserve. The size and area of intensive use occupies not more than 5 ha and is physically separated from the rest of the 456 ha Reserve situated within the gorge. Because of the difficulty of access into the gorge, the impact of recreationalists in the rest of the Reserve is minimal. In the year 1975/76, 17 660 visitors (71,6% of the total) used the picnic site compared

to an estimate of about 7 000 (28,4%) who used the rest of the Reserve (pers. comm. Ranger-in-Charge, Krantzkloof Nature Reserve, 1977).

A similar example is given by Farrell (1975), who refers to research which shows that many people are attracted to people rather than to nature. He states that the careful placing of social recreational facilities, which have a higher carrying capacity (Sudia and Simpson, 1973), can have the desirable effect of lessening the human impact on valuable landscape features and fragile ecosystems. The example quoted is the Rustenburg Nature Reserve, where swimming pools and a restaurant near the entrance attract 97% of the visitors while only 3% walk to the area of natural beauty, comprising a mountain stream, pools and waterfalls, a matter of only 20 minutes walk.

The location of tourist facilities and buildings in peripheral areas of nature reserves is recommended by Tinley (1971). According to Day (1975) proposals for the Suikerbosrand Nature Reserve in the Transvaal include bus and nature trails which, together with all other amenities, will be located on the periphery of the Reserve. The interior will remain undeveloped with admission to the general public limited to those who are motivated towards nature study or who wish to have an adventurous experience in more natural surroundings.

The provision of facilities which have the effect of attracting large numbers of people can be advantageous in a small nature reserve, where limited size results in high visitor impacts. The presence of a picnic site, a

massed wild flower garden or a water feature which attracts water birds, provided that such facility is correctly sited, preferably in a peripheral area, so that it does not occupy too much space, could have the effect of concentrating visitors thereby reducing the impact over the remainder of the reserve.

### Conclusion

In concluding this assessment of the recreational value of small nature reserves, it is clear that recreation ranks as the most important activity in visitor surveys conducted in nature reserves. Having noted that recreation generally exerts an adverse impact on ecosystems and that in a small nature reserve this human impact in terms of numbers per unit area can be greater, is recreation justified in a small reserve? As previously discussed, the biological value of small nature reserves is generally not high, on account of their size. It seems appropriate therefore to encourage recreational usage in these reserves to give urban dwellers the opportunity of experiencing something of the relaxation, the quietness, the atmosphere and the adventure that fairly natural areas offer. This could have the effect of reducing the human pressure in larger, biologically more valuable nature reserves. Clarke (1976) sees the role of small suburban nature reserves and picnic sites as filter areas which, in satisfying the recreational needs of the majority who like to enjoy open air and nature with many other people, attract the masses away from vulnerable semi-wilderness areas.

In the final assessment, it is apparent that small nature reserves, particularly those situated in or near urban areas, have a potential for recreational use. A management strategy which allows for optimal recreational usage in small nature reserves and restricts it in the larger, more viable reserves is consequently recommended.

### EDUCATIONAL USES OF SMALL NATURE RESERVES

The visitor surveys discussed in the previous section (referenced and summarised in Table 2.1 and represented graphically in Figure 2.1) showed recreation rather than nature study to be the most important activity in nature and forest reserves in South Africa and overseas. Nevertheless, perhaps the greatest value of small nature reserves is their potential for education. Slatyer (1975) recognises the value of small reserves in serving to promote a social awareness of the value of conservation and of nature reserves in general. Improved public attitudes towards conservation and the wise use of natural resources may also result if greater use is made of urban parks for educational and wildlife study (Arvill, 1967).

In investigating the needs and activities of children in an outdoor environment, Hart (1973) concluded that a diverse physical environment that can be comprehended, explored and within which they feel competent and secure, is desirable for their social and emotional development. He advocates a natural environment, for example trees, water, soil and a varied topography: an environment which remains relatively stable

compared to the complex changeable human world. In a natural area or in a vacant or abandoned lot containing rubble, as opposed to a formal landscaped park, children from the age of three years enjoy modifying the environment, which is seen as an important factor in healthy child development. Hart condemns the removal of natural elements in the interest of aesthetics, durability and safety in suburban areas and playgrounds. Retention of small natural areas is sufficient to satisfy the needs of children.

Environmental and wildlife legislation is the concern of Rabie (1976), who stresses that effective enforcement cannot be maintained without the co-operation of the community. He sees education and leadership at all levels, particularly amongst the youth and African population in South Africa, as the most important means of promoting changed attitudes towards wildlife and habitat conservation. Rillo (1974) also stresses the need to extend environmental education from childhood through to those who have completed their formal education and to involve church and youth leaders, teachers, conservationists and recreationalists.

Small nature reserves have a potential to serve the educational needs of two main groups: the general public, including organised youth groups, and educational institutions. Each will be considered in more detail.

### General Public

The gap between conservation and the short term interests of recreational exploitation, which exerts heavy impacts on the environment, needs to be

reduced through the education of recreationalists (Usher, 1973).

Included is the need to appreciate the importance of maintaining and preserving existing natural resources on a long term basis so that they are available and can be appreciated by future generations. The National Audobon report for McGill University's Mont St. Hilaire Nature Reserve, recommended the establishment of a community nature education centre offering an effective programme as a means of safeguarding the Reserve from recreational overuse and misuse by the general public and from possible expropriation or surrounding land use threats (Adler, et al, 1974). While the visitor surveys referred to earlier reveal a low interest in nature study, recreationalists, in using nature reserves, must acquire an appreciation for, and increase their knowledge of, wildlife in general. The availability of certain educational aids and innovations in nature reserves orientated towards recreation can serve to promote such awareness and to educate visitors.

Many nature reserves provide a guide book giving relevant background biological, geological and geographical information to assist the visitor to appreciate aspects of the reserve, although Tinley (1971) comments that far more could be done in this field. He suggests that many research findings can be reorganised as suitable interpretative material in the form of guide or handbooks for the general public.

The self-guided nature trail is popular in Britain where, in 1972, 345 were available in nature reserves, forests and open spaces (British Tourist Authority, 1972). These trails have the effect of drawing people away

from more vulnerable areas while serving to increase public interest in the environment, wildlife and conservation. Their value for school groups, provided usual fieldwork techniques including preparation and follow-up are employed, is mentioned by Newbould (1974). The nature trails are generally short (20 surveyed by Usher (1973) averaged 2,69 km in length) and varied in formality. The formal trails direct the user to a series of numbered markers, each of which highlights features of interest given in an explanatory booklet. An alternative to a booklet is to display the information on boards but obviously the coverage is limited. In Usher's survey the number of marked locations varied from seven to 36, but he suggests that there should be sufficient to include all the essential educational aspects, taking care that the interest of the user is not lost through too many locations. The semi-formal trails place more emphasis on whole ecosystems and features of interest between the marked, often more widely spaced locations. The information provided on informal trails does not rigidly guide the user, but permits freedom to seek out features of interest.

An example of a South African nature reserve which offers facilities for educational institutions and the education of the general public is Melville Koppies in Johannesburg. This 68 ha municipal reserve is administered by the Johannesburg Council for Natural History. Apart from the fact that this small witness area preserves a portion of the biological communities typical of the Witwatersrand ridges, with a potential for research and education, archaeological relics from earlier human settlement enhance its value and resulted in its proclamation as a natural and historical monument in 1968. The Reserve does not cater for recreational activities

as access to the general public is restricted to one day a month, except during winter when the Reserve is closed, but interested educational groups may apply for admission. On the monthly open days, lectures and trails are conducted by volunteer guides or a self-guided nature trail, with a well illustrated booklet highlighting 36 marked locations, may be followed. The names of flowering plants are indicated on small labelled plates which are changed at different seasons. Additional interpretative literature on specific topics, such as the small mammals, birds, flora, plant ecology and archaeology, is available for users requiring specialist information. The Reserve is probably one of the most documented conservation areas in South Africa in terms of scientific and educational material. In 1976 at least 1600 people participated in the open days and four organisations, five schools, two colleges of education and a university used the Reserve for educational purposes (Jackson, 1976). Almost 50 research projects by universities, colleges, botanical and ornithological societies have been undertaken at Melville Koppies (pers. comm. Friede. H. 1977. Hon. Sec. Jhb. Council for Nat. Hist.). The use of the Reserve by educational institutions leads to the next aspect of the study.

### Educational Institutions

In considering conservation and environmental education in formal educational institutions, Newbould (1974) recognises the need to develop beyond the scope offered by the natural sciences and nature study. He suggests the reconstruction of school curricula on the basis of man-environment relationships, filtering through to many subjects, including biology,

ecology, physics, chemistry, geography, history, mathematics, language and the arts. Education is seen as a process of learning about the real world and how to live in it, with some of the work taking place outside the classroom in the form of field work.

Field work should be an important aspect of geography and the biological sciences in many schools and universities, with the emphasis at the latter on research. The past two decades have seen an increase in the amount of field work undertaken in South African schools. The biologists in particular use fairly natural environments to cope with the ecological studies prescribed in the syllabus. Comber (1966), Morholt, Brandwein and Joseph (1966) and Harding, Volker and Fagle (1969) stress that suitable sites for biological field work should be found within or close to schools, including those situated in urban areas. The use of ponds, waste ground and parks is suggested, with their value considerably enhanced if left in a fairly natural state. The development of small nature reserves in school grounds is recommended by Arnold (1976).

In Britain schools are well served by a large number of field centres from which valuable work is done in natural and semi-natural areas. An example is the London Education Authority Suntrap Field Centre in the Epping Forest in the Lea Valley. The valley from Hertford to Walthamstow is being developed as a 2400 ha regional park to serve the recreational needs of north London (Arvill, 1967). Suntrap caters for primary and some infant school groups from the London Borough of Waltham Forest. Clemans (1969) reports that classes of up to 80 pupils daily, accompanied

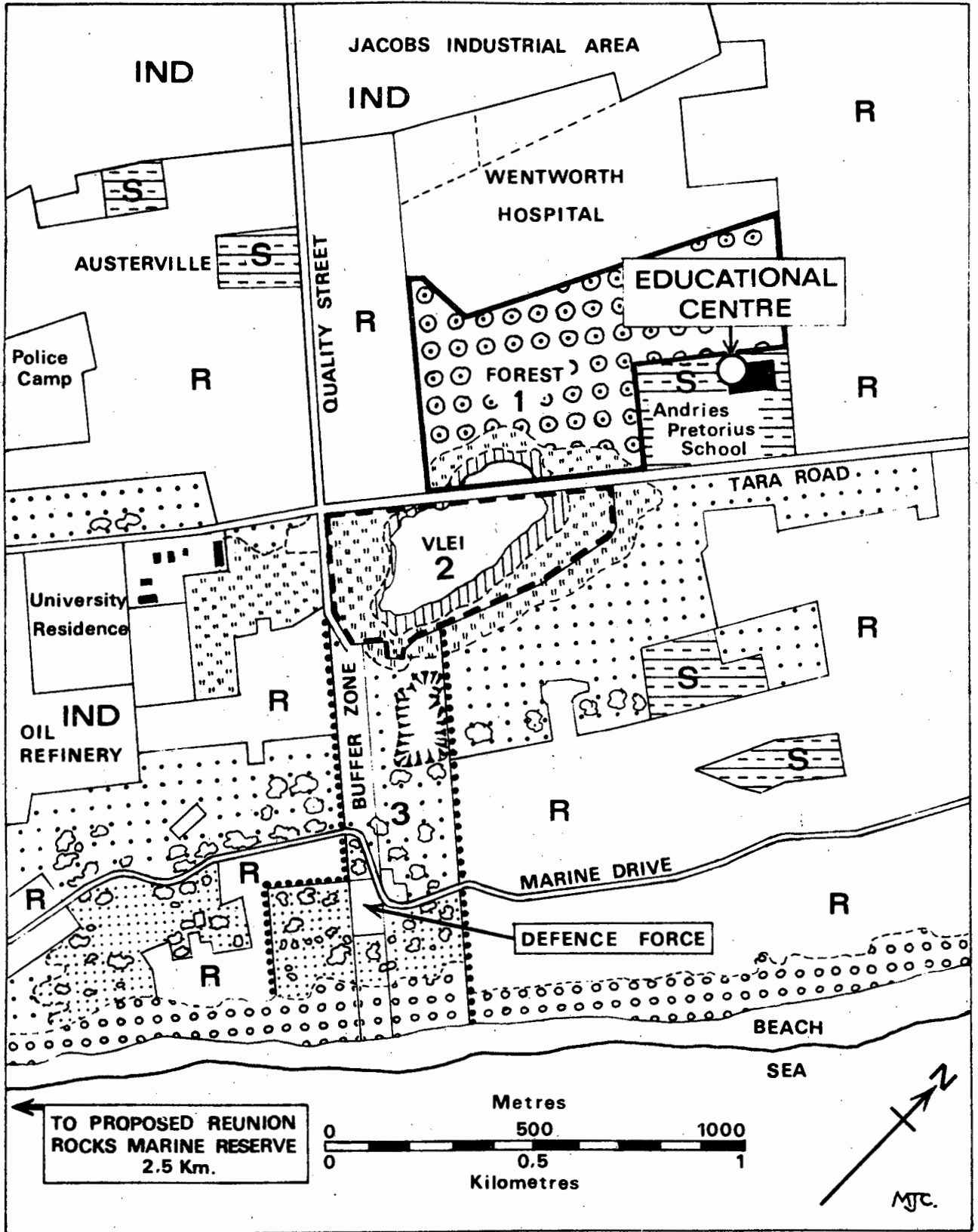
by their teachers and guided by five full time staff members, spend an entire day at the centre on up to 14 different occasions. By integrating biology and ecology with other subjects such as language, mathematics and geography, the courses offered aim to extend the experience of city children.

In Southern Africa much has been done by the conservation bodies and education authorities to encourage environmental education among school children. However Huntley (1977) and Rabie (1976) suggest that school curricula and the official agencies do not adequately promote an environmental and conservation awareness. Huntley adds that much of the present conservation education is offered by private organisations on a voluntary basis. The Rhodesian environmental school in the Mushandike National Park enjoys the co-operation of the Department of National Parks and Wildlife Management and the Ministry of Education. In Cape Town many schools use the Kirstenbosch School in the National Botanic Gardens and the School in the Wilds at Villiersdorp. The Wilderness Leadership School and the Wildlife Society Joint Venture Umgeni Valley programmes cater for some Natal pupils. Very little conservation education is available for non-whites apart from the Wildlife Society of Southern Africa courses which are offered to African teachers in Kwa Zulu. The Natal Education Department has established several field centres and has appointed an officer in charge of educational field activities. A list of educational sites in metropolitan Durban (Natal Education Department, 1975) includes eight nature reserves or natural areas.




MAP 2.1

BLUFF NATURE RESERVE, DURBAN

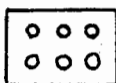
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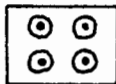
KEY TO MAP 2.1  
BLUFF NATURE RESERVE, DURBAN

-  1. NATURE RESERVE PROCLAIMED IN 1974  
 (NATAL PARKS BOARD)  
 2. BIRD SANCTUARY (DURBAN CITY COUNCIL -  
 TO BE LEASED TO NATAL PARKS BOARD)  
 3. SUGGESTED EXTENSION TO NATURE RESERVE

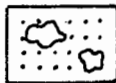
VEGETATION TYPES: UNDEVELOPED AREAS



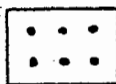
DUNE AND STEEP SLOPE COASTAL BUSH  
 (Sterlitzia nicolai)



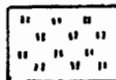
NATAL COAST FOREST



GRASS AND BUSH CLUMPS



POOR GRASS AND BUSH (DISTURBED AREAS -  
 HIGH % OF ALIEN SPECIES)



HYGROPHILOUS SEDGES AND GRASSES



REEDS (Typha latifolia)

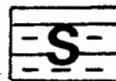


EXCAVATION - SAND

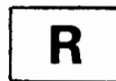
LAND USE: DEVELOPED AREAS



INDUSTRIAL



SCHOOLS



RESIDENTIAL

- SOURCES:
1. Air Photograph 21/3/1975, University of Natal,  
 Survey Dept.
  2. 1/6000 Map Sept. 1970, Durban City Engineer's  
 Town Planning Scheme in course of preparation.

The Happy Valley Education Centre, attached to a school adjacent to the 29 ha Bluff Nature Reserve in Durban (Map 2.1), is elaborated upon as an example of intensive biological and ecological studies being done in a small nature reserve surrounded by urban development, including an industrial area. Some 5000 Std. 3, 4 and 5 pupils and their teachers have used the Centre in the three year period since the Natal Education Department opened it in 1974. In 1976 approximately 1600 pupils from 19 Durban schools visited the field centre and Nature Reserve once a week for periods of three to six weeks (Keegan, 1976). It is staffed by one full-time teacher. The success of the venture depends upon the co-operation of the Education Department, the Natal Parks Board, which controls the Nature Reserve and the Wildlife Society of Southern Africa, which manages the swamp portion of the Reserve, pending its transfer to the Parks Board.

The field centre has laboratory, audio-visual, propagation and workshop facilities. Classes spend approximately 80% of the time out in the field investigating various ecological factors in fresh water, swamp and forest habitats within the Nature Reserve. Work and guide sheets are used to aid pupil investigation. The emphasis in field work, according to Marker (1970), is that there should be active pupil participation. Long and Roberson (1968) stress that pupils doing field work should discover for themselves rather than have the various aspects specifically pointed out. This is the approach at Happy Valley Education Centre. Having their class teacher present means that work done at the Centre and in the Nature Reserve can be followed up and related to the syllabus on return to the

school, a factor which greatly enhances the relevance of the educational programme.

The educational potential of this small urban reserve will be enhanced if a Wildlife Society of Southern Africa motivation to extend it along a strip to the sea and the proposed marine nature reserve at Reunion Rocks materialises (Hatton and Hunt, 1977 and Grindley, Cooper and Hall, 1976).

A unique diversity of ecosystems ranging from the intertidal zone of the sea shore to the dune communities, grassland, swamp and coastal forest, as depicted in Map 2.1, would be available within a fairly compact area.

The former Defence Force radar station on the seaward ridge is now the property of the Department of National Education which has plans to develop it as a field centre for educational purposes (pers. comm. Veary, K., 1977, Johannesburg).

Both Suntrap and Happy Valley cater mainly for the needs of primary school children. This is an important phase in education, for the ages of approximately seven to twelve years are characterised by what Piaget (1963) terms the stage of concrete operations, that is children tend to think in concrete rather than in abstract terms. Practical, tangible, real life experiences, such as those that can be gained through field work conducted in a nature reserve, are therefore desirable. Lowe (1974) considers that children within this age range are perhaps the most amenable to learning, the effects of which often extend far into their adult life. It is an ideal age to expose pupils to environmental concepts so that, as possible future decision makers, they may play an important role in environmental concerns and attitudes.

## Conclusion

In considering the educational value of nature reserves it is important to recognise the basic difference in the methods of approach applicable to the general public compared to the schools. Whereas the latter should ideally be involved in individual or group discovery, the former may be guided and given information in a more passive manner. There is no reason why some of the self-discovery techniques should not be applied to guide booklets aimed at the general user, an example being the use of dichotomous keys for the identification of plant species.

As with recreational pressures, the impact of educational activities, particularly where frequent large groups are involved, can have serious influences upon biological communities. This is very evident in the Bluff Nature Reserve where regular groups from the Happy Valley Education Centre have caused some of the steeper trails, in soils prone to erosion, to erode to depths of up to half a metre. It should be noted that this is a new venture and that a proposed management plan includes the division of the Reserve into three zones to enable each to be rested for considerable periods. Likewise Usher (1973) notes that the formal self-guided trails, in regulating users along a set route and concentrating them at certain locations, tend to increase the impact of trampling. He advocates changing the locations periodically to enable the ecosystems to recover. In contrast, Newbould (1974) sees self-guided trails as an important management tool in that the impact is concentrated along a prescribed route. The presence of marker posts and information boards in a nature reserve may be

considered to detract from the aesthetic qualities and should not be tolerated in reserves where biological conservation is the foremost consideration. In small reserves orientated towards education and recreation this problem is not as critical.

While large ecologically valuable or vulnerable nature reserves, such as the strict nature reserves and Russian Zapovedniki, are suitable for research purposes on account of the minimal human impact, it is undesirable that they be used for large scale educational purposes because of concentrated pressures from large groups at certain times. Small nature reserves can meet the educational needs of institutions and of the wider community, particularly where these are situated in or near urban areas. A number of small natural areas, conserving a variety of ecosystems and distributed throughout larger metropolitan areas is recommended.

#### MULTIPLE-USE IN SMALL NATURE RESERVES

Having shown that small nature reserves are generally less valuable in terms of biological and ecological conservation, but that they have a potential for recreational and educational purposes, it is necessary to consider the multiple-usage of such areas.

The term multiple-use suggests the wider use of resources such as forests, reservoirs, fisheries and farms. For example, apart from the exploitation of timber for economic purposes, the protection of watersheds and water supplies, the conservation of wildlife and human recreational

activities are possible uses of a forest. However, Dasmann (1973) warns that forests are less valuable for wildlife conservation where intensive timber production occurs or where alien species are planted.

In the context of this study multiple-use refers to the use of a natural area or a nature reserve for the conservation of the biological components and for its use by humans for such activities as recreation and education.

The concept of multiple-use of natural and other resources offers scope for the expansion of wildlife conservation and in catering for recreational pressures. In expressing concern for nature reserves overcrowded with people, Grafton (1968) advocates a multiple-use policy, not only in nature reserves, but also in public lands, state forests, and farms so as to extend conservation opportunities. However, multiple-usage leads to many problems and conflicts, particularly in natural areas, and calls for clear-cut management strategies.

Multiple-use in natural areas is a controversial concept, particularly in its application to the larger nature reserves. Two opposing points of view emerge. Those opposing multiple-use see all other forms of use, including human activities, in direct conflict with wildlife conservation in the biologically viable reserves, particularly in those that are classified as strict nature reserves. Contrasted are those favouring the multiple-use of natural areas if there is to be any hope of preserving wildlife in perpetuity. With escalating population pressures and increasing demands being inflicted upon the environment through technological advances, the

TABLE 2.3

HUMAN USE OF SELECTED NATURE RESERVES  
IN SOUTH AFRICA, 1975

NATIONAL PARK/ NATURE RESERVE	AREA (ha)	VISITORS (1975)	HUMAN IMPACT
			VISITORS/ha
KRUGER	1 948 528	374 892	0,192
HLUHLUWE	23 067	49 054	2,127
BONTEBOK	2 786	10 442	3,748
TSITSIKAMA	2 840	46 861	16,500
CAPE OF GOOD HOPE	7 750	371 712	47,963
PALMIET	35	9 721*	277,742 *

\* If reference is made to Appendix 3 it will be seen that 9 721 visits were recorded in the Palmiet Nature Reserve in 1975. However, as many visitors did not record their presence, the number of visitors could have been as high as 11 000 in which case the human impact would be 314,285.

demand for living space and the greater availability of leisure-time, Usher (1973) sees the need for wildlife to co-exist with man and man with nature.

Usher stresses the need to find ways of using natural areas for purposes of protecting biological species and for human recreation and education.

Slatyer (1975) comments on the UNESCO Man and Biosphere Project which recommends that large biosphere or ecological reserves maintain a core, free of human activities, in as natural a state as possible and a buffer zone providing scope for multiple-use activities such as education and recreation. Such a policy, suggests Slatyer, promotes a consciousness necessary for securing areas for conservation purposes and to counter-balance competition from land development groups.

While extensive human activities in large nature reserves are not always widely acceptable or desirable, there is no doubt that small nature reserves, which are not generally considered to be as ecologically viable, are admirably suited to a multiple-usage management policy. However cognizance must be taken of the fact that small nature reserves, on account of their size, are subjected to great human impacts in terms of numbers of people visiting annually. This is illustrated in Table 2.3, taking into account that carrying capacity cannot be measured in terms of the size alone, but by the extent to which facilities, roads and trails are developed (Sudia and Simpson, 1973). The Kruger National Park has a lower human impact in terms of visitors per year per hectare on account of its large size. By comparison the smaller Cape of Good Hope Nature Reserve had a similar visitor total in 1975 to the Kruger Park, but

experienced a human impact 250 times greater. Reserves under 100 ha in size are particularly vulnerable to visitor impacts as is typified by the example of the 35 ha Palmiet Nature Reserve. Although the number of recorded visits to this Reserve in 1975 was lower than 10 000, the human impact was 1447 times greater than that experienced in the Kruger National Park.

The conflicts and impacts of recreational activities and of large educational groups have been covered earlier under the relevant sections of this chapter. Where multiple-use activities are permitted, particularly in small nature reserves, careful management of the biological components and human elements is essential if the ecological quality is to be maintained. This is important if the reserve is to retain its attractiveness for the recreational user and value for educational purposes. In the example of the Melville Koppies Nature Reserve, mentioned earlier, management is orientated towards research and educational use. Human impacts are minimised by excluding recreation and by limiting the access by the general public for educational purposes.

The Cape Province has 44 proclaimed municipal nature reserves, 45% of which are less than 100 ha in size. These reserves receive a provincial subsidy. On account of the difficulty of preserving and protecting ecosystems, representative and endangered biotic species, of conserving natural landscape features and of providing education and recreation in the same reserve, the Department of Nature and Environmental Conservation

recommends that local reserves be designated into one of four categories (Neethling, 1976) :

Ecosystem nature reserves where biological and habitat preservation is accorded the highest priority and recreation is actively discouraged.

Landscape nature reserves which offer protection to outstanding natural features such as waterfalls, gorges and mountains, and where recreation is limited.

Game parks or fauna reserves, the minimum size of which is 100 ha, and wild flower gardens or flora reserves which fall into the multiple-use category and where species indigenous to the region are preserved or cultivated and facilities for recreation and education are encouraged.

This classification creates a range of nature reserves which vary from the higher status ecosystem reserves to the lower status fauna and flora reserves. The establishment of ecosystem reserves in urban areas is difficult to justify on account of the high monetary value attached to such land. Local authorities are more likely to accede to the setting aside of land for nature conservation if the multiple-use approach, which permits human activities, is pursued. The possible exception is where a species is facing extinction and is in need of protection.

A way of accommodating multiple-usage in small nature reserves is to zone portions of the reserve for different intensities of use, along the lines suggested by the UNESCO Man and Biosphere Project (Slatyer, 1975) for large ecological reserves. Adler, et al (1974) and Moll (1975)

postulate management plans based upon zones of varying usage. These are now discussed, while the similar zonation of the Palmiet Nature Reserve is considered in Chapter 4.

The University of McGill Mont St. Hilaire Nature Reserve was mentioned earlier under the recreational uses of small reserves. Although this 1104 ha Reserve does not fall within the small size category as defined in this study, the suggested management plan (Adler, et al, 1974) is considered on account of the orientation of Mont St. Hilaire towards multiple-usage with an emphasis on education and to a lesser extent on recreation. In order to maintain the biological quality for educational and university research purposes, the Reserve is divided into six zones. The Adler, et al (1974) report recommends two zones :

A private zone where the general public is excluded and where there is strict control of pedestrian access and a ban on all but emergency vehicles.

A public zone containing the interpretative and administrative facilities, to which the general public has access with a maximum of 3000 visitors on any one day being admitted by limiting the number of parking spaces. The formula for arriving at this capacity is discussed in Chapter 4. A control on indiscriminate walking and a ban on vehicles, except those used for service or emergencies, is suggested.

Recommendations for the multiple-use management of the 41 ha nature reserve on the New Germany Commonage are made by Moll (1975).

The nature reserve occupies the most natural portion of the 108 ha Commonage, the remainder of which has been expropriated for a freeway or will be developed for residential purposes. Although the nature reserve portion is fenced, it is not yet open to the public and remains undeveloped in terms of Moll's management proposals. The plan suggests three zones of increasing intensities of use :

The nature reserve, approximately 23 ha in extent, is the largest of the zones. It is planned to manage it so as to maintain it as natural and with as wide a diversity of habitats as possible. Such management will include the protection from fire disturbance of the fairly extensive forest and the reintroduction of some game species. Paths are not planned and human access will be strictly limited to small groups with a genuine interest in nature study. This zone is seen as having the status of a mini-wilderness.

The nature park, about 16 ha in size, will be managed to maintain as great a variety of fauna and flora as possible. It will be stocked with selected game and small dams are planned to increase the plant and bird species.

Visitors will be admitted on a system of trails which are planned to traverse the area. The nature park will cater for the recreational and low key educational needs of the general public.

The service area, an area of approximately 2 ha, which will contain parking, toilets, refreshment facilities, braai and picnic sites, semi-formal gardens and an educational centre with a good view of the Reserve. The educational centre will cater for visitors, schools and youth groups. A small camping site for overnight courses is envisaged.

Although it is difficult to appraise proposals which have not been implemented, the zonation for multiple-use, as suggested for Mont St. Hilaire and New Germany Commonage offers scope for the management of small nature reserves which cater for recreational and educational activities and where the conservation of biological components is desired. The recommendations of Adler, et al (1974) impose stricter controls on recreational activities on account of the orientation towards education. The service area proposed by Moll (1975) is similar to those mentioned by Farrell (1975) and Day (1975) and discussed in this study under the recreational uses of small nature reserves. The object of such an area of intensive use is to site development at and to attract the larger proportion of people to a peripheral area, thereby lessening the human impact on the larger portion of the reserve. Likewise the nature park caters for those desirous of studying or observing wildlife and for the more adventurous requiring exercise in natural surroundings, leaving the nature reserve area comparatively free of human intrusion.

#### SUMMARY AND CONCLUSION

Attwell (1971), in considering the impact of visitors on nature conservation areas in Rhodesia, provides a useful summary which can be applied and adapted to the context of the small nature reserve. Citing Leopold (1941), Attwell states that all wild areas, no matter how small, have a value. The aim of nature conservation should be to safeguard a representative selection of ecosystems for the education and enjoyment of people and for scientific and aesthetic reasons. Nature reserves require

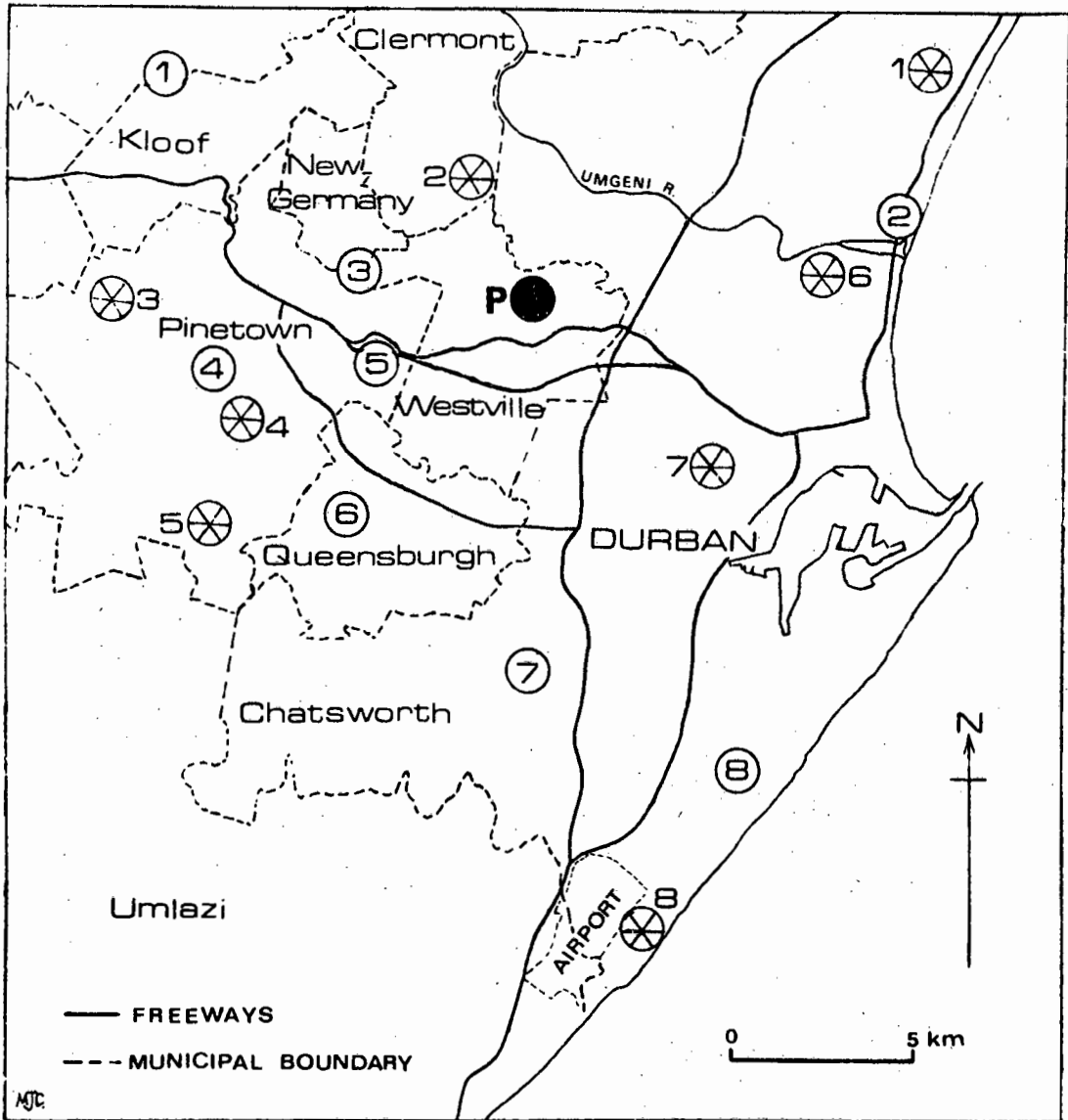
protection, through management, against human impacts caused by excessive multiple-use activities, if the natural qualities for which the areas were originally preserved and which attract the visitor, are not to be lost. Nevertheless the multi-disciplinary approach to planning and management is essential with consideration being given to biotic, ecological, human, economic and aesthetic aspects. Education is essential if the successful implementation of such nature conservation management policies is to be accepted and appreciated by the general user. Finally, in view of increasing visitor pressures on nature conservation areas, there is a need to proclaim additional areas.

Small nature reserves are able to meet the above statements in most respects, with the exception that, on account of their size, they are particularly susceptible to human impacts with possible deleterious influences upon ecosystems represented. But with careful management and control employing a multiple-use approach combining biological conservation with human utilization, Grafton (1968) stresses that small nature reserves can serve the important role of relieving human pressures on larger, higher status conservation areas. With the continuing population explosion in South Africa and elsewhere the prospect of proclaiming large nature reserves in the future is remote (Knobel, 1976). This is confirmed by the large number of small reserves which have been established in South Africa in recent years. Of the nature reserves less than 100 ha recorded in Appendix 1, excluding the Botanic Gardens, 84,0% have been established since 1960.

The following comment on small nature reserves, in relation to large ecological conservation areas in Australia, by Frankel (1975), modified slightly, is an appropriate conclusion to this evaluation of small nature reserves :

The size of small nature reserves does not imply that they have no value. In the long term they are more vulnerable, but in fully developed areas they are more likely to be established or retained. They are likely to be closer to centres of population, hence have intrinsic social and educational values for the largest number of citizens, but only rarely will they succeed in serving as long term ecological reserves.

MAP 3.1 LOCATION OF PALMIET NATURE RESERVE IN METROPOLITAN DURBAN



**P** ● PALMIET NATURE RESERVE

○ ESTABLISHED NATURE RESERVES

NPB - Natal Parks Board  
MUN - Municipal

1. KRANTZKLOOF (NPB)
2. BEACHWOOD MANGROVES (NPB)
3. NEW GERMANY COMMONAGE (MUN)
4. MARIANNWOODS (MUN)
5. PARADISE VALLEY (NPB)
6. NORTH PARK (NPB)
7. KENNETH STAINBANK (NPB)
8. BLUFF (NPB)

⊗ POSSIBLE CONSERVATION AREAS

As recommended by the Natal  
Town and Regional Planning  
Commission.

1. VIRGINIA PARK
2. ALLER RIVER
3. PINETOWN/KLOOF GREENBELT
4. MARIANNHILL PUBLIC OPEN SPACE
5. KLAARWATER PUBLIC OPEN SPACE
6. BURMAN BUSH
7. PIGEON VALLEY
8. REUNION MARINE RESERVE

## CHAPTER 3

THE PALMIET NATURE RESERVE

The Palmiet Nature Reserve is a municipal nature reserve located within the Borough of Westville, a residential town to the west of the City of Durban. It is 11,5 km by road from the city centre and 10,2 km from the sea at the grid reference 29° 49' 15" S, 30° 56' 0" E. It is situated on the northern side of the rugged Palmiet River valley at altitudes varying from 100 to 210 metres. The river is named after the riverine plant, Pronium serratum (Palmiet), which was formerly abundant but which today is represented by only one plant in the Reserve. The Nature Reserve takes its name from the river. The Reserve occupies two lots : Lot 380, which is 13,2 ha in extent and Lot 417, which is 21,5 ha, giving a total area of 34,7 ha (Map 4.3 indicates the relevant Lot numbers).

The location of the Palmiet Nature Reserve in relation to other nature reserves in metropolitan Durban is shown in Map 3.1. In recent years a number of small provincial and local nature reserves has been established and these are fairly well distributed throughout the greater Durban area. The Palmiet Nature Reserve is particularly well placed to serve the inhabitants and educational institutions in the western part of the region, including the Berea in the City of Durban.

A brief outline of the Palmiet Nature Reserve is given in Chapter 1. In this chapter the Reserve is assessed as an example of a small nature reserve of less than 100 ha in terms of its biological value, the extent

to which it is used, the attitudes of users and then considers the management and some of the associated problems. By way of an introduction a brief historical survey is given.

In tracing the ownership of the area now occupied by the Palmiet Nature Reserve, the first recorded land division was the grant of the 4418 acre farm, Wandsbeck, on the first day of the year 1848, to Edmund Morewood, who pioneered the growing of sugar elsewhere in Natal. Nine months later the farm was transferred to five people including Jonas Bergtheil, who was responsible for bringing German settlers to grow cotton and, when this failed, vegetables. According to Holliman (1974) six German families settled in Wandsbeck, the settlement receiving the name of Westville after Martin West, the Lieutenant-Governor of Natal from 1845 - 1849. Bush had to be cleared before farming could commence, but it is unlikely that cultivation extended at this stage into the steep Palmiet valley. However, Kemp (1969) reveals that the bush in the nearby kloof, which was presumably the Palmiet Valley, provided wood for buildings, fence poles and fuel. It is therefore likely that the biological communities were disturbed by humans from 1850 onwards.

Two descriptions give an early impression of the Palmiet Valley. In 1851, soon after the arrival of the German settlers, Thomas Phipson (Currey, 1968) described the steep-sided valley encountered on the road between Durban and New Germany, set amidst a thick wood which was "in many places quite safe from the apprehension of the axe." This

no doubt referred to the numerous cliffs with vegetation inaccessible to human destruction.

Just over 100 years ago Henry Brooks (Brooks, 1876) described the valley with its krantzies of 300 feet and included a coloured sketch of what today is known as the Cascade in the Palmiet Nature Reserve, as a frontispiece to the book. The impression given in the description compares favourably with the present appearance of the Reserve with agapanthus, aloes, thunbergias, ipomoeas, antelopes, monkeys, wild cats and kingfishers mentioned in the text still occurring. The unknown factor is how much of the wildlife not mentioned in the passage has disappeared from the valley. Nevertheless, such a description serves to validate one of the values of preserving small natural areas, namely to preserve a portion of the former natural heritage which was very much a part of the landscape when the first people settled in Westville over 100 years ago.

From 1875 Indians were granted title to some of the smallholdings, many of which extended into the Palmiet valley (Holliman, 1974). They were market gardeners and often cleared steep land right down to the river to grow crops such as bananas, pineapples and mangoes, the remnants of which can still be seen today. In tracing the title-deeds of the present Reserve (Lots 380 and 417 on what was then subdivision 32 of Wandsbeck) it transpires that the land has always been in the ownership of Whites, having passed in 1885 from the Bergtheil syndicate to H. Schefermann and from 1902 until 1943 several members of the Westermeyer family owned the land. It appears that the western portion of the present Reserve

was farmed, probably by Indian tenant farmers. A former resident (pers. comm. Harrison, A., 1976) who lived in Northcliffe Avenue overlooking the present Reserve from 1934 until 1939, frequently visited the valley which he described as more open than at present with mainly grass and bush clumps. Indian tenant farmers cultivated the southern slopes of the valley, but there was virtually no cultivation on the northern slopes occupied by the Reserve. This is confirmed by the earliest aerial photograph taken in 1937, which shows open, predominantly grass covered landscape, obviously the result of regular fires which exerted an important influence on the vegetation.

In 1943 the company which developed Chiltern Hills township purchased the land from the Westermeyers together with a large part of what today constitutes Westville North. Lot 380 was transferred in 1949 to the then Town Board of Westville as a subdivisional endowment. In 1960 Lots 380 and 417, which constituted the major portion of the Westermeyer's former land, were proclaimed a buffer strip separating White and Asian Group Areas in terms of Government legislation. This proclamation had the effect of restricting development in the area that was to become the Nature Reserve.

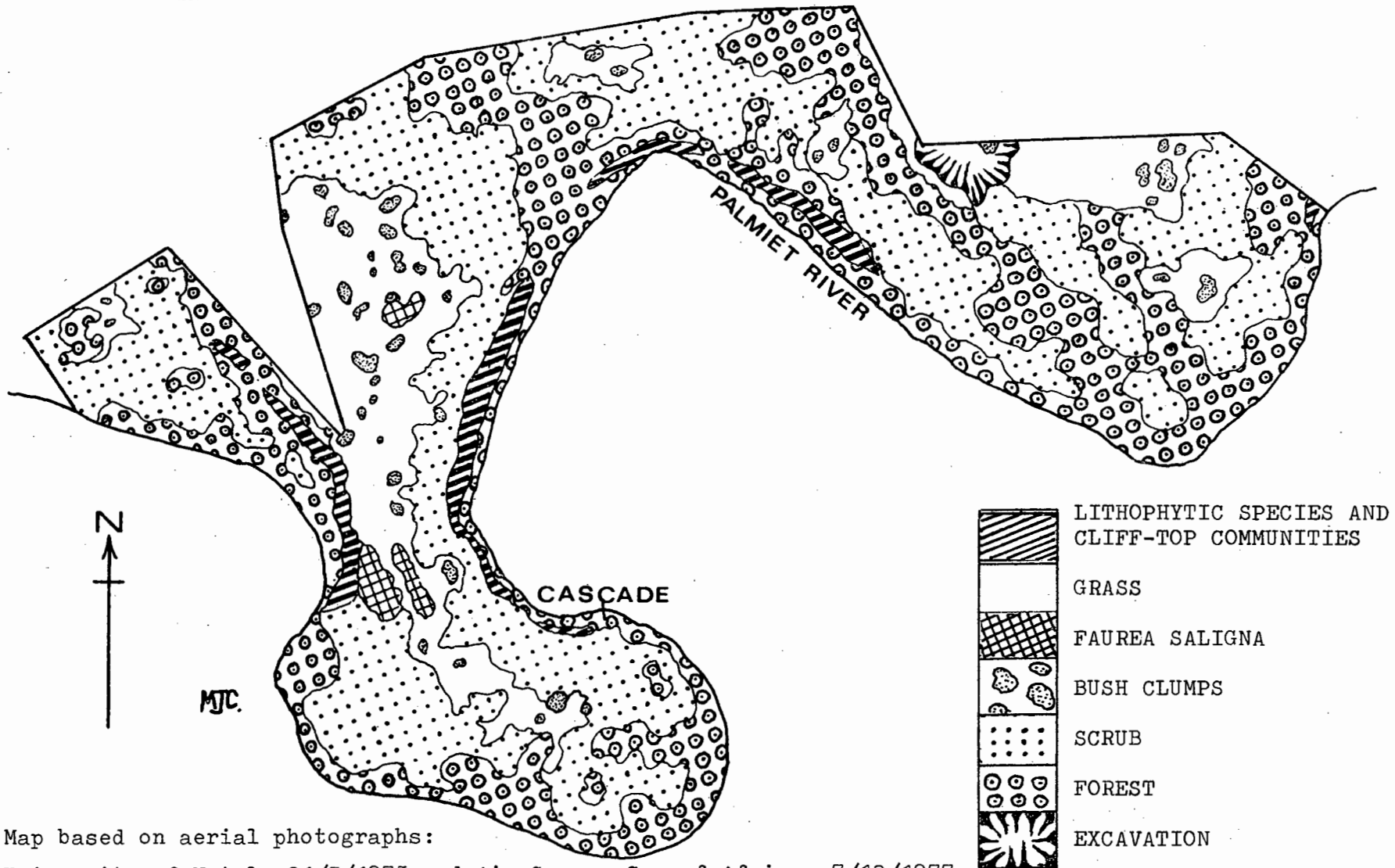
The opening of a four-lane highway from Durban through Westville in 1948 saw the rapid expansion of the town as a residential suburb to Durban. As the more desirable land was occupied, plots were proclaimed in

steeper areas. In 1968 a group of residents pressed for the retention of a portion of the town in a natural state. With the co-operation of the Town Council, the Palmiet Nature Reserve was opened in 1972 on the municipal portion (Lot 380) of the Group Area buffer zone. The land was offered by the Borough as a gift to the Natal Parks, Game and Fish Preservation Board for consideration as a Provincial nature reserve. The offer was rejected as it was considered to be too steep, it was infested with invasive pest plants, the river was subject to pollution, a sewage pipeline was planned through the valley and, at that stage, it appeared unlikely that the proposed reserve would be extended (correspondence 27/6/1970 : Secretary, Natal Parks Board to Town Clerk). It is possible that the Parks Board felt that local communities should participate more actively in nature conservation and were not keen to add another small reserve to the fair number in existence at the time.

A management committee of the Highway Centre of the Wildlife Society of Southern Africa agreed to administer the Reserve for the Borough of Westville. In 1974 the Borough purchased Lot 417 from the Department of Community Development as an extension to the Nature Reserve.

### BIOLOGICAL EVALUATION

A brief description of the flora, fauna and avifauna of the Palmiet Nature Reserve is given in Chapter 1. Also summarized are the four main plant communities, the distribution of which is shown in simplified form in



Map based on aerial photographs:

University of Natal, 21/3/1975 and Air Survey Co. of Africa, 7/12/1977

Map 3.2. The location of each community on the map was determined from aerial photographs.

There is a lack of research on the biological components of the Reserve. An avifaunal research programme (Piper, 1976) is at present being undertaken but this is still in the preliminary stages. In time it is hoped to measure the species composition of avifauna in the Reserve and to monitor changes that take place as surrounding development occurs. No work has been done on the flora. Without detailed knowledge of all components of the biota represented, including a measure of the species diversity and long term information on the rates of extinction of species, it is difficult to assess the biological value of the Reserve.

In the absence of adequate data, an idea of the representativeness of the vegetation of the Palmiet Nature Reserve can be obtained by noting how many of the plants listed by Acocks (1975) occur in it. According to Acocks the Reserve is classified as Coastal Tropical Forest. The list of known plants is incomplete, but from what has been identified, the following analysis represents the percentage of the plants given by Acocks which are known to occur in the Reserve :

Commonest trees of the coastal belt forest	82,4%
Trees of less general occurrence	59,3%
Shrubs and climbers of general occurrence	66,7%
Shrubs and climbers of less general occurrence	43,3%
Small plants of the forest floor and margin	46,2%
Small plants of less general occurrence	21,1%

FIGURE 3.1

AERIAL PHOTOGRAPH : PALMIET NATURE RESERVE

Key on the next page.



KEY TO FIGURE 3.1AERIAL PHOTOGRAPH: PALMIET NATURE RESERVE

..... PALMIET NATURE RESERVE BOUNDARY

1. RESTRICTED ZONE - PALMIET WILDS
2. PUBLIC ZONE - GRASS RIDGE SPUR
3. ENTRANCE IN DAVID McLEAN DRIVE
4. UNIVERSITY OF DURBAN-WESTVILLE
5. WESTVILLE BOYS' HIGH SCHOOL
6. BUSINESS CENTRE IN JAN HOFMEYR ROAD
7. FRANK FARRER SPORTSFIELD
8. LONGTILL DEVELOPMENT: LOTS 1229 AND 1230
9. DURBAN - PINETOWN FREEWAY (R. 103)
10. WESTVILLE NORTH

Aerial Photograph: THE AIR SURVEY COMPANY OF AFRICA,  
DURBAN.

Date: 7/12/1977

Approximate Scale: 1/10000

In the light of this analysis it can be assumed that the Palmiet Nature Reserve has a fair representation of the plants which occur along the Natal coast. But a more detailed study is essential before an overall assessment of the value of the biotic communities can be given.

The aerial photograph (Figure 3.1) shows the extent of development which is encroaching upon the Reserve. In the past decade houses and a shopping centre have penetrated the steeper portions of the valley, as well as the flood plain. Large tracts of undeveloped land still remain to the north, west and east of the Nature Reserve with the result that it is in effect considerably larger than its present 35 ha. It is likely that the species diversity of birds and other forms of wildlife will become lower as the Reserve gradually becomes completely enclosed by development.

One of the problems of small nature reserves is the lack of sufficient variety of habitat to support a wide diversity of species. In studying the avifauna, Bunning (1977) found this to be a problem in the Melville Koppies Nature Reserve. The lack of habitats such as a marsh, thick bush, riverine forest, open short grassveld and old trees reduces the variety of resident breeding species. In this regard the Palmiet Nature Reserve is more fortunate in the variety of habitats which occur, for, with the exception of a marsh, it has all those mentioned. One value of urban nature reserves is that they provide important temporary refuges for immature individuals of species which breed in suburban

gardens and for many birds which refuse to adapt to urban development on account of the high human, domestic animal and traffic disturbance. In this regard the Palmiet Nature Reserve serves an important role and it is essential that the management plan for the biological communities aims to maintain as many habitats as possible.

The plant communities have, in the past, been influenced by recurrent fires almost every year, with grass and bush dominating those areas affected. Since the Reserve was established in 1972, runaway fires have been controlled and a burning management programme is confined to a three or four year cycle in a small portion of the Reserve known as the Grass Ridge spur. In those parts where fire has been excluded for over five years there is evidence of successional changes back to bush and forest. The Faurea saligna woodland community, being a member of the protea family, depends upon occasional fire for its maintenance. Fire therefore remains an important factor in the management of the plant and related communities, as without it there would evolve a lower diversity of species if bush and forest dominated the area. The vegetation which perhaps most closely resembles that occurring before the extensive settlement in 1850, probably grows on the cliffs and steep slopes where it is protected from fires and safe from human destruction mentioned by Phipson in the account referred to earlier.

Unfortunately the value of the vegetation in the Reserve is downgraded by the presence of large stands of invasive non-indigenous plants, including

Lantana camara and Eupatorium odoratum. These are prevalent in areas that have been disturbed in the past and on the fringe of the portion of the Reserve which is burnt for purposes of grassveld management. It is estimated that the percentage of these pest plants in relation to indigenous species is as high as 80% in some disturbed areas.

It is difficult to conclude with an overall assessment of the biological value of the Palmiet Nature Reserve. In terms of its value for preserving a remnant of the past natural landscape, it probably ranks high. But it would be regarded as deficient in terms of species diversity when compared with a large nature reserve. Nevertheless this does not detract from other values which the Reserve offers and which are considered in the following sections.

#### EVALUATION OF VISITOR USAGE AND ATTITUDES

The extent to which the Palmiet Nature Reserve is used is indicated in an analysis of the recorded visits which are summarized for the years 1973 to 1976 in Appendix 3. Over the four year period an average of 9 400 people per annum visited the Reserve. Taking into account the fact that up to 47,5% of the visitors do not record their presence (see note attached to Appendix 3), the average per annum over the four year period is nearer 11 500 visits.

Apart from the general public, the greatest use has been made by cross-country runners from the local boys' high school. Numerous youth groups,

including Boy Scouts, Girl Guides and church groups feature as users of the Reserve. The use and value of the Nature Reserve for education is considered in the next section.

In order to find out why people visit the Reserve and their opinion of it, a survey was conducted, mainly over week-ends, for a 12 week period during which time 169 interviews were recorded. The questionnaire and full results are recorded in Appendix 4.

The survey showed that most visitors are White (94,3%), speak English (88,7%) and visit in a family group (52,1%). The number of children and adults recorded was almost evenly divided. The local community uses the Palmiet Nature Reserve extensively, with 61,2% of the respondents coming from Westville, and 16,4% and 7,9% from neighbouring Durban and Pinetown respectively. The majority (65,1%) were not members of a conservation society but 74,6% of the respondents pay visits to nature reserves or natural areas between once a month and two to three times a year. The Palmiet Nature Reserve had been visited five times or more by 29,6% of the respondents, 33,1% had visited between one and four times and 37,3% had not visited it previously. Most people interviewed discovered the reserve through the Wildlife Society and press publicity and by a street sign.

In keeping with the trend in visitor surveys conducted in other nature and forest reserves, recreation was the most important activity pursued

by visitors. The greater proportion or 76,4% of all the responses made by the 169 groups interviewed, was for recreational activities and 23,6% were for nature study or observation. Walking (29,7%) and getting away from the noise and traffic of the city (24,4%), followed by picnicking (8,1%) were the main recreational categories. Of the nature orientated activities, general nature study (8,9%) and bird-watching (8,1%) represented the chief interests. Most respondents (86,4%) felt that the Nature Reserve served their particular needs and interests very well or satisfactorily. The majority of respondents did not spend a long time in it with 56,2% spending up to two hours and only 20,7% spending more than three hours.

It would seem that most visitors seek qualities of solitude in the Reserve, as 79,3% stated that they did not wish to meet more than 10 people and this figure includes the 51,5% who did not wish to meet more than two people. In visitor surveys conducted in England, peace and quiet was one of the greatest attractions of nature reserves (Usher, 1973). In assessing the value of the Reserve for solitude, aesthetic enjoyment, learning about nature and for exercise, each category received approximately the same number of responses with the percentage ranging from 24,0 to 26,6. Only one person felt that the Reserve had little or no value.

The suggestion that the Palmiet Nature Reserve be turned into a formal park with lawns and caged wildlife, rather like Mitchell Park in Durban, was rejected by 95,3% of the respondents. It evoked strong reactions with comments such as it is cruel to cage animals and birds, and that it would attract too many people, being recorded. But 36,7% stated that they would

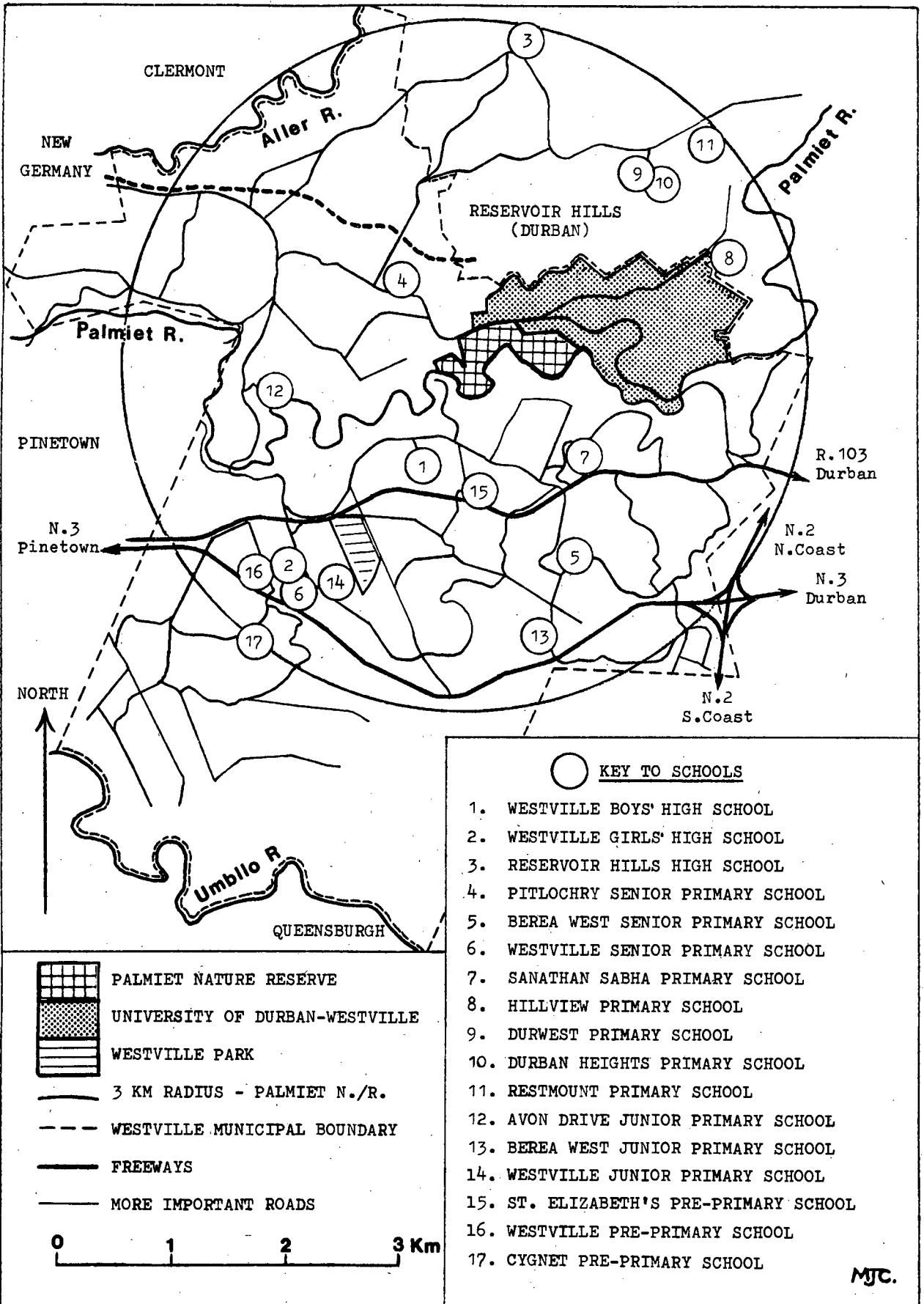
like to see more animals in the Palmiet Nature Reserve while 54,4% rejected this suggestion. To the question as to whether the Palmiet Nature Reserve satisfies the requirements of a nature reserve, 81,1% responded yes, 6,5% no and 12,4% expressed no opinion. Some of the reasons given as to why it fails to satisfy the requirements were that it is too small, it is not fenced, it is too close to urban development and it lacks animals and wildlife.

Two aspects of the survey, namely the use of paths by the visitors and suggested improvements in the management of the Reserve are covered in Chapter 4.

In the final overall assessment, 30,2% of those interviewed stated that the Reserve was excellent or very favourable, 59,2% that it was favourable to satisfactory, 2,9% that it was unfavourable and 7,7% were unable to assess. This largely favourable reaction suggests that the Palmiet Nature Reserve has a value in the community. It serves a wide range of people including youth and family groups. The majority of visitors are satisfied with the absence of large animal life and are prepared to visit it for what it has to offer : namely a natural area in which recreational activities and relaxation can be pursued in comparative solitude, away from the stress of city life. It must be recognised, however, that this visitor survey is biased in favour of users who would not visit the Reserve if they did not like it. A fairer assessment of the value of the Palmiet Nature Reserve could have been obtained in a random survey of Westville residents.

MAP 3.3

PALMIET NATURE RESERVE : LOCATION OF NEIGHBOURING SCHOOLS



## EDUCATIONAL VALUE OF THE PALMIET NATURE RESERVE

Situated within a rapidly expanding metropolitan area, only 11,5 km from the centre of Durban, the Palmiet Nature Reserve has a high potential for education. The extent to which it is used for teaching and research purposes and for the education of the general public is now considered.

Within a 3 km radius of the fairly central northern entrance to the Palmiet Nature Reserve are the University of Durban-Westville and 17 schools : three high, three senior primary, five primary, three junior primary and three pre-primary schools. \* Their location in relation to the Reserve is shown in Map 3.3.

### Use by Educational Institutions

The Palmiet Nature Reserve is not widely used by schools, including those situated within a 3 km radius of the Reserve, despite the fact that the Natal Education Department (1975) lists it as an educational site. In the period 1973 - 1976 only 60 groups with a total of 2051 children from schools have used it (see Appendix 3). While the small size of the Reserve necessitates limiting group visits to one at a time, it is under-

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\* Natal Education Department schools have 4 phases: junior primary which cover class 1, 2 and Std. 1; senior primary, Stds 2-4; junior high, Stds 5-7 and senior high, Stds 8-10. In Westville the 3rd and 4th phases are single high schools from Std 6-10. Std 5 is attached to senior primary schools. Pre-primary schools accommodate children for 2 or 3 years before class 1. The Indian primary schools extend from class 1 - Std 5 and high schools from Stds 6-10.

used for educational purposes and many more schools could be accommodated. In the same period the University of Durban-Westville, which adjoins the Reserve, has used it for teaching and research purposes on 42 occasions, 33 of which were in 1976.

Education did not feature prominently in the Palmiet Visitor Survey (Appendix 4) mainly because of the fact that it was largely conducted over week-ends. Included were one school and four youth groups, which represent only 1,3% of the 381 responses made by the 169 groups interviewed. In order to obtain a more accurate assessment of the extent to which the Reserve is used for educational purposes a survey was conducted in nearby educational institutions and extended to more distant ones, which used the Reserve in 1976 or in the past. The purpose of the survey was to investigate the extent to which local and other educational institutions use the Palmiet Nature Reserve, how it is used, attitudes to the Reserve for education, problems encountered and suggestions for improvement. The latter are discussed in Chapter 4. Other educational field sites used in metropolitan Durban and further afield were noted. The survey was conducted by means of informal, personal interviews with the headmaster or relevant teacher or both and with lecturers in various departments at the tertiary educational institutions. The questions used and a summary analysis of the results are recorded in Appendix 5.

Three departments of the University of Durban-Westville made good use of the Reserve in 1976, namely Botany, Zoology and Education. Botany

students do taxonomic and practical ecological studies, particularly with angiosperms, ferns and mosses, and transects to investigate the nature of the grassland and vegetation. The Zoology department uses the Reserve for studying animal behaviour and recognition, collecting specimens and ecological exercises, for example, comparing north and south facing aspects. A criticism of the lack of a substantial north facing slope in the Reserve is noted. Such an area exists on the University campus, but this is not available to other users. Education students undergoing teacher training use the Reserve for ecology and nature conservation. The need for practical field work in Indian schools is stressed by the lecturer concerned.

Of the 17 schools situated within the 3 km radius, only three visited the Reserve in 1976: a high school and two senior primary schools. A further three schools, a high, a senior primary and junior primary, have used it in the past, while 11 schools have never used the Reserve. Not one of the Indian schools included in the survey has used Palmiet: one did not know that it existed! Of the Indian schools, only two undertook field work in other natural sites, while all white schools participated in excursions or field activities. Of the surveyed institutions situated beyond the 3 km radius, a college of education and high school have used the Reserve in the past and a junior primary and pre-primary school visited it in 1976.

The survey showed that the work undertaken in the Reserve was biologically orientated, except for 6 classes from a high school and a group from a college of education which did geographical field work associated with the river and another high school which did combined geographical-biological studies. The visit of a Std 2 class was an extension of class work on the study of birds. Worksheets were used and follow-up work done on return to the school. Another senior primary school merely took a large group of 150 pupils and teachers from their Std 4 classes for a walk in the Reserve without specifically relating the excursion to any particular aspect of the syllabus or teaching. Conservation, nature observation and ecological aspects were discussed and pointed out. On return, aspects were integrated into various subjects, including languages.

Only two schools used volunteer guides who are members of the Reserve's education committee. One, a senior primary, took all their Stds 3, 4 and 5 pupils, class by class, over successive weeks in previous years. The other, a pre-primary, organised two small groups on different days. In both instances a basic interest and awareness in a natural area, its ecology and conservation was the aim. The chief drawback was that these outings were not related to current work being done in the classroom, although teachers accompanying the groups may have done so on return. This highlights an essential element of field work, namely that, if it is to be successful, it must be integrated and become an extension of routine teaching in the classroom. It is therefore desirable for the regular teacher to plan and to conduct the field exercise and to follow it through in successive lessons.

The Natal Education Department (1975) grades the Palmiet Nature Reserve as suitable for all four phases, that is, from class 1 through to Std 10. Based on the analysis of the survey both from usage and from the opinions expressed by those interviewed, it is clear that the Reserve is very suitable as an educational and research site for tertiary institutions. It would appear to be more suitable for high and senior primary schools and less suitable for junior and pre-primary schools. The university, two out of three high schools, three out of three senior primary schools and one out of three junior primary schools make up the total of seven institutions, within a 3 km radius, which have used it, whereas not one of the five primary or three pre-primary schools has used the Reserve. This pattern is confirmed by listing (in Appendix 5) all the educational sites used by the 18 educational institutions surveyed within the 3 km radius of the Reserve. The university and high schools use mainly nature reserves and natural areas. The lower primary and pre-primary schools tend to use less wild areas, such as parks and commercial concerns, where animals and birds are massed or caged and are therefore readily visible.

The six junior primary and pre-primary schools felt that there is very little interest for small children in the Palmiet Nature Reserve: it lacks big mammals and the birds are difficult to see compared to Mitchell Park in Durban, where a selection of wildlife is enclosed. Stainbank Nature Reserve, which has re-introduced large mammals, and the Lion Park, a commercial animal park, are preferable to Palmiet as animals are seen, although a disadvantage of the latter is its distance of 73 km

from Durban. Other comments include the attraction and danger of the bilharzia infested river for small children (3 schools), the problem of snakes (3 schools), overgrown paths (2 schools), one trail is too steep and dangerous for small children (1 school), the valley is hot (1 school), and one school criticised the ban on collecting specimens.

Contrasted to this, one Durban pre-primary school outside the 3 km radius felt that the Reserve is a suitable place to which small children can be taken to give them the atmosphere of a natural area, the river being the greatest attraction. Two small groups of five year old children, taken on a short walk by a volunteer guide, found sufficient interest in the insects, bird-calls, selection of plants, bird and animal spoor to respond enthusiastically on return to the school. This school also uses Mitchell Park as a venue for educational visits. A junior primary school, working on a study theme of the environment, visited the Reserve as an example of a natural area.

The fourth phase biology syllabus requires pupils to study either a terrestrial or an aquatic environment in the field. Schools tend to select coastal sites for this purpose because of the greater range of biotic species which occur in a very small area compared to an inland site, such as the Palmiet Nature Reserve. One high school feels that the Reserve lacks mammals, finds bird studies difficult and dislikes the alien vegetation, but would nevertheless like to make use of it on account of its closeness. Another high school, although it has not used

the Reserve, stated that it is highly suited for the third phase (Std 6-8) biological and geographical field work.

Taking into consideration the distance of the surveyed educational institutions from the Palmiet Nature Reserve, three schools stated that it was not close enough to enable pupils to walk and that if transport was required, they might as well travel to a more distant and possibly better site. Of the four institutions within 1,5 km by road of the Reserve, three use it, the fourth being a pre-primary school. Two Indian schools are less than 3 km by road, but do not use it. All the other schools covered in the survey are situated at a road distance of more than 3 km.

It is of interest to note that two junior primary schools revealed that small, fairly natural areas nearby are used for field outings.

Lack of expertise in conducting field work in natural areas probably accounts for the lack of this type of educational pursuit in most of the Indian schools surveyed. One stated that the inspectors are not keen on classes doing field work and another finds transport difficult.

### Research

Situated adjacent to the campus of the University of Durban-Westville, the Palmiet Nature Reserve is suitable as a venue for research projects and is used for this purpose by the University.

There are five research projects currently in progress and three proposed in the Reserve. The Botany Department of the University of Durban-Westville is engaged in work on fungi, the root parasite Buttonia natalensis while initial work on Bulbine natalensis, using material from the Reserve, is now in progress overseas. The department plans to investigate the decline of Prionium serratum (Palmiet) in the Reserve. The primate research work by the Department of Psychology at the University of Natal in Durban is to be extended to the Palmiet Nature Reserve with a proposed project on visual and vocal communication among Ceropithecus aethiops (Vervet Monkey). A grant has been made available by the Natal Town and Regional Planning Commission for an investigation into the status of the vegetation of small nature reserves, including the Palmiet, in the Durban metropolitan area. The burning strategy for Faurea saligna in association with grassveld management in the Reserve is being conducted by the Palmiet Nature Reserve Management Committee. Avifaunal research is in progress on the behaviour and population strategies of Motacilla clara (Long-tailed Wagtail) with possible changes related to river quality. This project will be extended to measure the species composition of the Reserve, to monitor seasonal and annual changes and to compare the avifaunal structure of the Reserve with that of the surrounding suburban environment, noting changes in time as further peripheral development takes place (Piper, 1976). The fact that scholars from the local high school are assisting, stresses the educational role of such a project conducted in an urban nature reserve.

These projects being undertaken or planned in the Palmiet Nature Reserve and those at Melville Koppies in Johannesburg, mentioned earlier, emphasise the scope and potential of small nature reserves for research purposes.

#### Educational Opportunities for the General Public

A guide book to the Palmiet Nature Reserve (Moll, 1973) giving aspects of the flora, fauna, geology and history is available for sale to visitors in the Reserve and at a nearby commercial concern. Included are lists of trees, birds and snakes occurring in the Reserve. A selection of numbered trees may be identified from the guide book list. A few small information signs give brief details about plants of interest. Two examples are quoted :

Palmiet (Prionium serratum). Formerly abundant along this river, this is the only specimen. Please protect.

The orchid, Cyrtorchis arcuata, clings to the overhanging branches of this Umdoni (Syzygium cordatum) tree. It is an epiphyte, i.e. it does not obtain nourishment from the tree (as does a parasite) but merely support.

An advantage of these signs is that information is available to all visitors, including those who do not possess the guide booklet to the Reserve. However the amount of information that can be included on each sign is minimal in comparison to that contained in the booklet.

Guided trails have been organised two or three times a year by the Reserve's education committee. Since mid 1976 these have been held monthly, with attendances varying from 42 to 10, averaging 26 (Median 29) over a five month period. Children's environmental education trails are arranged during most school holidays. During the period 1973 - 1976 a total of 813 people have participated in 29 guided trails (average 28 per trail) that have been offered in the Reserve by the education committee. An innovation in 1977 that has proved popular is the trail which takes approximately a dozen people into the Reserve at sunset for a braai and conservation discussion around a fire. The party returns in the dark, an experience which offers a degree of adventure which is sought after by many urban dwellers. The main purpose of these trails is to introduce participants to the nature reserve and its wildlife, to simple ecological processes and to matters of concern in both the natural and urban environments. Perhaps an important value that can be ascribed to these guided trails is the development of an appreciation for a small natural area which lacks the more spectacular biological components, for example the large mammal population of larger nature reserves.

#### MANAGEMENT AND PROBLEMS

The Palmiet Nature Reserve is administered for the Borough of Westville by a management committee of the Wildlife Society of Southern Africa, consisting of 12 members which include ecologists, educationists and

people with a general interest in wildlife. Several members of the staff of the University of Durban-Westville, which adjoins the Reserve, serve on the committee. The main work of the committee is divided into the day to day running of the Reserve, the ecological management and the provision of educational trails and aids. The chairman acts as the co-ordinator, particularly between the committee, the Town Council and Borough Officials and reports annually on the work of the committee and the extent to which the nature reserve is used. A town councillor represents the Borough at the meetings of the management committee.

Members of the committee do not receive remuneration for their work.

The only full-time official employed is an African Ranger, who has the difficult task of patrolling and policing the Reserve, maintaining paths and selling literature to visitors. His salary is paid through an annual grant-in-aid which is made available by the Town Council. The Natal Parks, Game and Fish Preservation Board co-operates in training prospective Rangers for the Reserve. At times extra labour is engaged, for example, when fire-breaks are burnt. The Town Engineer's Department also assists in this area, particularly if a fire threatens the Reserve.

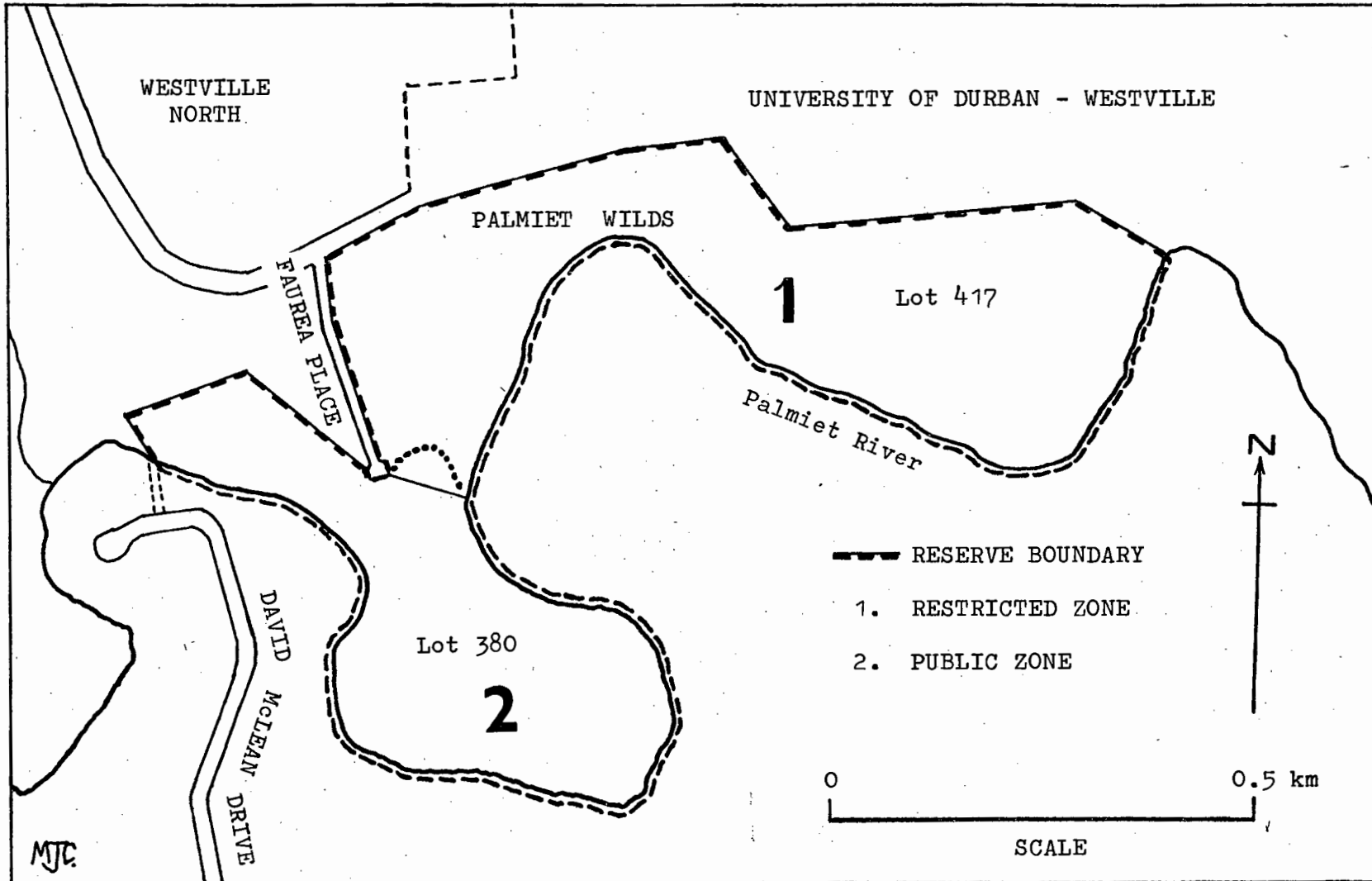
### Management Zones

The Palmiet Nature Reserve is at present divided into two management zones :

1. a restricted zone
2. a public zone

MAP 3.4

PALMIET NATURE RESERVE : PRESENT MANAGEMENT ZONES



These are depicted in Map 3.4.

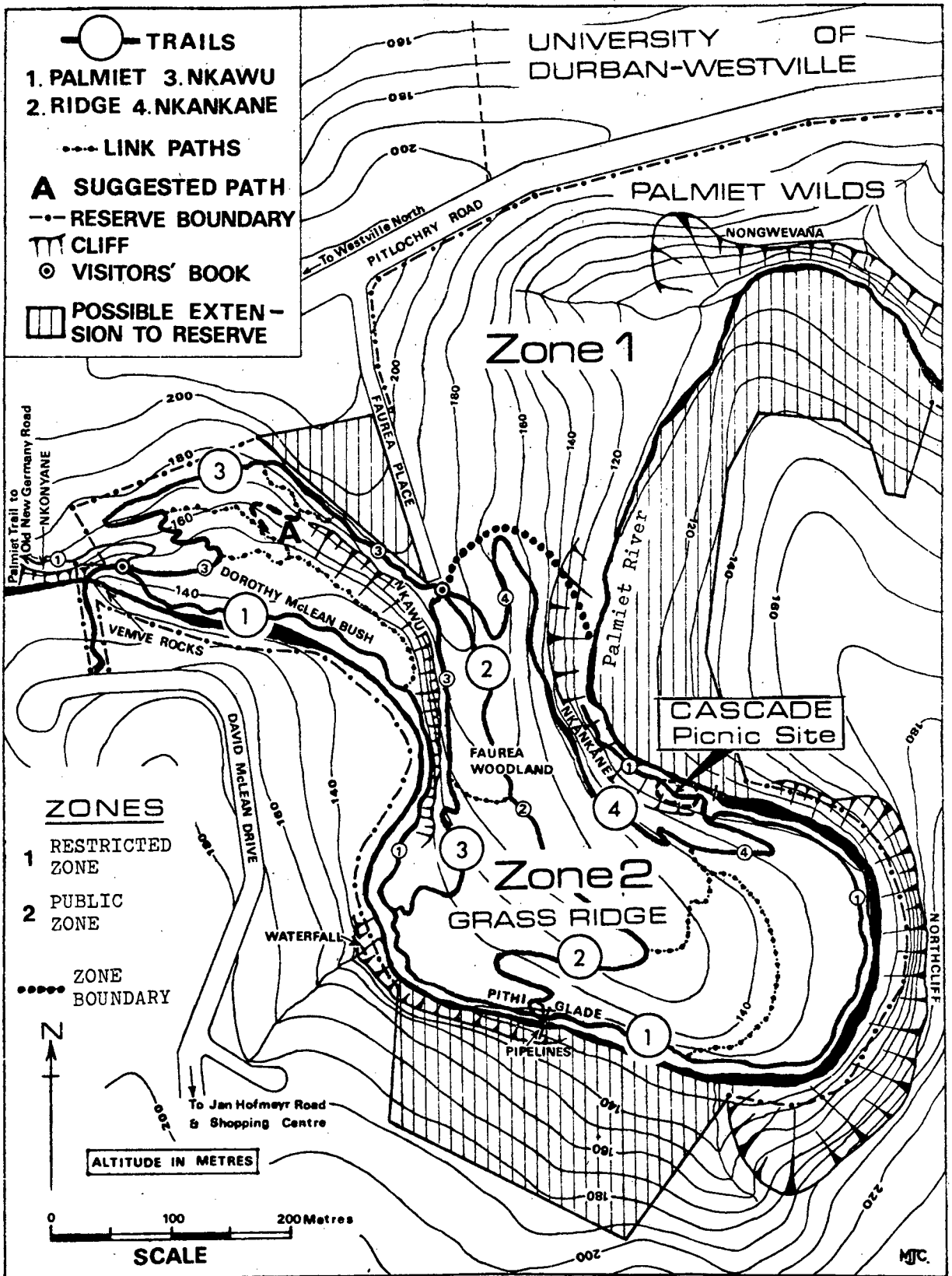
1. The Restricted Zone

Known as the Palmiet Wilds, it is approximately 21 ha in extent. The area occupies Lot 417 which was added to the Reserve in 1974, from which date the management committee has deliberately precluded the development of paths and amenities which would attract people to the area. The only exception is a short length of a trail which occupies approximately 0,6 ha and which facilitates the completion of a circular trail from the other zone. The term restricted is used in the sense of a limitation imposed upon the public through lack of a convenient means of access rather than in the sense of prohibition. Complete exclusion would be too difficult to implement, whereas the lack of paths is a deterrent on account of the rugged topography and predominant bush and forest vegetation. There is nothing to prevent a genuine enthusiast, who perhaps would like to observe nature away from the disturbing influences of other visitors and school parties and who is prepared to find his way without a path, from entering the zone.

As the human impact in this zone is low, the emphasis is placed on wildlife which can exist and breed in comparative freedom. The zone is similar to that which Moll (1975) terms a mini-wilderness in the management zones suggested for the New Germany Commonage Nature Reserve in Chapter 2. This zone is ideal for research purposes in the

MAP 3.5

PALMIET NATURE RESERVE : PUBLIC ZONE SHOWING TRAILS



sense that this use is permitted in strict nature reserves and Zapovedniki. The zone is adjacent to the campus of the University of Durban-Westville and is therefore very accessible. However the University has, to date, used the public zone which provides easier movement on established paths.

## 2. The Public Zone

This is the original 13 ha area (Lot 380) that made up the Reserve when it was established in 1972. The visiting public, schools and youth groups have unlimited access to this portion of the Reserve through a network of paths, which total 4,8 km in extent and are shown in Map 3.5. Educational and other groups are required to seek permission to enter as a group so that a limit can be placed on the number of groups using the Reserve at one time. A small picnic site which accommodates only 20 to 30 people is situated at the end of the Palmiet River trail 1,3 km from the entrance at what is known as the Cascade. Most of the visitors are reluctant to carry their food and utensils over this distance with the result that litter and other problems associated with picnic sites do not occur to any great extent. But the small clearing with rustic log seats serves as a gathering place for discussions, resting and refreshment on guided trails in the Reserve. Scouts, Guides and other groups use the site on their hiking expeditions and, with permission, are able to make a fire, in the specific fire-place, provided that they do not use wood from the Reserve.

The role of the Reserve as a buffer zone between two racial groups precluded the construction of buildings, including toilets, but the recent deproclamation of Lot 380 in this regard should overcome the problem in the future.

## Problems

The chief problem with small nature reserves is that they are susceptible to surrounding land-use pressures (Edwards, 1974), often with deleterious ecological consequences. Ecosystems contained within the nature reserve often extend beyond the reserve boundary. In the Palmiet Nature Reserve, the main problem in this regard is the fact that the southern boundary is the middle of the river, which means that half the river ecosystem and riverine forest community are not afforded full protection.

River pollution and flooding are further problems. Upstream on the river from the Reserve are the industrial towns of Pinetown and New Germany, which have factories on the banks. Although strict control is enforced, spillages of chemical pollutants have taken place in the past. A serious one occurred in January 1974, causing stress to water life and blue duiker in the Reserve. A local school, assisted by the Council for Scientific and Industrial Research, in studying the Palmiet River (Holland, et al, 1974), found that the Ecoli I, bacteria and algae counts were high in the Pinetown area but that they had decreased by the time the river reached the Palmiet Nature Reserve. The report suggested that any increase in pollution would result in eutrophic conditions with serious consequences for water plant and animal life.

As street and property development has taken place in Pinetown, New Germany and Westville, the discharge of drainage systems into the river

has increased the flood regime considerably. Prolonged rain over a three day period (18-20/3/1976) when 239,0 mm fell in Pinetown and 285,5 mm near the Palmiet Nature Reserve, caused the river to rise 3,4 metres in some areas and spread 70,6 metres over the flood plain at one point in the Reserve. The riverine ecosystem was seriously disturbed by the deposition of vast quantities of sand and the destruction of aquatic and terrestrial plants, including large trees. A large amount of domestic and other litter was deposited along the bank. The river is the chief source of litter in the Reserve as visitors are generally co-operative in this regard.

The urban location of the Palmiet Nature Reserve results in visual impacts of insensitive property development, such as the unattractive rear view of a big shopping complex, and noise pollution, especially from traffic. Municipal servitudes are planned through the Reserve, for example, a main trunk sewer will follow the valley and a proposed road will cross through the valley affecting a major portion if it materializes. Water pipelines cross the river on a bridge at one point to disrupt the aesthetics of the natural landscape. Domestic and feral dogs create a problem when they hunt in the Reserve and residents living nearby complain about snakes and monkeys. Garden plants and weeds often germinate in the Nature Reserve, particularly along the river.

Although very little vandalism is attributed to visitors, African herbalists take vast quantities of roots, bulbs, bark and plants for medicinal

purposes. The identification of contents of one such raid revealed that parts of 21 different plants had been taken, including orchids and some other fairly rare plants. During the dry winter months, fire is a threat to the Reserve, but the occurrence of deliberately kindled fires is not great.

#### Legal and Financial Problems

A problem facing the Palmiet Nature Reserve and local authority nature reserves in Natal is the lack of satisfactory provision for proclamation in terms of the Natal Provincial Nature Conservation Ordinance. In terms of Chapter IV of the Nature Conservation Ordinance No. 15 of 1974, clause 59 allows for the proclamation of a private nature reserve or a private wildlife reserve on any area of privately-owned land. In seeking clarification, the Provincial Administration regards municipal land as privately owned land upon which a private nature reserve may be proclaimed and to which the public are admitted by permission of the local authority (correspondence 7/3/1977 : Provincial Secretary to Town Clerk of Westville). The ordinance provides for the protection of wildlife and makes it necessary for the reserve to be fenced, but no monetary subsidies are paid, as they are in the Cape Province.

The terminology private nature reserve is unsatisfactory as private suggests an individual person's landholding, such as a farm. Municipal land upon which a nature reserve is established and to which the public is admitted is in fact public land and in terms of the town planning scheme

for Westville, the Palmiet Nature Reserve is designated as Public Open Space. The Reserve is freely open to the general public, which does not seek the permission of the municipal authorities in order to enter the area.

The Palmiet Nature Reserve is not proclaimed in terms of the Provincial Ordinance and as at December 1976 no private nature reserve had been proclaimed in Natal. The classification of the Palmiet Nature Reserve as Public Open Space in the Westville town planning scheme gives it a fair measure of protection, as deproclamation is possible only with the consent of the Administrator. But there is nothing to prevent the Town Council from permitting the development of a sporting facility, which also falls under the Public Open Space category, on a portion of the Reserve.

No specific municipal by-laws have been promulgated to cover the protection of wildlife in the Palmiet Nature Reserve. Notice boards at both entrances state in English, Afrikaans and Zulu :

The destruction and removal of fauna and flora, the lighting of fires (except with permission) and the depositing of litter is prohibited.

Right of admission reserved.

By order of the Town Clerk.

Beware of Bilharzia in the River.

Dogs not permitted.

The wording was approved by the Borough, but it has no legal standing as it is not entrenched in the municipal by-laws.

Two general municipal by-laws, which fall under the Standard By-Laws framed under the provisions of Section 200 of the Local Government Ordinance No. 21 of 1942, and which are also applicable to the Nature Reserve, fall under the nuisance by-laws in Chapter 2. Clause 6 forbids the lighting of bonfires in public places and clause 7 bans the discharge of any firearm, air-gun, sling or catapult in the Borough unless the permission of the Mayor is obtained. There are also two clauses in the Nature Conservation Ordinance No. 15 of 1974 which specifically protect some categories of wildlife in municipal areas in Natal. In Chapter VIII, clause 128 (4) protects wild birds on town lands and on all land open to the public and in Chapter XI, clause 205 (2) considers specially protected indigenous plants which appear in an attached schedule. Apart from wild birds and protected plants, the other biological components in town lands or in the Nature Reserve are not afforded any measure of legal protection.

Inadequate finance is a problem which affects local nature reserves in Natal. Municipalities are generally short of finance for essential services and can seldom expend vast sums of money on nature conservation. In this respect the local authorities in the Cape Province have an advantage, for they receive, in terms of the Provincial Nature Conservation Ordinance No. 15 of 1974, a subsidy of 50% on all expen-

TABLE 3.1

EXPENDITURE ON SELECTED LOCAL NATURE RESERVES  
IN SOUTH AFRICA

1. LOCAL NATURE RESERVES WHICH RECEIVE A SUBSIDY IN THE CAPE PROVINCE :	R
Settler's Park, Port Elizabeth	52 065
Tygerberg, Bellville	35 345
Jan Marais, Stellenbosch	16 000
Helderberg, Somerset West	13 500
Villiersdorp	10 000
Bredasdorp	8 123
Durbanville	6 160
Mountain Lake, Matatiele	2 000
Van Kerwel, George	2 000
King William's Town	1 810
Kalbaskraal	1 000
Tierberg, Keimoes	710
2. LOCAL NATURE RESERVES WHICH DO NOT RECEIVE A SUBSIDY :	
Ilanda Wilds, Amanzimtoti	8 910
Uvongo River, Margate	4 570
Melville Koppies, Johannesburg	4 000
Palmiet, Westville	1 600
Grahamstown	961

Source: The Town Clerks of the Municipalities concerned.  
The figures represent the expenditure for the most recent year as at the end of December, 1976.

diture which includes capital works and salaries. An examination of the costs in local nature reserves (Table 3.1) shows that those which receive a subsidy in the Cape Province generally reflect a higher expenditure.

As mentioned earlier, the Town Council of Westville pays an annual grant-in-aid to cover the salary of the African Ranger in the Palmiet Nature Reserve. This has varied from R550 in 1972/73 to R3 500 in 1977/78. The latter grant allows for the employment of additional occasional labour. The Wildlife Society of Southern Africa has very little spare finance for capital works in the Reserve. Their contribution in this case must be regarded in terms of expertise and administration which is offered voluntarily. A fence and the adequate control of invasive pest species are two costly needs in the Palmiet Nature Reserve.

### CONCLUSION

Despite the many problems related to small local nature reserves, particularly in Natal, there is no doubt that they have a value in promoting nature conservation and in providing recreational opportunities in local communities. The Palmiet Nature Reserve in Westville is an example of a small municipal reserve which functions successfully on account of the co-operation between the Town Council, the Wildlife Society of Southern Africa and local residents who offer their services in a voluntary capacity.

The need for extra finance in the Palmiet Nature Reserve has been highlighted. However, on the positive side, it should be noted that this small Reserve operates on a budget which is less than what it costs to maintain a 17 ha formal park in Westville. This is illustrated by comparing the expenditure in the Park and Nature Reserve:

	<u>Westville Park</u>	<u>Nature Reserve</u>	<u>% Nature Reserve/Park</u>
1973/74	R14 967	R500	3,3
1974/75	R26 858	R1 100	4,1
1975/76	R35 739	R1 200	3,4
1976/77	R38 935 *	R1 600	4,1
1977/78	R40 415 *	R3 500	8,7

\* Estimates

The expenditure in Westville Park does not include sporting facilities but merely the maintenance of lawns and gardens. While acknowledging the need for formal parks in an urban environment, the comparison serves to emphasise that it is possible to operate small nature reserves at a fraction of the cost. This should encourage local authorities to set aside some of their larger open space areas for nature conservation purposes.

## CHAPTER 4

THE POTENTIAL OF THE PALMIET NATURE RESERVE

It has been seen that the Palmet Nature Reserve, situated within an urban area, is widely used, particularly for recreational purposes. It has a potential for education although it has not fulfilled a vital role in this regard to date. Consideration is given in this chapter to recommendations for multiple-use management so that the full potential of the Reserve can be realised. Suggestions for the management of the biological communities and recreational pressures and for enhancing the educational value are given. A modified system of zones of differing intensities of human use and prospects for extending the Reserve are suggested. Finally, possible solutions to some of the administrative problems are considered.

THE BIOLOGICAL POTENTIAL OF THE PALMIET NATURE RESERVE

The biological deficiency of small nature reserves, in terms of species diversity, the extinction of species and as reservoirs of gene pools, has been established in Chapter 2. With a recommended multiple-use management strategy for small nature reserves there is a need, firstly, to maintain the quality of the biotic communities and, secondly, to manage the vegetation so as to maintain as wide a diversity as possible. Each aspect is considered in more detail.

The maintenance of the quality of the vegetation and associated communities is important for aesthetic and educational reasons. Recreational and educational users would expect the natural appearance of the Reserve to

be maintained without showing signs of deterioration or drastic change through excessive use. As has already been suggested, there is very little information on recreational carrying capacities for natural areas. A carrying capacity suggested in the literature surveyed is that of Bonnaire (1973, cited by Adler, et al, 1974) where the National Forestry Department in France recommended that the simultaneous occupation of forests by the general public should be restricted to four persons per hectare if natural qualities are to be preserved. Research at the Morgan Arboretum near Montreal (Inhaber, 1972 cited by Adler, et al, 1974) showed that the ratio of simultaneous visitors to maximum daily visitors is 1,5. The carrying capacity of the 35 ha Palmiet Nature Reserve using the Bonnaire and Inhaber data would be :

$$\begin{aligned} \text{Maximum visitors per day} &= 4 \text{ persons/ha} \times 35 \text{ ha} \times 1,5 \\ &= 210 \text{ persons} \end{aligned}$$

In the above calculation cognizance is not taken of the fact that visitors to the Reserve are confined to the 13 ha Public Zone, in which case the maximum daily capacity would be reduced to 78. The recorded daily visitor total in the period 1973-1977 has exceeded 78 on average 27 times per year, mainly on Sundays. The 210 limit was exceeded on average five times a year over the same period.

This capacity assumes a fairly close correlation between the ability for the natural environment to recover in France and on the Natal coast as well as a similar simultaneous to total visitor ratio to that at the Morgan Arboretum in Canada. It is obvious that research is needed to determine

a human carrying capacity for the Palmiet Nature Reserve, as it is possible that the climate and vegetation would permit a higher impact than those found abroad. The imposition of a daily maximum visitor limit is difficult to impose in an urban nature reserve for, as Simmons (1973) points out, if public money is used for nature conservation, then the public expect to be able to visit the reserve. Apart from expenditure, the setting aside of urban land which could possibly be used for other purposes, justifies the admission of the general public. Should the biotic communities show signs of deterioration as a result of a high visitor impact, serious consideration will have to be given to the exercising of some form of limit. There is an immediate need for research into the carrying capacities for various vegetation types in South Africa and it is possible that a small nature reserve, such as Palmiet, is suitable for such research.

The second need in multiple-use management in a small nature reserve is to ensure that as wide a diversity of biotic species and communities is maintained, for two reasons. Firstly, diverse natural environments increase the educational value of nature reserves. A nature trail which encompasses a wide variety of biotic communities or ecosystems offers more scope for education and for the creation of interest. Secondly, diversity enables the biotic communities to withstand human impact. Basing his observations on the work of Tansley (1935) and Elton (1958), O'Connor (1974) shows that diverse biological systems are associated with a high degree of stability and are more resilient. They have a

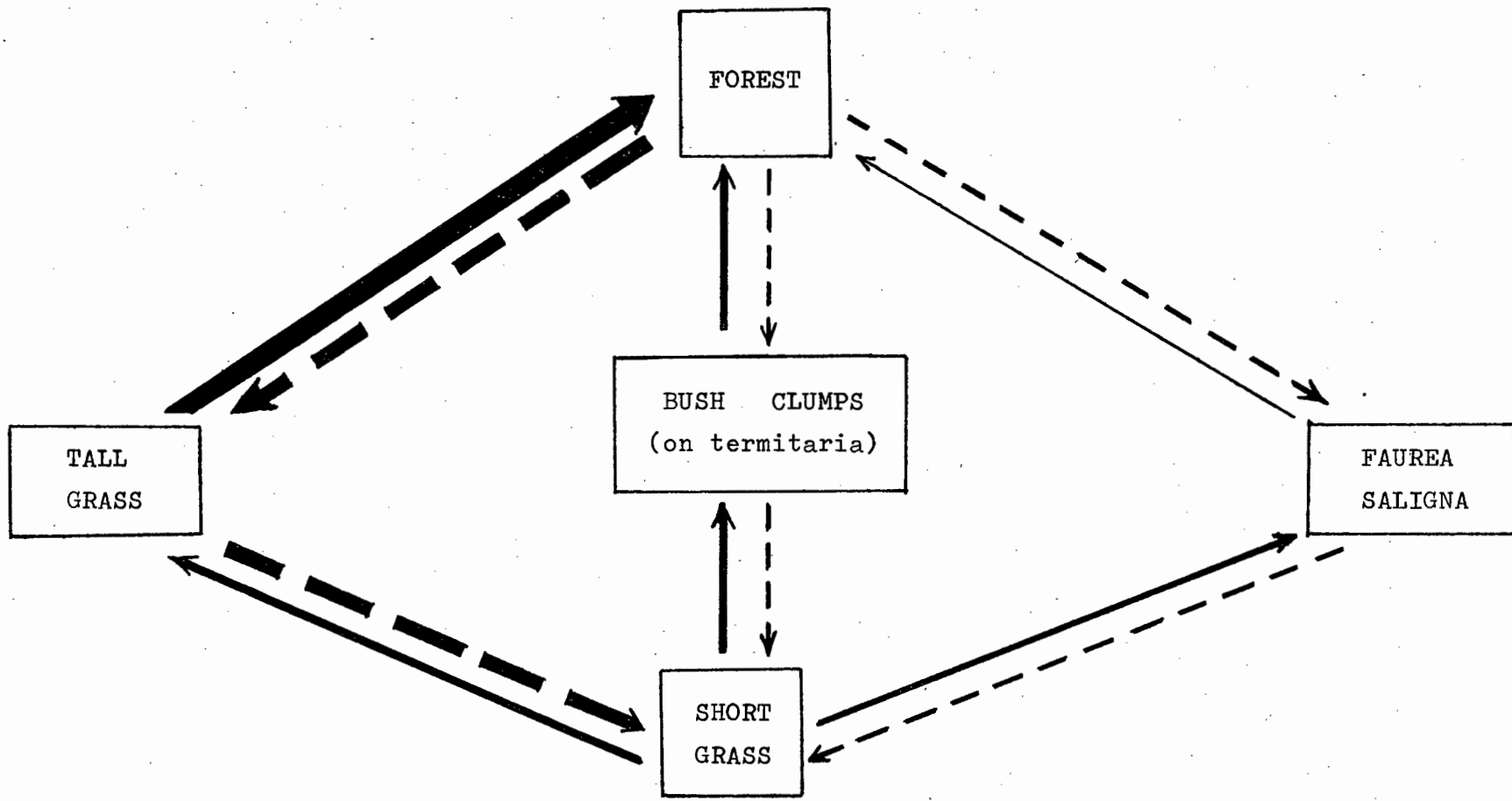


FIGURE 4.1 PALMIET NATURE RESERVE : SUCCESSIONAL RELATIONSHIPS BETWEEN CHIEF PLANT COMMUNITIES

The unbroken arrows indicate succession with protection from fire, broken arrows indicate what occurs with no fire protection, and the thickness of the lines indicates the potential rate of change.

After Moll (1975)

greater capacity for self-restoration resulting from damage than simpler systems and are less likely to face irreversible damage through over-intensive or inappropriate use.

The Palmiet Nature Reserve, on account of its small size, lacks the species diversity of a more extensive reserve. By means of management, in the form of human manipulation, it is possible to maintain a greater diversity of plant communities than would be the case in a naturally functioning system. This provides a wider range of habitats for a larger number of bird species and other organisms.

Reference to Figure 4.1 shows the successional relationships between the chief plant communities in the Palmiet Nature Reserve. It has been modified from a diagram showing the relationships between plant communities in the New Germany Commonage (Moll, 1975) which, on account of its location 3,75 km west of the Palmiet Nature Reserve in the same valley, has a similar vegetation. The exception is the Protea roupelliae community which is absent in the Palmiet Reserve and this has been omitted in Figure 4.1. It is apparent that unless human management by grassveld burning is implemented, the natural succession of plant communities ultimately gives rise to a predominantly forest vegetation with a loss of important habitat types, particularly for birds and flowering plants associated with open grassveld and bush clumps. Very little tall climax grass is evident in the Reserve because of burning which took place too frequently prior to the opening of the Reserve. The

present fire management programme, which is attempting to establish a suitable interval and season for burning, should be pursued with careful monitoring of changes that take place by means of permanent quadrats. De Graaff (1973) recommends that burning plots should be established in each major vegetation type to determine the effect of fire during the different seasons and to establish a burning regime which is beneficial in terms of the envisaged management objective. The present programme in the Reserve has a control plot from which fire is excluded so that successional changes can be recorded. The veld burning is confined to the Grass Ridge spur. Through effective management, the area should support the present short grass, bush clumps, Faurea saligna plant communities and climax grass in the future. Care is needed to prevent fire and other human disturbance from penetrating both the river flood plain and the steeper slopes where the extent and quality of forest needs to be improved.

There is also need for research into management strategies for improving the quality of the plant communities which have been invaded by non-indigenous pest plants, particularly Eupatorium odoratum and Lantana camara, in the Reserve. They are particularly prolific in disturbed areas and at the edge of the grassveld that is burned. It would seem that many visitors are unaware of these non-indigenous plants, although 14 respondents in the visitor survey (Appendix 4) requested their removal. In some instances Eupatorium and Lantana have been replaced

by the indigenous plant, Isoglossa woodii, along the cut paths opened six years ago through impenetrable stands of these pest plants. The present invaded areas would ultimately revert, through succession, to indigenous forest, but the process seems to speed up through human intervention and management. The main problem is that until sufficient natural vegetation can oust the pest plants, regular clearance is needed which necessitates a larger labour force. It is recommended that a removal programme be accompanied by research into the most effective methods for eradication and that the succession of natural species be regularly monitored through a system of permanent quadrats.

The small size of the Palmiet Nature Reserve limits the number and diversity of the larger mammals which attract many people to game reserves and national parks. Junior and pre-primary schools near the Palmiet Reserve do not use it because of the lack of visible animal life. The visitors surveyed (Appendix 4) were not particularly interested in seeing more wild animals in the Reserve, with 36,7% responding favourably and 54,4% unfavourably to this question (Question 14). The response to question 13 was overwhelmingly against turning the Reserve into a park with lawns, indigenous trees and caged wildlife similar to Mitchell Park in Durban. In this case 95,3% gave a negative answer and only 4,1% agreed. The Palmiet Visitor Survey shows an obvious bias, in that it was visited by those who are probably largely favourably disposed towards this type of nature reserve. It is highly likely that a survey undertaken at random amongst Westville residents might produce a different result.

The collection of specimens, particularly by schools, can reduce certain species and create adverse conditions in a nature reserve in general. Every living and dead organism forms an essential part of the energy flow within an ecosystem and to remove even fallen leaves or to burn dead wood can reduce the decaying processes necessary for plants and all life linked within food chains. Regular removal of material and specimens by groups and large numbers of school children can ultimately result in serious impoverishment in a small nature reserve. In recognising the problem of collecting in fragile habitats or rare species, Newbould (1974) suggests that the controlled collection of above-ground parts of common plants may be educationally beneficial without causing ecological harm. The argument is on grounds that conservation is for man and that restrictions on visiting nature reserves or collecting specimens might stultify its objectives. Small nature reserves have an advantage over larger biologically more valuable reserves in this regard. It is recommended that a method of control for the removal of specimens from the Palmiet Nature Reserve be implemented by means of permits. Groups wishing to make fires are required at present to seek permission in order to ensure that the specified site at the Cascade is used and that wood is supplied from a source outside the Reserve.

The small size and urban location of the Palmiet Nature Reserve renders it suitable for multiple educational and recreational use provided efforts are made to conserve and manage the biological elements so that its prime function as a wildlife preserve for use by humans is maintained.

THE RECREATIONAL POTENTIAL OF THE PALMIET NATURE RESERVE

The value of the Palmet Nature Reserve for recreation is undoubted with recreational activities accounting for 76,4% of all the responses made by visitors when asked the reason for their visit (survey recorded in Appendix 4). It would seem that the majority of visitors would not like substantial improvements to facilitate recreation in view of the fact that 72,2% of the groups interviewed stated that they would like the Reserve to remain as it is at present, that is, undeveloped in terms of physical facilities. This question elicited the highest response of all the management possibilities listed in question 16 in the survey.

Apart from suggestions for educational facilities, which are discussed in the next section, 48,5% of the respondents in the survey requested toilet facilities, 43,2% suggested rustic seats or logs upon which to sit, 37,9% asked for improved trail markers and better access, with 30,8% of the latter specifically requesting a bridge across the river, and 33,1% asked for improved parking. The other suggestions stated in the questionnaire all scored less than 20% including suggestions for the provision of a tea room (7,1%), for clearing the bush so that the Reserve is more like a park (4,1%), and to provide swings (1,2%). The need for toilets and drinking water is of high priority as is the need for a bridge to overcome the closure of the main entrance after rain. Although parking is not a serious problem at present, with increased numbers of visitors there is little prospect, without purchasing land, of providing off-street

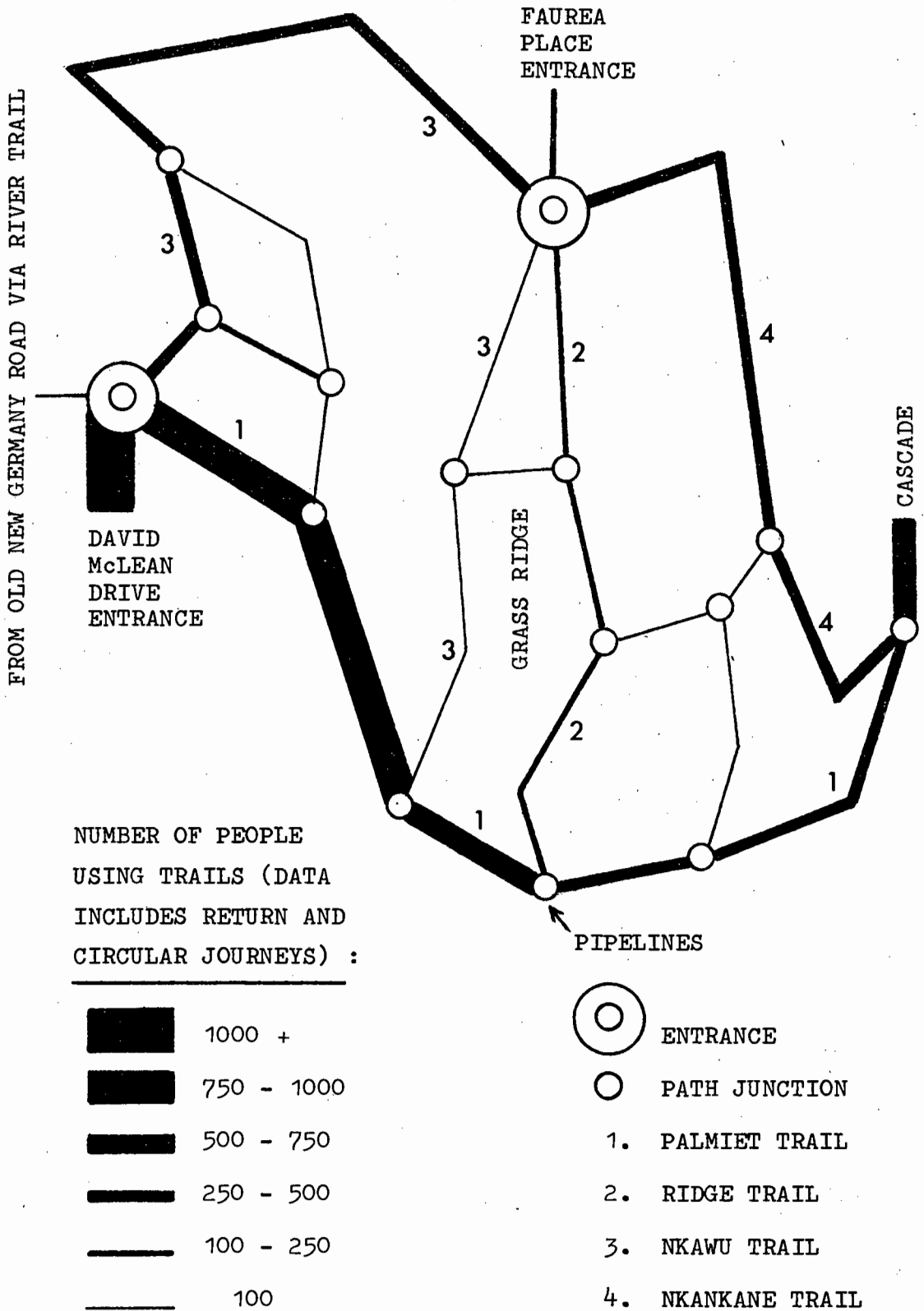
facilities as access to the Reserve is by means of a pedestrian right-of-way.

As 66,9% of the groups interviewed visited the Reserve for purposes of walking, the activity which scored the highest response, consideration must be given to the needs of this group. With poor facilities for picnicking this activity ranked third (18,3%) and suggestions for an improved picnic site are discussed later under multiple-use zoning. Closely associated with walking is the fact that 55,0% of the groups recorded that they visited the Reserve to get away from the noise and rush of the city and 79,3% stated that they would not like to encounter more than 10 people in walking around (51,5% did not want to meet more than two people and only 13,6% were prepared to meet more than 20 people). It is obvious that the majority of visitors seek a degree of solitude, an aspect which must be considered when planning for recreation in the Palmiet Nature Reserve.

The quality of solitude is easily lost if visitors, in walking in the Reserve, regularly meet other users. At the Victoria Falls National Park in Rhodesia, problems such as congested paths and the trampling of vegetation are caused by the high annual visitor impact. The projected figure of 250 000 for 1975 (Van Riet, 1972) represents an impact of 9 542 people per hectare per year when concentrated in an area of approximately 26,2 ha within the 56 000 ha National Park. The smaller area is the one which is frequented by the tourists when viewing the

FIGURE 4.2

PALMIET NATURE RESERVE : VISITOR FLOW ON TRAILS



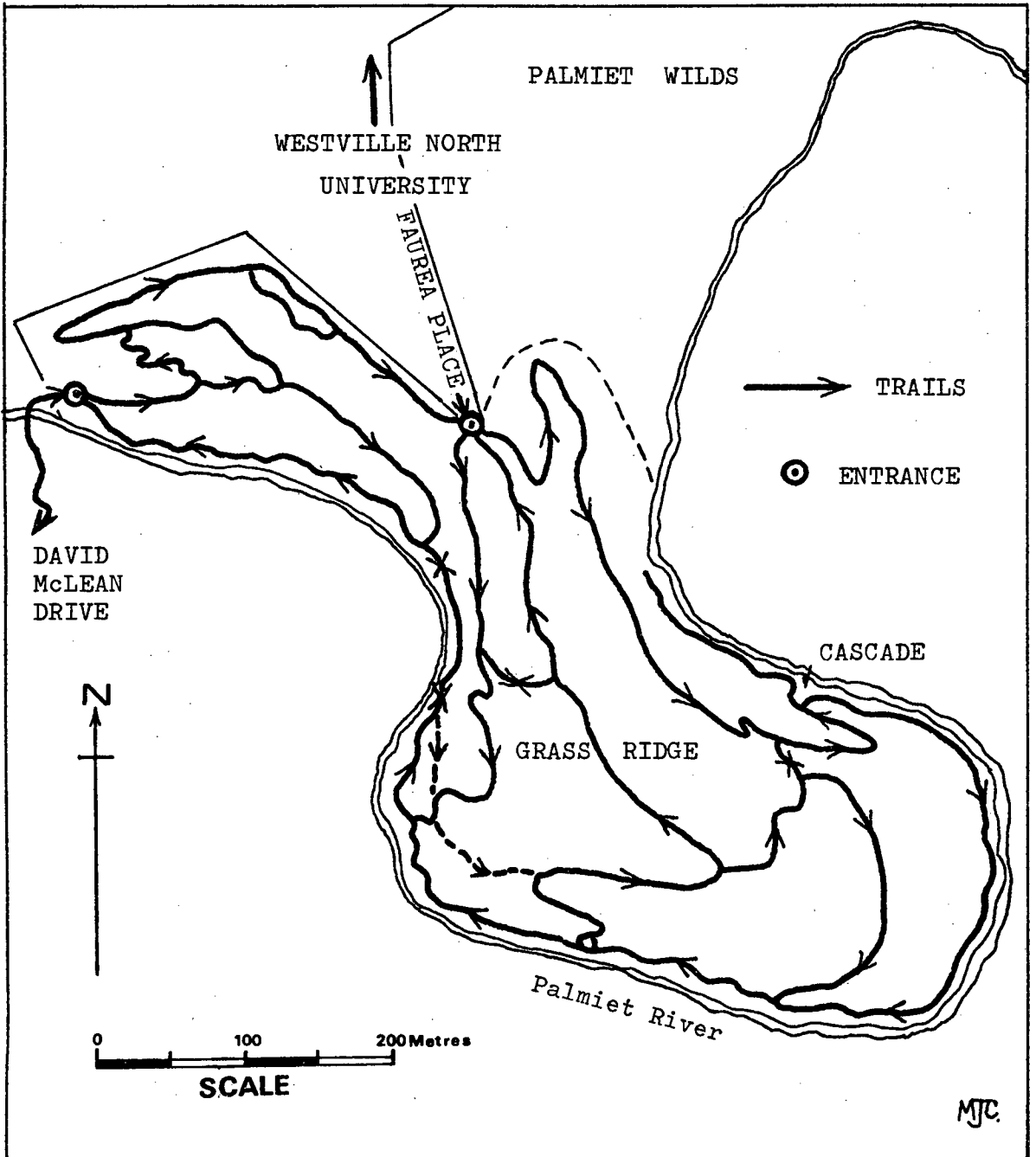
This diagram is drawn topologically.

SOURCE : Data derived from routes followed by visitors interviewed in the Palmet Visitor Survey (Appendix 4). The exact data for each section of path is given on Page 206.

MAP 4.1

PALMIET NATURE RESERVE

SUGGESTED ONE-WAY SYSTEM OF PATHS



numerous sights in the vicinity of the Falls (pers. comm. Wood, A.W.J., 1976, Dept. of National Parks and Wildlife Management, Salisbury). Van Riet recommended changes that were designed to improve and protect the aesthetic and natural qualities of the area and suggested a system of one-way paths in an attempt to solve the congestion problem. This has been implemented, but Evans (1972) states that the Department of National Parks relies on the co-operation of visitors to comply without forcing them to do so.

Although rigid regimentation is not desirable in a nature reserve, a system of one-way paths is a possibility in the Palmiet Nature Reserve should the number of visitors in any one day increase to the extent of destroying the quality of solitude. The human impact in 1975 was 278 people per hectare per annum (see Table 2.3). This is 34 times less than that recorded in the portion that attracts tourists at the Victoria Falls. The advantage of a one-way system is that it eliminates groups walking in the opposite direction and lowers the chances of meeting people. The density of people using the paths in the Reserve was determined from the visitor survey and plotted in Figure 4.2. This shows the most used path to be the Palmiet Trail which follows the river. By constructing a short link path the Palmiet Trail can be duplicated to facilitate one-way movement, as shown in Map 4.1. If necessary, the other paths that traverse the Grass Ridge spur can be converted to one-way trails, as indicated in Map 4.1.

The deterioration of paths through heavy use and subsequent erosion is a problem. Cross-country running in the Palmiet Nature Reserve has an

adverse effect on paths, one of which has been rerouted to a more gentle gradient because of serious erosion which takes place in soils derived from Table Mountain Sandstone. Apart from damage to paths, this activity is incompatible in a nature reserve as it disturbs wildlife and conflicts with visitors pursuing nature study interests. In the four year period 1973 - 1976, 34,2% of the total number of visitors recorded in the Palmet Nature Reserve was cross-country runners (Appendix 3). It is strongly recommended that cross-country running be banned in the Reserve.

When trails show signs of deterioration through visitor pressure they should be closed and users routed on to alternative paths. Goldsmith (1974) suggests placing gravel on paths that carry heavy traffic and steps on steep paths prone to erosion. Research by Bayfield (1973) shows that paths in steep areas become wider and that short cuts develop across curves. This needs careful control if numerous tracks are not to detract from the natural and aesthetic quality expected in a nature reserve.

The provision of circular trails is desirable as many hikers prefer not to retrace their route on the return journey. The visitor survey in the Palmet Nature Reserve showed that 68,1% of the people interviewed followed a circular trail despite the fact that this necessitates walking out of the valley up fairly steep paths. In this Reserve it is possible to follow circular routes of varying lengths. Respondents requested route markers, an indication of the length of trails and a map of the trails, to be located at the entrances.

The demands for recreational facilities by the visitors surveyed in the Palmiet Nature Reserve are not sophisticated. Most visitors are seeking to walk in a natural area in comparative solitude. Such qualities are lost as visitor numbers increase and the resultant impacts can be deleterious unless checked and alternative strategies offered.

### EDUCATIONAL POTENTIAL OF THE PALMIET NATURE RESERVE

It was shown in Chapter 3 that the Palmiet Nature Reserve is underused for educational purposes by schools. A report of the Nature Conservancy of the United Kingdom in 1963 examined the needs of schools, colleges and universities with regard to educational facilities in nature reserves (Usher, 1973). The suitability of the Palmiet Nature Reserve may be assessed in the context of the Nature Conservancy recommendations. The report concludes that nature reserves used for intensive educational purposes should ideally :

1. contain the diversity required for the demonstration of a wide range of habitats, communities and species, and the operative ecological factors;
2. not be liable to destruction or irreparable damage by controlled but heavy use; e.g. certain types of bogs are easily damaged by excessive trampling and are unsuitable for large parties;
3. not contain rare features or species which ought to be permanently conserved for research and similar activities, in the national interest;

4. be reasonably accessible to users; educational reserves near to cities and towns will serve a larger number of schools than those in remote areas;
5. have rides, paths and other access routes for safe and rapid movement of parties within the area;
6. contain a field museum or similar centre; and
7. have a qualified warden.

The field museum or similar centre mentioned in clause 6 may be interpreted as an education centre with display, discussion, lecture and research facilities.

The Palmiet Nature Reserve meets the recommendations fairly well in all but the last two suggestions. It has numerous terrestrial and riverine habitats, most of which can withstand the incursion of large parties; rare features or species are, as far as is known, absent; its urban location makes it accessible to many schools and paths offer access to just under half the Reserve. However the Reserve is deficient in terms of an education or interpretative centre and a qualified warden. The African Ranger employed is unable to assist with education as would a qualified warden suggested by the Nature Conservancy report.

In the educational survey (Appendix 5) conducted among the educational institutions which have used the Palmiet Nature Reserve, nine out of the eleven, which responded to suggestions for improvements, mentioned the need for an education centre, although four of these added that this facility

was not essential. The response of the general public in the Palmiet Visitor Survey (Appendix 4) to an education centre was that only 38,5% of the respondents felt that it was necessary. Apart from housing interpretative material in the form of pictures, specimens and literature which would benefit teachers, pupils and general visitors to the Reserve, it would enable groups to assemble for lectures, discussions, audio-visual presentations and research projects. The Happy Valley Education Centre in Durban enhances the work done by schools in the Bluff Nature Reserve. However the provision of a centre should not detract from the emphasis on field work which should be done in the nature reserve itself. There is little point in taking a class to a nature reserve to follow a programme which could be done in their own school building. With this in mind and taking into account the cost, the establishment of an education centre in the Palmiet Nature Reserve should have a fairly low priority.

The educational survey revealed that many teachers failed to use the Palmiet Nature Reserve and other natural areas because of their lack of knowledge of these areas and the natural environment in general and their lack of expertise in field work techniques. Many interviewed suggested that the employment of a fully qualified teacher or guide and the provision of guide notes for teachers as well as model worksheets, which can be adapted to suit particular pupil needs, would help to overcome this problem. Two schools suggested that such an officer was more valuable than the need for an education centre. Covered working facilities are nevertheless essential if a permanent officer is to operate an effective educational

programme. There is no doubt that the success of the Happy Valley courses can be ascribed to the presence of a permanent teacher who directs the educational programme, which includes the drawing up of suitable worksheets. Financial restraints render the employment of a full-time teacher beyond the resources of the Palmiet Management Committee unless the Natal Education Department is in a position to introduce a similar scheme to that in operation at the Bluff Nature Reserve. There is scope for the immediate development of suitable teacher guides and pupil worksheets graded for the various phases from junior primary to high school. These could effectively serve to improve educational methods, obviating the present situation where some classes are conducted around the Reserve to see specific features but with no emphasis on ecological principles and relationships. The present use of volunteer guides for schools could be extended and training programmes for these guides and school teachers could go a long way towards improving the educational value and relevance of the Palmiet Nature Reserve to schools.

The Natal Education Department (pers. comm. 4/11/1976, Education Field Activities Committee, Pietermaritzburg) considers it essential that natural areas used by schools have toilet facilities and that interpretative centres, although not essential, enhance the value of the site. In the educational survey numerous schools requested provision of toilets and drinking water in the Palmiet Nature Reserve. It is necessary

that these basic facilities are provided if the Reserve is to be ranked as an acceptable site for use by schools. These services should ideally be incorporated into an education centre. The only other improvements suggested by the survey are the need for a bridge over the river at the main entrance and maps at both entrances to the Reserve. The bridge is essential if the Reserve is to be used regularly for educational purposes as the river often cannot be crossed easily for long periods in the summer rainy season.

Having considered possible improvements for educational institutions, the following suggestions to improve the general educational outreach of the Palmiet Nature Reserve would, in many instances, also be of value for teachers and schools. In the Palmiet Visitor Survey (Appendix 4) 26,6% of the respondents, in considering the value of the Reserve, ranked learning about nature slightly ahead of exercise, solitude and aesthetic enjoyment. In suggesting improvements, 66,3% of the respondents requested that more outdoor educational aids be provided in the Reserve. A self-guided nature trail with an appropriate booklet (similar to those at Melville Koppies in Johannesburg and Stainbank Nature Reserve in Durban), and an increase in the number of small signs highlighting features of interest, would serve to educate casual visitors who are not particularly interested in being herded around the Reserve on organised guided trails. In a survey conducted in Bridestones Nature Reserve in England, only 16,7% of the respondents requested nature trails (Usher, Taylor and Darlington, 1970). More interest was displayed in a self-guided nature trail in the Palmiet Visitor Survey, with 75,8% of

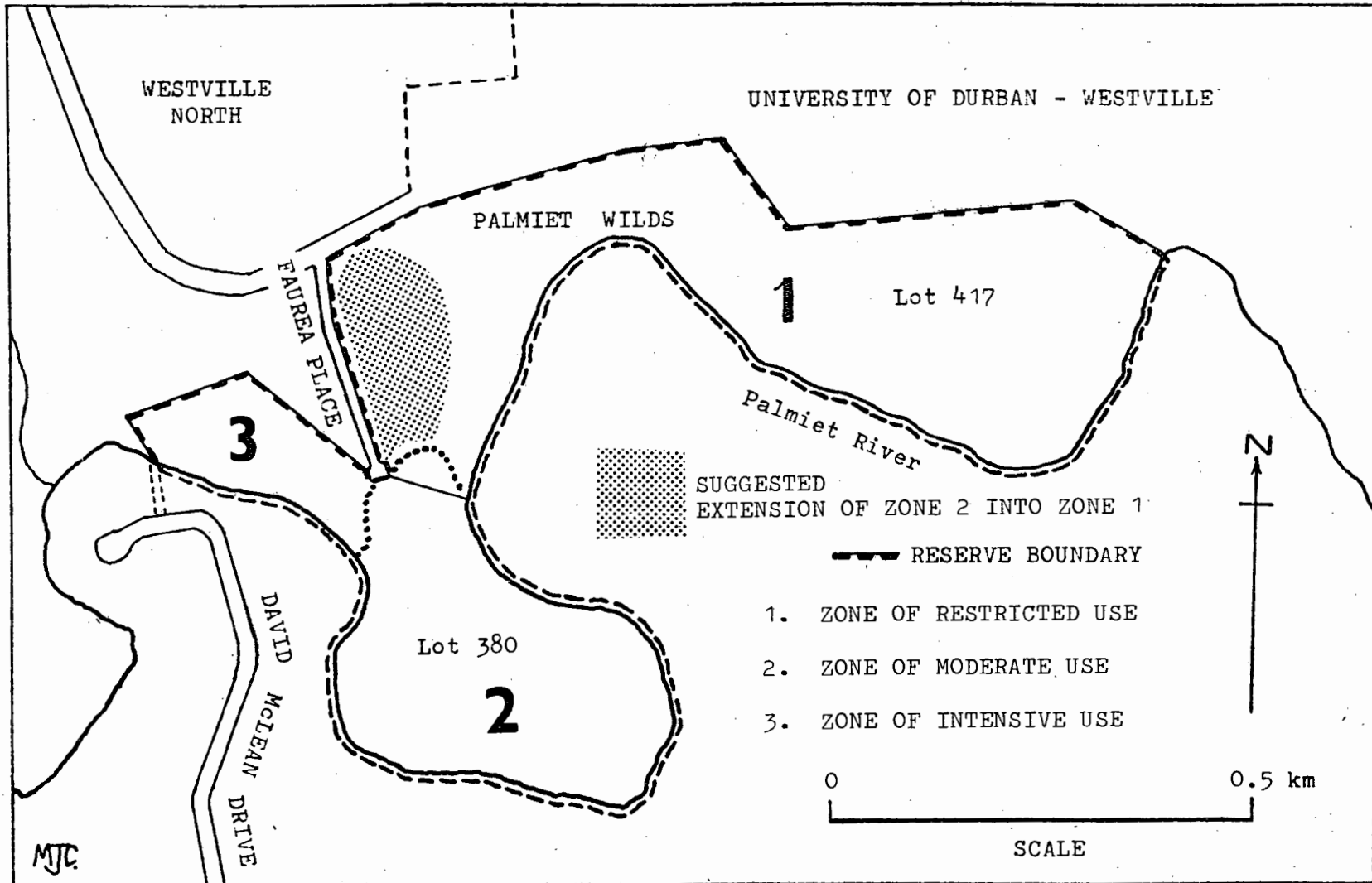
those interviewed stating that they would use such a trail. By comparison to visitors at Bridestones, a larger number at Palmiet were prepared to pay more for the trail booklet, with 8,3% willing to pay approximately 5 cents, 43,2% approximately 25 cents and 24,3% prepared to pay approximately 75 cents.

Rourke (1976a) mentions the value of a display of labelled plants, currently flowering, in the information hut at the Fernkloof Nature Reserve in Hermanus. Volunteers man the hut on Sunday mornings. An inexpensive information hut and plant display would prove to be a relatively simple way of informing and educating visitors to the Palmiet Nature Reserve. The production of specialist publications, similar to those of Melville Koppies, on topics related to the biology, ecology and geology of the Reserves is recommended for those requiring more detailed and advanced information. Several respondents in the Palmiet Visitor Survey requested such information.

Care is needed to ensure that a proliferation of educational aids, for example trail marker posts and information boards, does not detract from the natural quality expected in a nature reserve. Possible means of blending them into their surroundings and suggestions for concentrating them in a portion of the Reserve, leaving other areas clear, are considered in the zoning proposals which follow.

MAP 4.2

PALMIET NATURE RESERVE : SUGGESTED MANAGEMENT ZONES



## ZONING FOR MULTIPLE-USE MANAGEMENT

The Palmet Nature Reserve remains, at the present time relatively undeveloped in terms of facilities. Certain suggestions have been made to enable this small reserve to fulfil its potential in the educational and recreational fields. It is recommended that buildings, if and when constructed, are located in peripheral areas in accordance with the observations of Farrell (1975), Day (1975) and Tinley (1971) and discussed under the recreational values of small nature reserves in Chapter 2.

A small nature reserve which permits multiple-use activities needs to be carefully managed if the quality of the biotic communities is to be maintained. The present management plan of the Palmet Nature Reserve with two zones, a public area and a restricted zone (shown in Map 3.4) that leaves 60% of the Reserve comparatively free of human intrusion and impact, does tend to serve this purpose. A third zone is recommended to cater for a range of interests which would attract many visitors away from a large portion of the present public zone, thereby reducing the human impact on it. The three recommended zones, shown on Map 4.2, are :

1. a zone of restricted use
2. a zone of moderate use
3. a zone of intensive use

These zones are similar to the three zones, namely a nature reserve, nature park and a service area, suggested by Moll (1975) for the New

Germany Commonage. In comparison to the two existing zones discussed in Chapter 3, it is suggested that the public zone be divided into two zones of differing intensities of use.

1. Zone of Restricted Use : the Palmet Wilds

The function and size (approximately 21 ha) should remain identical to that of the present restricted zone. As mentioned previously, access to visitors is limited through the absence of paths. Such an area where the preservation of wildlife and the provision of nesting and breeding sites, without significant human interference, is accorded the highest priority, serves a valuable purpose for research in various biological fields.

2. Zone of Moderate Use

Approximately 11 ha in extent, this zone retains the function of the present public zone with 3,5 km of trails catering for the nature enthusiast wishing to study or observe wildlife or to walk in a natural surrounding in comparative solitude. The creation of a third zone of intensive use would hopefully attract some of the present users away from this area in order to decrease the number of users. It is recommended that development, apart from the existing trails, be minimised with emphasis being placed upon the protection of the natural components and the retention of the natural appearance of the area.

3. Zone of Intensive Use

The fact that this proposed zone is only approximately 3 ha in size probably renders it inadequate for the high visitor impact that will

result. The location and size is determined by the fact that the area is physically separated from the rest of the Reserve by the Nkawu cliff and because it is adjacent to the entrance through which most of the visitors enter. The Palmiet Visitor Survey (Appendix 4) showed that 87,4% of the visitors surveyed use the entrance from David McLean Drive which is more accessible to most of Westville, Durban and Pinetown - from where 85,5% of the respondents originated. Suggestions for expanding the zone follow in the section dealing with recommendations for the expansion of the Reserve.

It is recommended that this zone contain future buildings such as toilets, an information hut, education/interpretative centre which should preferably incorporate the toilet facilities. According to National Audubon recommendations (Adler, et al, 1974) for the McGill University Mont St. Hilaire Nature Reserve near Montreal, an interpretative centre used by schools and the general public should be sited not more than 120 metres from the parking ground. Consideration should be given to the construction of buildings with natural materials such as stone, timber and thatch so that they blend with the natural environment. However, should high cost factors necessitate more utilitarian structures, it is possible to screen these by means of shrubs and trees as suggested by Moll (1975) for the proposed buildings in the New Germany Commonage Nature Reserve.

Educational aids, including self-guided trails, information boards and tree identification numbers could be intensified in this zone, although these would have to extend into the zone of moderate use on a less

intensive basis owing to the lack of habitat diversity within such a small area. Every effort should be made to blend such aids by using natural colours and materials where possible so as to lessen their impact on the natural environment. Special features to focus attention and to attract many visitors to this proposed zone of intensive use and away from the rest of the Reserve are recommended. A possible attraction is a larger picnic and braai area than the existing small Cascade site which should be discontinued as a picnic site as it falls in the proposed zone of moderate use. Several respondents in the visitor survey requested such a facility within easy access of the parking area. However as an adequate picnic site would occupy a large portion of this proposed zone, transforming it into a semi-natural park, there is merit in siting a picnic area outside the present Reserve and concentrating on intensive educational and walking activities in the intensive use zone so as to retain much of the natural appearance of this zone. The idea of semi-formal massed indigenous flower gardens in a small area and a pond or series of ponds to increase aquatic plant and bird life (Moll, 1975) in a portion of the zone, are suggested features which would attract interest. The only source of water is the river, which necessitates placing such features on the flood-plain with consequent siltation problems from the occasional floods that inundate the area. A respondent in the visitor survey suggests the erection of a hide near a pond to facilitate bird observation. Maintenance of a few openings in the bush and a variety of suitable habitats would, however, also serve this purpose.

The density of paths could be higher than in the proposed zone of moderate use. Taking the existing network into account, the proposed intensive use zone has 1,27 km of paths, or 0,41 km per ha, compared to 0,33 km per ha in the zone of moderate use. It is possible that this density of paths is too high for an area in which moderate use is proposed. The only possible improvement to the existing paths in the proposed intensive use zone is a possible short link path, shown in Map 3.5 to enable hikers using the upper Nkawu Trail to follow a circular route within the zone rather than retrace their steps or enter the zone of moderate use. In order to screen different trails in this close network of paths, the vegetation should be managed so as to retain forest and bush over most of the proposed zone. Measures may have to be taken to prevent the erosion of paths as a result of intensive use. It might be necessary to consider steps in stone or creosoted logs on steeper paths.

An analysis of the visitor survey (Appendix 4) indicating the length of time spent in the Reserve by respondents shows that 21,3% spent one hour and less, 34,9% spent up to two hours and 23,1% up to three hours in the Palmiet Nature Reserve. This is less than the three to seven hours spent by 68,1% of the picnickers at Krantzkloof Nature Reserve (Appendix 2). This suggests that the size of the area proposed for intensive use and the extent of the paths may be inadequate to contain visitors for periods of up to three hours. The suggested educational aids and features would encourage visitors to linger, but an extension of the trails west of the Reserve seems desirable as an added means of diverting recreational activities.

The small size of the proposed zones into which the general public are to be permitted is likely to cause a loss of solitude. The suggested divisions were located taking into account the existing size and division of the Reserve. It has been indicated that it is essential to investigate ways of increasing the size of these zones and the possibilities of extending the total area of the Reserve, if the facility is to reach its full potential.

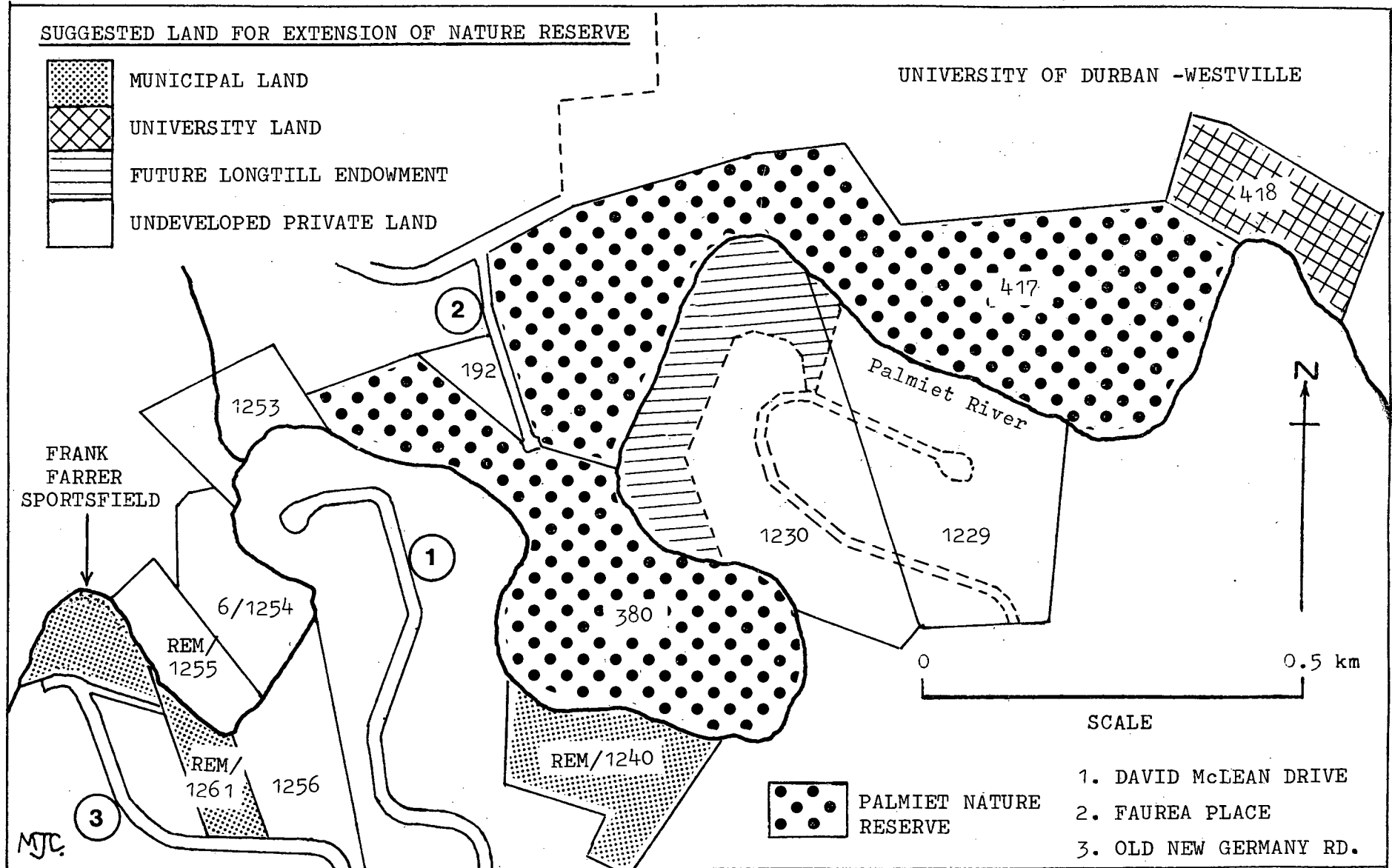
Within the existing Reserve it is possible to increase the size of the zone of moderate use by extending it into the restricted area. The boundary between these zones corresponds to the existing division which came about in 1974 when the Palmiet Wilds, or the present zone of restricted use, was added to the Reserve. The retention of an area totalling 60% of the Reserve, undisturbed by human intrusion, is desirable, but with an anthropocentric emphasis towards multiple-use activities, it is recommended that part of this area be opened to the general public by extending the zone of moderate use by approximately 5 ha, into the grassland area of the restricted zone as indicated on Map 4.2. An advantage would be the consolidation of all the grassland area, which is maintained by a burning management programme, into the zone of moderate use. This portion adjoins houses, whereas the rest of the restricted zone is adjacent to an undeveloped portion of the University campus. Reference to Table 4.1 shows that the restricted zone would decrease to approximately 16 ha and that of moderate use would increase to approximately 16 ha which, together with the 3 ha proposed for inten-

TABLE 4.1

PALMIET NATURE RESERVE: PRESENT SIZE AND POSSIBLE  
EXTENSIONS TO RESERVE AND RECOMMENDED ZONES

	<u>ha</u>	<u>% of Total</u>
PRESENT NATURE RESERVE: Lot 380	13,2	38,0
Lot 417	21,5	62,0
	<hr/>	<hr/>
	34,7	100,0
POSSIBLE EXTENSIONS:		
<u>Zone 1 : Restricted Use</u>		<u>ha</u>
Proposed zone in present Reserve. Lot 417 reduced to increase Zone 2 (45,5% of total).		15,8
Possible additions:		
Longtill endowment: Subdivision of Lots 1229 and 1230		4,7
Remaining river reserve (S. side)		1,1
University land (Lot 418)		4,2
		<hr/>
		25,8
<u>Zone 2 : Moderate Use</u>		
Proposed zone in present Reserve. Lot 380 minus allocation to Zone 3 plus rem. Lot 417 (45,5% of total).		15,8
Possible additions:		
Municipal land : Rem. Lot 1240		3,2
Remaining river reserve (S. side)		1,0
Purchase of Lot 192		0,7
		<hr/>
		20,7
<u>Zone 3 : Intensive Use</u>		
Proposed Zone 3 in present Reserve Rem. Lot 380 (9,0% of total).		3,1
Possible additions:		
River reserve (S. side)		0,5
Access from David McLean Drive		0,1
Municipal land: Rem. Lot 1261 ( <u>Dissotis</u> swamp)		1,2
Municipal land: Rem. Lot 1262 (F. Farrer Sportsfield)		1,4
River reserve: Lot Rem. 1262 - Nature Reserve		1,6
		<hr/>
		7,9
		<hr/>
<u>Totals</u>	<u>ha</u>	<u>% of Total</u>
Zone 1: Restricted use	25,9	47,6
Zone 2: Moderate use	20,6	37,9
Zone 3: Intensive use	7,9	14,5
	<hr/>	<hr/>
	54,4	100,0

..... Restricted.  
} 52,4 { Public  
} admitted



sive use would open approximately 54% of the Reserve to the general public and reduce the restricted zone to approximately 46%.

The extension of the zone of high useage will be difficult within the bounds of the present Reserve as it will be advantageous to retain the natural cliff barrier as the boundary between it and the zone of moderate use in the same way that the Krantzkloof picnic site is physically separated from the rest of the Nature Reserve. There is scope for extending this zone upstream outside the Reserve. This is considered in the following section.

#### Recommendations for the Extension of the Palmiet Nature Reserve

The Palmiet Nature Reserve is at present effectively larger than its actual size of 35 ha as there is still undeveloped land adjoining the reserve (see Figure 3.1). The prospect of increasing the size of the present Reserve by extending it onto surrounding undeveloped private land is remote on account of the high cost of this land and the lack of financial assistance for local authority nature reserve purposes. Several possibilities exist for extending the Reserve using municipal land and by incorporating endowment areas when subdivision of undeveloped land surrounding the Reserve occurs. The location of these areas is shown on Map 4.3 and the exact sizes are tabulated in Table 4.1. The addition of these areas to the existing Reserve could increase its size from 35 ha to 54 ha or more.

The existing Nature Reserve lies entirely on the northern side of the river. There is a need, where possible, to extend it to include the southern side of the valley. In 1975 the Borough of Westville proclaimed a river reserve along the Palmiet River which will result in future property subdivisions stopping 15 metres short of the river. When the Reserve is ultimately fenced it will be essential for management purposes to move the present boundary of the Reserve from the centre of the river to include at least the 15 metre river reserve on those properties which have already been subdivided and proclaimed. A 15 metre riverine strip on the southern side would add a total of  $2\frac{1}{2}$  ha to the Reserve.

A proposed subdivision of Lots 1229 and 1230 by the Longtill Company will generate almost 5 ha of endowment land along the southern bank of the river which could be added to the Reserve. It is recommended that this area be added to the zone of intensive use as most of it lies adjacent to this zone. As a portion of it is opposite the proposed zone of moderate use, it could be in part, or in its entirety, allocated to this zone if there is a need to increase the area used by the general public. The inclusion of Lot 418 (approximately 4 ha) could possibly be negotiated with the University authorities. This is steep, forested land that has little or no potential for development by the University but would be an ideal eastern extension to the restricted zone and could serve as a useful research area for the University.

A useful possible addition to the moderate use zone is the 3 ha Lot Rem 1240 owned by the municipality on the southern side of the river. Apart from increasing the size of the Reserve and zone, it would serve the function of providing more land on the southern side of the river. As it is visible from much of Zone 2 it would be aesthetically more pleasing to retain it in a natural state without housing development. Privately owned Lot 192 (0,7 ha), which intrudes into the Reserve in the form of a wedge and which contains valuable cliff-top climax vegetation, should be considered for purchase. The problem is that the high cost, with a value of at least R30 000 in 1976, is likely to preclude this addition.

Apart from some housing development on the southern side of the river, the opportunity exists to extend the proposed zone of intensive use upstream from the Reserve on municipal land and along the river reserve which will materialise when present areas of undeveloped land are subdivided. An existing trail extends from the Nature Reserve for just over 1 km upstream to the Old New Germany Road. This was the original route into the Reserve from the south before David McLean Drive was constructed thereby providing a convenient motor access to what is now the main entrance to the Reserve. It is recommended that this trail, with a possible extension further upstream, become the basis for a linear extension of the intensive use zone. If it remains a narrow strip the wildlife potential will be low, but it has scenic and recreational values which could serve to attract large numbers of hikers desiring to walk in a fairly natural rugged area. Reference to Figure 4.2 shows that the river

path is the most popular trail in the Palmiet Nature Reserve and it is possible that a trail along the river reserve will prove as attractive for recreational purposes.

The existing trail ultimately passes over municipal land in Old New Germany Road (Remainder of Lot 1261) which is just over 1 ha in extent. Although small, the land contains a swamp in which the attractive Dissotis canescens (wild Lassiandra) grows and flowers towards the end of summer. As the Palmiet Nature Reserve does not have a similar habitat and as these plants are becoming scarce in Westville, the area merits inclusion in an extension of the Reserve. Situated high above the river flood plain, the swamp offers scope for the construction of small dams, which were suggested to increase the bird and plant species in the intensive use zone and which have value for school classes which study ponds and aquatic life.

Almost adjacent to the Dissotis swamp is the Frank Farrer African Soccer Ground and recreational hall situated on municipal land about 1½ ha in extent and established before housing encroached into this portion of the valley. While not advocating the removal of this facility on account of the lack of an alternative convenient site in central Westville, if for some reason it should cease to serve its present function, this land would represent a useful addition to the proposed intensive use zone of the Palmiet Nature Reserve. Situated opposite an impressive cliff and riverine forest and provided with a road access, the area has potential for development into

an attractive picnic site with braai facilities. The trend revealed in the survey at the Krantzkloof picnic site (Chapter 2 and Appendix 2) where 29,8% of the picnickers participated in no other activity and where only 30,6% walked for more than an hour, has significance for the location of a picnic site 1 km from the Palmiet Nature Reserve. Many visitors would be attracted to a picnic site and few, in walking for a period of less than an hour along the river trail would reach the existing Reserve.

The provision of camping facilities in the Reserve was suggested in the visitor survey. Requests by youth groups to camp are refused but it is possible that camping could be developed on a site, such as the soccer field, situated away from the main Reserve. The soccer field currently has toilet and ablution facilities and the recreation hall and rooms could be used by Boy Scouts and Girl Guides. This complex also has potential as an educational centre which could serve the Nature Reserve.

Apart from the acquisition of municipal land it is possible that the subdivision of Lots 1253, 6/1254, Rem. 1255 and 1256 could add up to 5 ha on to the suggested western extension to the Reserve. This would have the effect of increasing the size of the Reserve to almost 60 ha. At present the Town Council of Westville is opposed to cluster development and only permits single dwellings or duplex units on each stand, the minimum area of which is 1 800 sq. metres. Land subdivisions therefore extend into the steeper valley sides, often over cliffs. A clustering of dwelling units on flatter, more suitable land leaving the steeper valley parts

undeveloped is recommended as a means of providing additional land for the Reserve.

West of the soccer field there is the possibility of extending the trail along the river for several kilometres over land that has not yet been developed and which will become part of the river reserve when subdivision takes place. The Palmiet Nature Reserve Management Committee is keen to link the Reserve to the New Germany Commonage Nature Reserve by means of a 7 km trail, but unfortunately housing development on part of the river will prevent this route from following the river in its entirety. Such a trail would be similar to the urban river trails planned for hikers and horseriders along the Braamfontein Spruit and Orange Grove Spruit in Sandton in the Transvaal (Clarke, 1972). An extended trail up the Palmiet River would provide additional scope for hikers and could possibly accommodate those visitors which objected to the ban on dogs in the Reserve.

According to Diamond (1974 and 1975), nature reserves which are as near to being a circular shape as possible, are considered to be more desirable in order to minimise dispersal distances within the reserve. Reserves which are elongated or that have dead-end peninsulas, generally have low dispersal rates from the central to the outlying parts. This may encourage extinction rates that are typical of geographical islands. The present shape of the Palmiet Nature Reserve tends to be elongated rather than circular. Unfortunately the suggested western extension has the

effect of exaggerating this elongated shape. The provision of recreational and possibly educational opportunities within the suggested western extension would effectively reduce the visitor impact in the present Nature Reserve. Furthermore it should obviate the need to eliminate the zone of restricted use which is essential for the successful implementation of multiple-use management which includes the conservation of the biological components, in a small nature reserve.

#### SUGGESTED SOLUTIONS TO ADMINISTRATIVE PROBLEMS IN THE PALMIET NATURE RESERVE

The problem of proclaiming local authority nature reserves in Natal in terms of the Nature Conservation Ordinance No. 15 of 1974 and the general lack of finance for these reserves has been highlighted in Chapter 3. It was seen that the term private nature reserve or private wildlife reserve on privately-owned land is misleading in the case of the Palmiet Nature Reserve which has been declared a public open space in terms of the Westville town planning scheme.

The Cape Provincial Nature Conservation Ordinance No. 19 of 1974 provides, in Chapter II, Part II, for the proclamation of local nature reserves established by municipalities and divisional councils. The ordinance covers the protection of all forms of wildlife, the appointment of advisory councils and the payment of a subsidy by the Provincial Council to cover 50% of the expenditure incurred by the local authorities for the development and maintenance of local nature reserves. Through

this form of proclamation the Nature Conservation Department displays an interest in the conservation efforts of local authorities and has appointed a professional officer to take charge of the planning and development of those reserves which receive the provincial subsidy (Neethling, 1976). The fencing and formulation of a management policy which covers the control of soil erosion, veld and game management, the control of recreation and the provision of facilities, is required of these reserves.

The impressive nature conservation effort in Natal by the provincial conservation body, the Natal Parks, Game and Fish Preservation Board cannot be denied. Nevertheless if the value of local urban nature reserves for educational and recreational purposes is to be recognised, it is recommended that serious consideration be given to accommodating, in the Natal Nature Conservation Ordinance, the category of local nature reserves for proclamation purposes and provision for the payment of a subsidy to such reserves. In this way more effective control can be exercised with the establishment of clear management objectives to facilitate orderly planning and maintenance of local nature reserves. It would also afford better protection to all forms of wildlife in local nature reserves and not merely the categories covered in town lands, namely wild birds and protected indigenous plants listed in the schedule to the present ordinance.

There is no reason why more adequate protection of the wildlife in local reserves such as the Palmiet Nature Reserve should not be promulgated through local by-laws and it is recommended that the formulation of suitable regulations for this Reserve be entrenched in the municipal by-laws. Local authorities with proclaimed nature reserves in the Cape Province are required to frame regulations with regard to their Advisory Boards and many such as Bellville, Somerset West and De Aar have specific by-laws related to their nature reserves. In Natal, Vryheid has by-laws pertaining to the Vryheid Mountain Game and Nature Park, Uvongo has special by-laws controlling parks, reserves and pleasure grounds, and Amanzimtoti has by-laws to cover the denudation of vegetation in the Borough. The Administrator may approve of such by-laws in terms of Section 200 of the Local Government Ordinance No. 21 of 1942.

With regard to the establishment of management objectives, as required of Cape local authorities with proclaimed nature reserves, it is suggested that a concise written management plan along the lines of that drawn up for the Aberlady Bay Nature Reserve in Scotland (Usher, 1967 and 1973), be formulated for the Palmiet Nature Reserve, regardless of the absence of such a requirement in Natal. Management decisions concerning the Reserve are minuted but a consolidated plan of management objectives does not exist. Such a plan would not remain static and could be amended when appropriate, but it would serve to indicate to the Borough Council and the general public exactly what the Management Committee is aiming to achieve in the Reserve.

Lack of municipal finance for nature conservation purposes prevents the erection of a fence around the Palmiet Nature Reserve. A provincial subsidy would greatly assist such a project. Regardless as to whether or not finance is available from this source in the future, a fairly high priority should be placed on fencing the Reserve. Twenty respondents in the visitor survey (Appendix 4) suggested that fencing be undertaken and it is required if proclamation is to be considered. A fence around an urban reserve is essential to maintain better control of poachers, herbalists, dogs and the entry points of visitors. As there is undeveloped land around the Palmiet Nature Reserve provision should be made to allow wildlife to penetrate as development takes place. A fence would have the effect of reducing the gene-flow into the Reserve and the number of breeding individuals (Berry, 1974) but in any case, once completely encircled by urban development, the reserve becomes the equivalent of an island with very little interchange of wildlife, apart from some birds, from the surrounding area.

The present grant-in-aid from the Borough of Westville covers the employment of one African Ranger in the Palmiet Nature Reserve. More than one Ranger is necessary for the effective control of the Reserve, particularly when the Ranger has time off or is on leave. It is recommended that for more effective control and management of the Reserve, at least another Ranger be employed on a full-time basis.

Charging for admission is a possible source of income and, as suggested by groups interviewed in the visitor survey, could serve to limit the number of visitors. The cost of collecting such fees is often not commensurate with the income derived and Neethling (1976) points out that only 11 out of 51 local nature reserves in the Cape charge entrance fees for this reason. In Natal one local nature reserve, (that at Vryheid) charges entrance fees. The problem can be partly solved by charging for admission when the Reserve is well patronized over week-ends and public holidays.

### CONCLUSION

The main conflict within a small nature reserve is that of human pressure created by recreational activities and regular large groups from educational institutions. The result can be the loss of biological, aesthetic and solitude qualities expected in a nature reserve. The management strategies and improvements suggested for the Palmiet Nature Reserve in this chapter, including the division of the Reserve into zones of varying intensities of use, should serve to retain some measure of the three qualities mentioned above and to increase its potential for multiple-use activities. The accommodation of local nature reserves in the Nature Conservation Ordinance would enhance the legal status of Palmiet Nature Reserve and other municipal reserves in Natal and help to alleviate the financial problem experienced by them.

## CHAPTER 5

CONCLUSION

The large number of local nature reserves established since 1960 in the Cape Province has been stressed by Neethling (1976). Of the 47 proclaimed in this period, 19 are less than 100 ha in extent. In Natal eight local reserves have been proclaimed since 1969 of which six are smaller than 100 ha, included among which is the Palmiet Nature Reserve. Consideration is given in this chapter to the formulation of conclusions regarding the value of the Palmiet Nature Reserve specifically, and the numerous small nature reserves in general, in the light of evidence presented in this thesis.

An evaluation of the biological status of small nature reserves leads to the conclusion that they are deficient in terms of species diversity and gene pools and that they are vulnerable to high extinction rates and adverse influences from surrounding land-use development, particularly in urban areas (Diamond, 1975 and 1976; Terborgh, 1974; Bannikov and Krinitskii, 1975; Specht, 1975; Edwards, 1974 and Simmons, 1974). No research has been done in the Palmiet Nature Reserve to confirm this evidence but its size of 35 ha is slightly below the minimum size of 40 ha recommended by Foreman (pers. comm. 1976) for a nature reserve which contains a normal species diversity level for many components of the ecosystem (Galli, Leck and Foreman, 1976). Most authorities recommend conservation areas larger than 10 000 ha in extent thus nature reserves less than 100 ha are not considered to be ecologically

viable. There is a need for research into the relationships between the size of nature reserves and the diversity and extinction rates of species, along the lines of the biogeographic studies cited, and it is suggested that small reserves such as the Palmiet Nature Reserve are ideal for this purpose.

It might be argued that the prime purpose of a nature reserve is to conserve the biological components and that there is little purpose in establishing small nature reserves if they are not ecologically justifiable. It has, however, been shown in the survey of literature and in the example of the Palmiet Nature Reserve, that small nature reserves are well suited to multiple-use activities which conserve and utilize the biological communities for education and recreation. It was seen that a small nature reserve, such as that on the Bluff in Durban, fulfills an important educational role for schools. Surveys in the Palmiet Nature Reserve and in overseas reserves show that recreation is the most important activity. Usher, Taylor and Darlington (1970) consider that recreational activities in English nature reserves smaller than 20 to 40 ha are likely to have an adverse effect on the biological communities. Obviously the carrying capacities for vegetation in England and on the Natal coast cannot be compared, but it is likely that a reserve of the size of the Palmiet Nature Reserve is large enough to accommodate recreation.

The need for quantitative research on the effect of recreational impacts on different ecosystems is stressed. The chief problem of multiple-use

management in a small nature reserve is that of human pressures resulting from recreational activities and large scale educational groups with subsequent loss in the biological, aesthetic and solitude qualities normally associated with nature reserves. As a suggested solution to this problem, it has been recommended that a system of zoning be introduced in small nature reserves managed for multiple-usage. This permits a zone of low human impact for the conservation of the biological communities, a zone of moderate impact, where those with a genuine interest in nature can study and walk in comparative solitude, and a zone of intensive use to which a large proportion of the visitors are attracted. The location of facilities including buildings and intensive educational aids within such an intensive zone in a peripheral area of the reserve would be in accordance with observations made by Farrell (1975), Day (1975) and Tinley (1971). The presence of alternative routes and circular trails in the Palmiet Nature Reserve helps to spread hikers within the Reserve and a one-way system of paths, as recommended by Van Riet (1972) for the Victoria Falls, is suggested once paths become too crowded.

The implementation of a third zone of intensive use in the Palmiet Nature Reserve will be more effective if the Reserve can be extended in size. A suggested extension along a trail within the river reserve west of the Nature Reserve would cater for recreational activities, especially walking.

Wise subdivision of undeveloped land west of the Reserve, allowing cluster-type development on flatter land, would permit use of the steeper portions of the valley for trails to cater for recreational needs in a wild area. There is much scope in towns and cities for leaving flood plains and steep land, unsuited to urban development, in a natural state and to establish trails for recreational purposes in these areas. This would follow the proposals made at a conference in the United States of America (Simonds, 1965) where it was suggested that legislation be enacted to preserve land along all streams and rivers up to the 50 year flood level against development, except for agriculture, recreation or parkway purposes. It was further suggested that flood plains along rivers be reserved for green belts in the centre of cities.

Small nature reserves, particularly those situated in urban areas, have potential for the education of the recreational user and for use by educational institutions. It has been shown that the Palmiet Nature Reserve is under-used for educational purposes. Numerous suggestions, such as the provision of guide notes and worksheets for schools, literature, self-guided trails, information boards and displays for the general public, have been made, to enhance the educational value of this Reserve. It would seem that many small local nature reserves throughout the country are not widely used for education. Of the 20 local nature reserves in South Africa of less than 100 ha which were covered in a mail survey, only five were used by schools and educational groups, with three

(namely Melville Koppies in Johannesburg, Settlers' Park Nature Reserve in Port Elizabeth and Helderberg Nature Reserve in Somerset West) being used extensively and two being used to a limited extent by local schools and groups. Of the remaining 15 nature reserves, it is not known whether four are used for education, six are not used at all, and five reserves are not yet open to the public. There is scope for encouraging a wider educational use of small local nature reserves in South Africa by introducing similar ideas to those suggested for the Palmiet Nature Reserve.

A problem affecting the successful operation of small local nature reserves in Natal is the fact that, unlike those in the Cape Province, they cannot be proclaimed as local nature reserves thereby qualifying for a provincial subsidy in terms of the Nature Conservation Ordinance. It has been shown that the Palmiet Nature Reserve costs less to operate financially than a formal park in Westville, largely on account of the fact that volunteers are engaged in the management of the Reserve. But essential needs in the Reserve such as a fence and the control of invasive pest plants are not being provided because of lack of finance. At present local nature reserves in Natal may be proclaimed as a private nature reserve or a private wildlife reserve, but financial subsidies are not payable. It is recommended that provision be made in all the provincial nature conservation ordinances to accommodate local nature reserves as is done in the Cape Province. This would result in improved management and conservation standards in many local reserves and in the production of a management plan in which objectives for the reserve are clearly stated,

as is required of those reserves claiming a subsidy in the Cape Province (Neethling, 1976). Such a written plan is an important necessity in the Palmiet Nature Reserve. Proper management with guidance from officers of the Provincial Nature Conservation Departments would overcome the criticism that many local nature reserves are no more than wild flower gardens, tawdry pleasure parks displaying a few semi-domesticated wild animals and grubby picnic sites with man-made structures (Rourke, 1976a).

A local reserve, such as the Palmiet Nature Reserve, offers scope for the local authorities and private conservation bodies to participate in nature conservation. Neethling (1976) observes that local reserves lead to a greater awareness of nature conservation on the part of local communities in that they cater for local expertise and enthusiasm and that considerably more time and money is often spent in many local reserves than is officially reflected in the municipal budget.

In assessing the value and acceptability of small nature reserves by the general public, a visitor survey, recorded in Appendix 4 and discussed in Chapter 3, gave the opinions and attitudes of users of the Palmiet Nature Reserve. The majority of visitors surveyed viewed the Reserve favourably with only 2,9% of the respondents stating that it was poor in their overall assessment and 7,7% stating that they were unable to make an assessment. This survey shows obvious bias, as most of the visitors are likely to be favourably inclined towards the Reserve, particularly as

only 37,3% had never visited it previously. Those unfavourably disposed are unlikely to visit the Reserve. A more objective assessment might have been obtained had a random survey of Westville residents been undertaken. It is likely that such a survey would have shown that the number of residents using the Reserve is in the minority. In attempting to discover the recreational preferences of people of all races in Durban, in a survey conducted over a 10 year period ending in 1970, Schlemmer (1977) found that, of all the numerous responses made by Whites, only 0,006% represented visits to local nature reserves. There were no responses from the other race groups in this regard. The reserves mentioned were Stainbank and Krantzkloof Nature Reserves, as the Palmiet Nature Reserve did not exist at the time of the survey. Schlemmer's research shows an apparent insignificant demand for use of natural areas among those surveyed in Durban.

Another analysis in which the number of visitors to nature reserves in metropolitan Durban is compared to the total population reveals a slightly higher demand. The Paradise Valley and North Park Nature Reserves are closed to the public at present, but the visitor totals to the others are as follows :

<u>Nature Reserve</u>	<u>Year</u>	<u>Visitor Total</u>
Krantzkloof	1975/76	17 660
Kenneth Stainbank	1975/76	10 804
Palmiet	1975	9 721
		<hr/>
		38 185

The estimate of the population of metropolitan Durban in 1974 was 1 189 500 of which 293 000 were White (Martins, 1975). The total number of visitors to the three nature reserves represents 3,2% of Durban's total population and, as most visitors to these nature reserves are white, 13,0% of the white population. These percentages assume that visitors only visited a reserve once and that more than one reserve was not visited by an individual.

By highlighting the low use of nature reserves by most Durban citizens, the survey by Schlemmer and the above analysis offer a balance to the Palmiet Nature Reserve visitor survey which was conducted among users of the Reserve. Nevertheless the figure of 38 185 visitors in a year to local reserves in the Durban area is considered sufficient to justify the need for nature reserves in urban areas.

No mention has been made of the many people who visit the larger nature and game reserves, often situated considerable distances from urban areas. The survey of Schlemmer (1977) revealed that 0,03% of all the responses of Whites represented visits to these more distant reserves. A particular value of small urban nature reserves orientated towards multiple-use recreational and educational activities, is that they can possibly serve to relieve the tourist pressure on the larger biologically more viable reserves (Grafton, 1968). The value of urban nature reserves will increase in the event of further fuel restrictions. However, while small nature reserves are acceptable in urban areas on account of

the general shortage and high value of land that can be set aside for these purposes, there is little justification for establishing small reserves in rural areas, unless the purpose is to preserve a rare species that can survive in a small area.

A final consideration in concluding this assessment of the value of small nature reserves is to speculate on the desirability of proclaiming small nature reserves. This is an important question as an analysis of the provincial, local and private nature reserves of less than 100 ha listed in Appendix 1, reveals that the majority, 84,0%, have been established since 1960. The population of South Africa is expected to double from 24 570 000 in 1974 to a projected 50 288 000 in the year 2000 (Sadie, 1974). As population and land-use pressures increase, Knobel (1976) stresses that the chances of proclaiming large nature reserves in the future are becoming increasingly remote. Frankel (1975) points out that although small nature reserves are ecologically vulnerable, they are usually located closer to urban centres and therefore have social and educational values for the largest number of citizens. This is considered sufficient reason to justify the establishment of small nature reserves.

It has been shown that the Palmiet Nature Reserve, as presently managed, has value in the community which it serves. With an improved educational outreach and the implementation of an additional management zone as suggested, the potential of this small reserve can be greatly enhanced.

The introduction of zones of differing intensities of use renders small nature reserves in general suitable for multiple-use management, which both promotes the conservation of biological communities and enables them to be used by humans.

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## APPENDIX 1

NATURE RESERVES OF LESS THAN 100 ha IN SOUTH AFRICA.

Name of Reserve	Location	Size (ha)	Date of Proclamation
<u>NATIONAL PARKS</u>			
Nil. See Note 1 at the end.			
<u>PROVINCIAL NATURE RESERVES</u>			
(Controlled by the Provincial Nature Departments)			
Tugela Drift	Colenso, Natal	98	1973
Harold Johnston	N. of Stanger, Natal	89	1967
Assegaaibosch (and Andries Venter Research Station)	Stellenbosch, Cape	*80(146)	1960
Beachwood Mangroves	Durban, Natal	76	1977
Voortrekker Monument	Winburg, O.F.S.	*70(105)	-
Adelaide Nature Con- servation Area (and Conservation Station)	Adelaide, Cape	59	1966
North Park	Queensburgh, Natal	52	1968
Lillie	Gravelotte, Tvl.	42	(1)
Cycad	Bathurst, Cape	50	1973
Cape St. Francis	Humansdorp, Cape	40	1974
Seekoei River	Humansdorp, Cape	*40 (66)	1969
Ida Doyer	Barberton, Tvl.	32	1964
Bluff	Durban, Natal	29	(2) 1974
Paradise Valley	Pinetown, Natal	28	1963
Vertroosting	Pilgrims Rest, Tvl.	27	1957

\* Size of natural portion of Reserve with the total size given in brackets (based on information from NACOR (1974) list.

(1) Not proclaimed.

(2) Forest only proclaimed i.e. 10 ha. Rest still to be negotiated.

Name of Reserve	Location	Size (ha)	Date of Proclamation
N'Jelele	Soutpansberg, Tvl.	21	1954
Kosi Bay	Kosi Bay, Natal	20	1950
Thorncroft	Barberton, Tvl.	16	1967
Eddie Rubenstein Orothamus	Hermanus, Cape	12	1973
Tienie Louw	Barberton, Tvl.	10	1967
Cythna Letty	Barberton, Tvl.	8	1967
Doreen Clark	Pietermaritzburg, Natal	5	1969
Eensaamheid Geome- tric Tortoise	Paarl, Cape	3,6	1972

LOCAL NATURE RESERVES: DIVISIONAL COUNCIL(CAPE PROVINCE)

Kalbaskraal	Kalbaskraal, Malmes- bury Divisional Council	34	1967
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LOCAL NATURE RESERVES: MUNICIPAL(PROCLAIMED)

Die Bos and Prieska- koppie	Prieska, Cape	87	1953
Helderberg	Somerset West, Cape	*80(385)	1960
Leeukuil	Vereeniging, Tvl.	80	1962
Mountain Lake	Matatiele, Cape	80	1975
Tierberg	Keimoes, Cape	77	1971
Bredasdorp	Bredasdorp, Cape	68	1964
Melville Koppies	Johannesburg, Tvl.	68	1959 (3) 1968
Ladismith	Ladismith, Cape	60	1967
King William's Town	King William's Town Cape	59	1973
Lambert's Bay	Lambert's Bay, Cape	57	1967

\* Size of natural portion of Reserve with the total size given in brackets (based on information from NACOR (1974) list.

(3) Proclaimed a natural and historical monument in 1968.

Name of Reserve	Location	Size (ha)	Date of Proclamation
Tygerberg	Bellville, Cape	57	1973
Ramskop	Clanwilliam, Cape	54	1970
De Aar	De Aar, Cape	51	1975
Settlers' Park	Port Elizabeth, Cape	*32 (54)	1938
Jan Marais	Stellenbosch, Cape	23	1962
Ceres	Ceres, Cape	15	1964
Centenary	Montagu, Cape	11	1961
Rondebult	Germiston, Tvl.	11	1955
Villiersdorp	Villiersdorp, Cape	+10	1965
Van Kervel	George, Cape	9	1968
Heidelberg	Heidelberg, Cape	8	1972
Durbanville	Durbanville, Cape	6	1966
Jurischpark	Riversdale, Cape	3	1962

LOCAL NATURE RESERVES: MUNICIPAL (NOT PROCLAIMED)

			(4)
Grahamstown	Grahamstown, Cape	68	1932
New Germany Commonage	New Germany, Natal	41	(5)
Palmiet	Westville, Natal	35	1972
Uvongo River	Margate, Natal	28	1962
Ilanda Wilds	Amanzimtoti, Natal	21	1969
Springside Valley	Hillcrest, Natal	18	1975
Mariannwoods	Pinetown, Natal	12	1977
Bendigo	Bendigo, Natal	5	1975

\* Size of natural portion of Reserve with the total size given in brackets (based on information from NACOR (1974) list.

(4) Date of Establishment.

(5) Not yet open.

Name of Reserve	Location	Size (ha)	Date of Proclamation
<u>SOUTH AFRICAN BANTU TRUST</u>			
Nil.			

NATURAL AREAS WITHIN NATIONAL BOTANIC GARDENS

Karoo Botanic Garden	Worcester, Cape	* <u>±</u> 50 (117)	
O.F.S. Botanic Garden	Bloemfontein, O.F.S.	* <u>±</u> 30 (45)	
Tinie Versveld Flora Reserve	Darling, Cape	* <u>±</u> 20 (21)	
Drakensberg Botanic Garden	Harrismith, O.F.S.	* <u>±</u> 15 (93)	
Natal Botanic Garden	Pietermaritzburg, Natal	* <u>±</u> 4 (50)	
Edith Stephens Cape Flats Flora Reserve	Philippi, near Cape Town	* <u>±</u> 3(3,6)	

PRIVATE NATURE RESERVES (PROCLAIMED)

Gradita	Humansdorp, Cape	92	1973
Mansergh	Bredasdorp, Cape	92	1969
Glendower	Pretoria, Tvl.	88	1973
Ken Heights	Hout Bay, Cape	71	1973
Avalon	Brakpan, Tvl.	51	1955
Boskloof - Schapenberg	Stellenbosch, Cape	50	1973
Sarande	Krugersdorp, Tvl.	50	1957
Pamula Park	Kempton Park, Tvl.	46	1967
Kanon	Mossel Bay, Cape	43	1971
Rooikrans	Montagu, Cape	34	1972
Kranskop	Waterberg, Tvl.	30	1965
Henry Melle	Pretoria, Tvl.	19	1974
J.P. Coetzee	Brakpan, Tvl.	17	1965
Nelspruit	Nelspruit, Tvl.	15	1972
Elangeni	Krugersdorp, Tvl.	11	1961

\* Size of natural portion of Reserve with the total size given in brackets (based on information from NACOR (1974) list.

Name of Reserve	Location	Size (ha)	Date of Proclamation
Samland	George, Cape	10	1973
Voëlvlei	Ceres, Cape	9	1973
Palmenhain	George, Cape	7	1975
Krantzes	Krugersdorp, Tvl.	4	1964
Tinus Yssel	Soutpansberg, Tvl.	1	1964

See TABLE 1.2 for an analysis of the above data.

#### NOTES

1. The Groenkloof National Park in Pretoria (6,76 ha) is excluded as it is the headquarters of the National Parks Board and the NACOR (1974) list records a natural area of approximately 2 ha. Queen Elizabeth Park (93 ha), headquarters of the Natal Parks Board in Pietermaritzburg, is listed in NACOR (1974) as having no natural area and has also been excluded.
2. The following proclaimed areas, controlled by the Cape Department of Nature and Environmental Conservation, are excluded on account of their small size and/or the fact that they have a specialised or administrative function:  
 Jonkershoek Fisheries Station, Stellenbosch (8,5 ha);  
 Pirie Trout Hatchery, King William's Town (8 ha) and  
 Northern Cape Nature Conservation Station, Hartswater (6 ha).  
 The Adelaide Nature Conservation Station (59 ha) is retained on account of the larger size of the property.  
 In the Transvaal the following administrative and specialized institutions are excluded (no size given): Head Office, the fisheries at Lydenburg, Marble Hall and Hartbeeshoek and the nursery at Hartbeeshoek.

3. The Doreen Clark Provincial Nature Reserve (5 ha) is retained as it is not open to the public and the entire area is managed as a remnant of mist-belt forest. Likewise the Eensaamheid Geometric Tortoise Reserve (3,6 ha) remains on account of its specialist function in preserving an endangered species.
4. It is possible that certain very small proclaimed municipal reserves in the Cape Province should be excluded, e.g. Jurischpark, Riversdale (3 ha) and Durbanville Nature Reserve (6 ha). The determining factor is how much of the nature reserve, however small, is cultivated wild garden and how much is natural and as self-perpetuating as possible. Lists of conservation areas are more valuable if they include the area of the reserve which complies with the latter criterion together with the total area of the reserve. The author has no information on the reserves in question and they are retained in view of their proclamation by the Provincial Nature Conservation Department.
5. The Austin Roberts Bird Sanctuary (13 ha) and Frank Struben Bird Sanctuary (1,6 ha) both in Pretoria, and Gonubie Mouth Bird Sanctuary (8 ha) near East London (all proclaimed by the Provincial Administrations) are excluded on account of their specialist function. The former Westdene Pan Nature Reserve (44 ha) in Benoni, proclaimed a Game and Nature Reserve in 1950 and a Game Reserve and Flora Nature Reserve in 1954, has subsequently been renamed Korsmans Bird Sanctuary (Pers. comm. Town Clerk, 1977) and is also excluded.
6. The natural portions of the National Botanic Gardens are included.
7. The Sea Fisheries Conservation Areas listed in NACOR (1974) are not included as the size of each area is not given.

8. For purposes of the totals given from which the percentages of reserves less than 100 ha are calculated, in Table 1.2, the Public Resort Nature Reserves in Natal, all greater than 100 ha, are excluded. These are Midmar, Wagendrift, Spienkop, Albert Falls and Chelmsford. Vaal Dam and Roodeplaat Dam in the Transvaal are listed in NACOR (1974) with natural areas of over 100 ha and are therefore retained. The Amalinda Warm-water Fish Station (385 ha) in the Cape is excluded on account of its specialist function.

#### S O U R C E S

- Cape Department of Nature Conservation.: List of Conservation areas.  
1976
- NACOR (National Committee for Nature Conservation).: Register of  
1974 Permanent Conservation Areas in South and South West  
Africa (August 1973). Koedoe 17. P. 85 - 119.
- Natal Parks, Game and Fish Preservation Board.: List of Conservation  
1977 Areas.
- Orange Free State Nature Conservation Section.: Correspondence.  
1976
- S.A. Nature Foundation.: A Guide to the National Parks, Game and  
1972 Nature Reserves of Southern Africa. Stellenbosch.  
226 pp.
- Transvaal Nature Conservation Division.: List of Conservation areas.  
1976
- Wildlife Society of Southern Africa.: Urban Nature Reserves of  
1976 Natal. Natal Wildlife 17,11. November. P. 5 - 7.

## APPENDIX 2

SURVEY OF VISITORS TO THE PICNIC SITEAT KRANTZKLOOF NATURE RESERVE

Purpose of survey: To assess the value of a picnic site in a nature reserve, to investigate the extent to which the users of the picnic area participate in activities other than picnicking and the extent to which they wander from the site.

---

QUESTIONNAIRE

1. Number in party?
2. Where do you live? Area; house/flat/hotel.
3. How often do you visit natural areas/nature reserves?  
 + 1/week, + 1/month, + 6/year, + 2-3/year, + 1/year,  
 never.
4. Have you been to Krantzkloof before? If yes, how many times?
5. Purpose of visit? Picnic/braai, other .....?  
 Have you come to observe or learn about nature e.g. birds or  
 plants?
6. Will you/have you walk(ed) beyond the picnic site?  
 How far?
7. How long did you stay at Krantzkloof?

ANALYSIS OF RESULTS

1. The survey was conducted on four occasions : two on Sundays, one of which was during a long week-end, and two on midweek public holidays. A total of 860 people in 122 groups was surveyed. On these days a total of 934 visitors to the nature reserve was recorded.

		<u>1</u>	<u>2</u>	<u>3</u>	<u>Column Headings</u>
Sunday	2/1/1977	32	214	225	1. No. of Groups Interviewed.
Thursday	19/5/1977	35	262	254	2. No. of people.
Tuesday	31/5/1977	24	232	273	3. No. recorded by the Ranger-in-Charge.
Sunday	19/6/1977	31	152	182	
	TOTALS:	<u>122</u>	<u>860</u>	<u>934</u>	

2. ORIGIN OF VISITORS

<u>† (km)</u>	<u>Centre</u>	<u>Total No.</u>	<u>% of Total</u>
27	Durban	503	58,5
9	Pinetown	165	19,2
11	Hillcrest & Gillitts	54	6,3
4	Kloof	25	2,9
19	Queensburgh	21	2,4
17	Westville	19	2,2
12	New Germany	13	1,5
50	Amanzimtoti	12	1,4
60	Pietermaritzburg	12	1,4
	‡Other areas	22	2,6
	+Foreign	14	1,6
		<u>860</u>	<u>100,0</u>

† Approximate distance from Krantzkloof (km).

‡ Other areas: Umhlanga, Ballitoville, Empangeni, Uvongo, Ladysmith, Johannesburg and East London.

+ Foreign : Rhodesia, Britain and United States of America.

Flat/Hotel Dwellers: 237 (or 36,0%) out of 659 questioned. (Initially this was not determined in the questionnaire, but when several respondents mentioned that they lived in flats, it was included. The remaining 64% lived in houses).

3. FREQUENCY OF VISITS TO NATURAL AREAS

	<u>+No. of Groups</u>	<u>% of Total</u>
1/week	19	15,6
1/month	40	32,8
4-8/year	34	27,9
2-3/year	23	18,8
1/year	6	4,9
Never	-	-
	<u>122</u>	<u>100,0</u>

(+ The answers given by a single spokesman in each group are recorded in this and subsequent questions).

4. FREQUENCY OF VISITS TO KRANTZKLOOF NATURE RESERVE

	<u>No. of Groups</u>	<u>% of Total</u>
Never	26	21,3
1-5 times	49	40,2
6-10 times	16	13,1
11-20 times	10	8,2
20 times +	21	17,2
	<u>122</u>	<u>100,0</u>

5. PURPOSE OF VISIT

	<u>No. of Groups Responding</u>	<u>% of 122 Groups Interviewed</u>	<u>% of All Responses</u>
Picnic/braai/+tea	104	85,2	38,9
Walk	89	72,9	33,3
Relax, getting away from city	37	30,3	13,9
Sightseeing, photography	20	16,4	7,5
Wildlife study/observation	15	12,3	5,6
Service project (clearing paths)	1	0,8	0,4
Swim (despite Bilharzia notice)	1	0,8	0,4
	<u>267</u>	<u>218,7</u>	<u>100,0</u>
(+ only 3 groups)			

Of the 104 groups which picnicked:

31 (29,8%) merely picnicked without pursuing any other activity.

72 (69,2%) walked beyond the picnic area.

Of the 15 groups which indicated wildlife study/observation:

13 (86,7%) were among the 104 groups which picnicked.

2 (13,3%) were among the 18 non-picnickers.

6. LENGTH OF TIME SPENT WALKING

½ hr. and less	28	}	58	65,2%	1 hour and less.
½ hr. - 1 hr.	30				
1 hr. - 1 ½ hrs.	13	}	31	34,8%	More than 1 hour.
1 ½ hrs. - 2 hrs.	12				
2 hrs. +	6				
	<u>89</u>				

WALKING: Analysis of Picnickers and Non-picnickers and Destinations.

	<u>Picnickers</u>		<u>Non-picnickers</u>	
	<u>1 hr. &amp; less</u>	<u>+ 1 hr.</u>	<u>1 hr. &amp; less</u>	<u>+ 1 hr.</u>
Gorge	38	13	4	7
Upper Trail	9	8	4	2
Up Valley	1	1	-	-
Road	2	-	-	-
	<u>50</u>	<u>22</u>	<u>8</u>	<u>9</u>

Of 72 Picnickers: 50 (69,4%) walked for 1 hour or less.

22 (30,6%) walked for more than 1 hour.

Of 17 Non-picnickers: 8 (47,1%) walked for 1 hour or less.

9 (52,9%) walked for more than 1 hour.

7. LENGTH OF STAY AT KRANTZKLOOF

	<u>No. of Groups</u>	<u>% of Total</u>
Up to 1 hour	11	9,0
1 - 2 hours	12	9,8
2 - 3 hours	11	9,0
3 - 4 hours	22	18,0
4 - 5 hours	28	23,0
5 - 6 hours	18	14,8
6 - 7 hours	15	12,3
More than 7 hours	5	4,1
	<u>122</u>	<u>100,0</u>

8. COMMENTS MADE BY RESPONDENTS.

Near to Durban : important factor with petrol restrictions  
(7 groups).

Change from beach : (4 groups).

Lack of picnic/braai sites in Durban area : (3 groups).

More walks and nature reserves needed : (3 groups).

No Indians : (2 groups). (One group of 9 Indians was  
interviewed on a different day to  
when these remarks were made).

Too many people : (1 group).

Too developed : radios, cars and smoke detract. (By contrast  
16 groups (13,1%) specifically commented on  
the peace and quiet - but only one such  
comment was made on this day).

Lacks bird life : (True of picnic site, but not away from it  
or when the site is empty).

Ball games should not be allowed.

Site needs to be enlarged.

Good facilities offered and it is free.

APPENDIX 3

USE OF THE PALMIET NATURE RESERVE: 1973-1976

USE	1973	1974	1975	1976	TOTALS
+GENERAL PUBLIC	4 753	5 218	3 634	4 118	17 723
SCHOOL CROSS-COUNTRY	2 809	3 941	4 764	1 389	12 903
WILDLIFE SOCIETY TRAILS	191 (6)	276 (10)	31 (2)	315 (11)	813 (29)
SCHOOLS	965 (23)	566 (22)	90 (3)	430 (12)	2 051 (60)
UNIVERSITY OF DURBAN-WESTVILLE	-	61 (5)	79 (4)	232 (33)	372 (42)
BOY SCOUTS/CUBS	232 (18)	499 (53)	645 (47)	173 (9)	1 549 (127)
GIRL GUIDES/BROWNIES	228 (13)	125 (5)	48 (2)	137 (7)	538 (27)
PIONEER CLUB	-	-	284 (38)	358 (34)	642 (72)
CHURCH GROUPS	191 (8)	359 (11)	50 (3)	79 (5)	679 (27)
OTHER GROUPS	206 (10)	58 (4)	96 (10)	83 (4)	443 (28)
RECORDED TOTALS	9 575 (78)	11 103 (110)	9 721 (109)	7 314 (115)	37 713 (412)
+GENERAL PUBLIC ADJUSTED (See Note 2)	7 011	7 697	5 360	6 074	26 142
REVISED TOTALS	11 833	13 582	11 447	9 270	46 132

Source and Notes on next page.

Source: Chairman's Annual Reports,  
Palmet Nature Reserve Management Committee.

NOTES:

1. The figure in brackets ( ) represents the number of groups which visited the Reserve.
  
2. + The general public statistics are derived from visitor books which are kept at the two official entrances to the Reserve. A survey in 1976 on 13 different occasions involving 139 groups indicated that 47,5% did not enter details in the books. The general public statistics are therefore increased by 47,5%, resulting in the revised totals.

## APPENDIX 4

SURVEY OF VISITORS TO THE PALMIET NATURE RESERVE

Purpose of the survey: To discover the composition and origin of visitors to the Reserve, the frequency of their visits, the extent to which they traverse the Reserve, their reasons for visiting the Reserve, their opinions of it and suggestions for its management.

The survey was conducted by means of personal interviews, with the interviewer recording the response of one member of the party where more than one person was present. Respondents were not informed that the survey formed part of this thesis, as it was felt that this might inhibit responses. The reason for the survey, as stated to respondents, is given in the introduction to the questionnaire. The results of the survey will be published in a report to the Palmet Nature Reserve Management Committee and the Borough Council of Westville for their consideration.

The survey was conducted over a 12 week period from 24/7/1976 until 17/10/1976. During this time, interviews were conducted with 169 groups which totalled 645 people. Most interviews took place over week-ends, when a large number of people visit the Reserve, but a number of week-day interviews is also included. Interviews were conducted randomly as individuals or groups were encountered in walking around the Reserve. Not all the visitors to the Reserve on any particular day were interviewed.

QUESTIONNAIREPALMIET NATURE RESERVE VISITOR SURVEY

Your co-operation in this survey will be appreciated. It is designed to find out your opinions and use of the Reserve. The results will help to determine future management policies and hopefully make the Palmiet Nature Reserve a more enjoyable place to visit.

DATE: / /	TIME:	Q.NO.	GROUP ID.NO.
1. *Personal details: <u>1.1/1.2</u> <u>1.3/1.4/1.5/1.6/1.7:</u> <u>1.8:0-10/11-20/21-30/</u> <u>31-60/61+</u> 1.9:Occupation: _____		5. How often to you visit natural areas/nature reserves?  + once a week   5.1 + once a month   5.2 + 2-3 times a year   5.3 + once a year   5.4 never   5.5	
2. Group details: alone   2.1 with family   2.2 mixed group   2.3 organised party   2.4 2.5 Name of organisation: _____ 2.6 Total No. in party: _____ 2.7 No. of adults: _____ 2.8 No. of children: _____		6. Have you visited Yes   6.1 Palmiet Nature Reserve before? No   6.2 6.3 If yes, how many times? <u>1x/2x/3x/4x/5x+</u> 6.4 How did you hear about it? _____	
3. Where do you live? Westville   3.1 Durban Central/Berea   3.2 Durban North   3.3 Durban South/Bluff   3.4 Pinetown   3.5 Other: _____   3.6		7. Approx.length/ 1 hour anticipated or less   7.1 length of 1-2 hours   7.2 visit 2-3 hours   7.3 3-4 hours   7.4 4 hours +   7.5 State: _____ hours	
4. Are you a member Yes   4.1 of a Conservation Society? No   4.2 4.3 If yes, which? _____		8. How many people 0-2   8.1 would you like 3-10   8.2 to encounter? 11-20   8.3 20+   8.4	

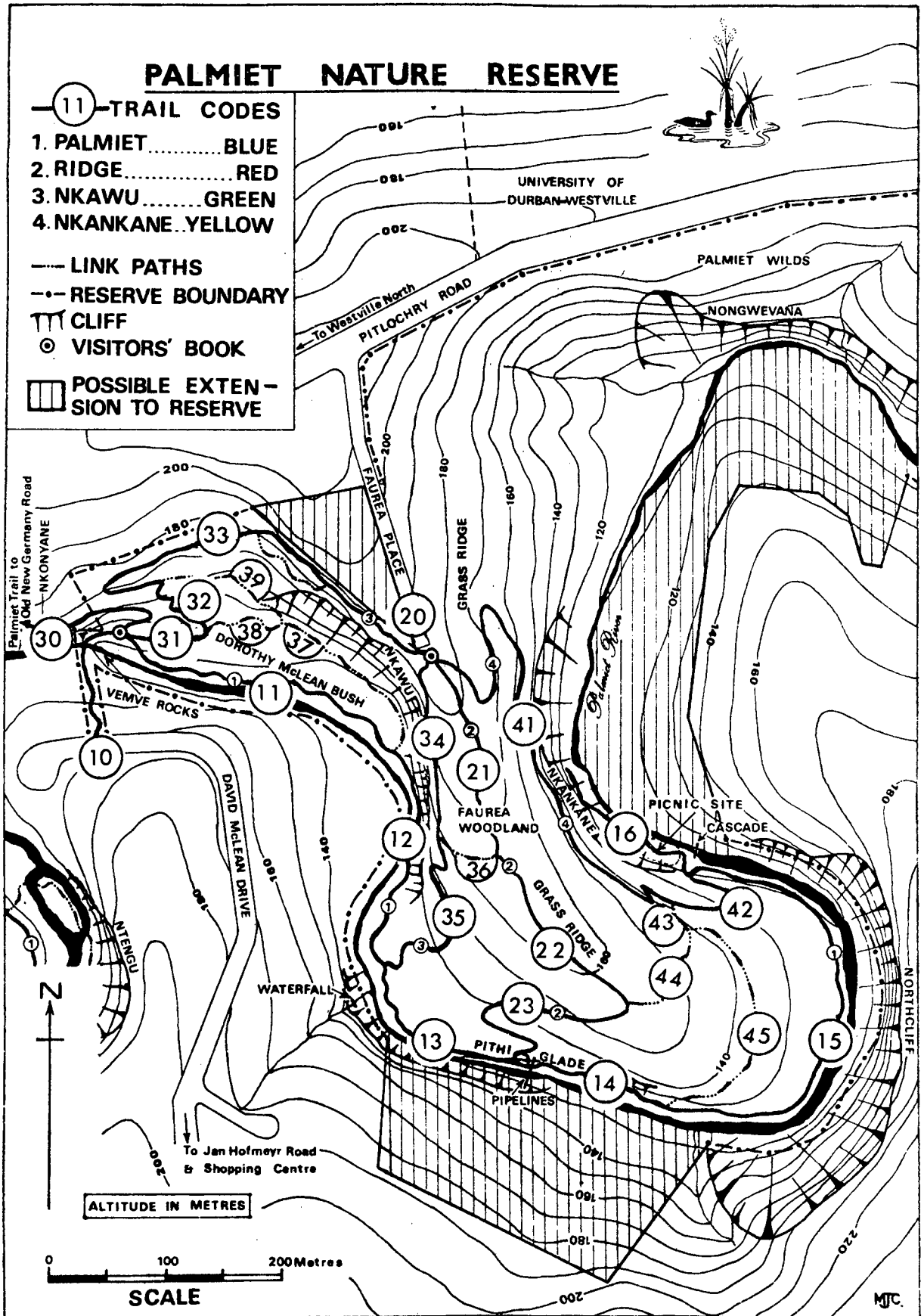
\*KEY TO Q.1

(not typed on questionnaire used in the field)

1.1 African  
1.2 Asian  
1.3 Coloured  
1.4 White

1.5 Afrikaans speaking  
1.6 English speaking  
1.7 Other language  
1.8 Age group

MAP A4.1 PALMIET VISITOR SURVEY QUESTIONNAIRE MAP



9. Which part of the Reserve did you visit/intend to visit?

MARK ON MAP

10. What is the purpose of your visit? SHOW CARD.

(More than one can be selected)

Walking	10.1
Picnicking	10.2
Photography	10.3
Bird-Watching	10.4
Other nature study	10.5

State: \_\_\_\_\_

Getting away from it	10.6
Others	10.7

State: \_\_\_\_\_

11. OPINION OF RESERVE

Does the Palmiet Nature Reserve serve your needs in the category/ies selected in Q.10?

Very well	11.1
Satisfactory	11.2
Could be improved	11.3
Not at all	11.4

Yes	13.1
No	13.2
N/O	13.3

12. What values do you feel the Palmiet Nature Reserve offers?

SHOW CARD

(One or more)

Solitude	12.1
Aesthetic enjoyment	12.2
Learning about nature	12.3
Exercise	12.4
No or very little value	12.5
Others	12.6

State: \_\_\_\_\_

Preamble to Qs. 13-16

The Palmiet Nature Reserve (35ha) cost R1100 to administer in 1974/75. Westville Park (Civic Centre-17ha) cost R26 800 in the same year (exclusive of the sporting facilities-merely lawns and a few gardens). Mitchell Park, Durban would cost considerably more to administer. STRESS THAT THE FOREGOING FACTS NEED NOT INFLUENCE OPINIONS GIVEN IN THE FOLLOWING QUESTIONS.

KEY: N/O = NO OPINION

13. Would you prefer to see Palmiet Nature Reserve turned into a park like Mitchell Park, Durban with lawns, indigenous and exotic trees, birds in aviaries and a selection of animals and reptiles in enclosed areas, a fountain, water areas and tea-room?

Yes	14.1
No	14.2
N/O	14.3

14. Would you like to see more wild animals, bearing in mind the cost of supplementary feeding, + of fencing the reserve and possible admission charges?

Yes	14.1
No	14.2
N/O	14.3

+(Explain that Reserve too small to support large mammals)

15. In your opinion does the Palmiet Nature Reserve satisfy the requirements of a nature reserve?

Yes	15.1
No	15.2
N/O	15.3

15.4 If No (15.2) give reason:

MANAGEMENT SUGGESTIONS

16. Which of the following management policies meets with your approval?

## SHOW CARD

(one or more choices)

- |   |       |
|---|-------|
| Leave the Reserve as it is at present                               | 16.1  |
| Leave the Reserve entirely natural: do not admit the general public | 16.2  |
| Remove the bush and undergrowth so that it is like a park           | 16.3  |
| Improve trail markers   | 16.4  |
| Improve main paths  | 16.5  |
| Improve all paths   | 16.6  |
| Provide more outdoor educational aids                               | 16.7  |
| Provide interpretative Centre                                       | 16.8  |
| Provide comfortable benches   | 16.9  |
| Provide rustic seats e.g. logs                                      | 16.10 |
| Provide tea-room  | 16.11 |
| Provide toilet facilities   | 16.12 |
| Provide swings, etc. for children                                   | 16.13 |
| Improve parking   | 16.14 |
| Improve access  | 16.15 |
| Others  | 16.16 |
| State: _____  |       |

KEY: N/O = NO OPINION

- |  |     |      |
|--|-----|------|
| 17. If a self-guided trail was available in the Reserve, would you use it? | Yes | 17.1 |
|  | No  | 17.2 |
|  | N/O | 17.3 |

If YES (17.1) which of the following would you be prepared to purchase?

- |                               |      |
|-------------------------------|------|
| A typed sheet (cost +5c)      | 17.4 |
| A small typed booklet (+ 25c) | 17.5 |
| A printed booklet (+75c)      | 17.6 |

18. What is your overall assessment of the Palmiet Nature Reserve?

- |                              |      |
|------------------------------|------|
| Excellent/very favourable    | 18.1 |
| Good/favourable/satisfactory | 18.2 |
| Poor/unfavourable            | 18.3 |
| Unable to assess.            | 18.4 |
- (one choice)

Note down any faults and/or suggested improvements or any other comments visitor would like to make, in space below.

THANK VISITOR FOR HIS/HER CO-OPERATION

ANALYSIS OF RESULTS1. PERSONAL DETAILS

Of the 645 people in groups surveyed, the following were:

	<u>No.</u>	<u>% of Total</u>
1.1 African	2	0,3
1.2 Asian	30	4,6
1.3 Coloured	5	0,8
1.4 White	608	94,3
	<u>645</u>	<u>100,0</u>
1.5 Afrikaans speaking	60	9,3
1.6 English speaking	572	88,7
1.7 Other: (German 5, Italian 3, Dutch 2, Danish 1)	13	2,0
	<u>645</u>	<u>100,0</u>
1.8 Estimated age group:		
0 - 10 years	214	33,2
11 - 20 years	115	17,8
21 - 30 years	117	18,2
31 - 60 years	173	26,8
61 years +	26	4,0
	<u>645</u>	<u>100,0</u>

Note: Apart from 1.9 (the occupation of the spokesman of the the group, where more than one person was interviewed) these coded details were completed in private by the interviewer at the conclusion. This was to avoid initial antagonism towards the survey which might have resulted from asking personal details such as age. The ages are estimates and cannot be considered to be accurate.

1.9. Occupation:

	<u>No. of Groups</u>	<u>% of Total</u>
Commerce	32	18,9
Industry, including Engineering	32	18,9
Housewife	18	10,7
University student	16	9,5
Scholar	16	9,5
Teacher (University 6, School 6)	12	7,1
Other profession (Medical 4, Accountant 4, Legal, Architect, Clergyman)	11	6,5
Retired	11	6,5
Administration	8	4,7
Services	7	4,1
Other (Transport 4, Farmer, Policeman)	6	3,6
	<u>169</u>	<u>100,0</u>

2. GROUP DETAILS

Of the 169 groups interviewed, the following were:

	<u>No. of Groups</u>	<u>% of Total</u>
2.1 Alone	20	11,8
2.2 In family group	88	52,1
2.3 In mixed group	54	32,0
2.4 In organised party	7	4,1
	<u>169</u>	<u>100,0</u>

## 2.5 Names of Organisations:

Brownies, Girl Guides, Pioneers, School, Youth group,  
Birthday group, Durban Joint Council.

2.6 Total number of people in the 169 groups : 645

2.7 Adults: 330 or 51,2%

2.8 Children: 315 or 48,8%

3. ORIGIN OF VISITORS

		<u>No.</u>	<u>% of Total</u>
3.1	Westville	395	61,2
3.2-3.4	Durban <sup>1</sup>	106	16,4
3.5	Pinetown	51	7,9
3.6	Other areas:		
	Metropolitan Durban <sup>2</sup>	28	4,3
	Pietermaritzburg	13	2,0
	Rest of Natal <sup>3</sup>	21	3,3
	Rest of South Africa <sup>4</sup>	19	3,0
	Foreign <sup>5</sup>	12	1,9
		<u>645</u>	<u>100,0</u>

1. Durban: Central 84, North 14, South 8.
2. Other areas in metropolitan Durban: Amanzimtoti 9, New Germany 6, Kloof 4, Hillcrest 4, Queensburgh 2, Umhlanga 1, Inchanga 1, Bothas Hill 1.
3. Rest of Natal: Tongaat 6, Babanango 6, Winterton 6, Port Shepstone 2, Verulam 1.
4. Rest of South Africa: Johannesburg 5, Port Elizabeth 3, Piet Retief 3, Cape Town 2, East London 2, Germiston 1, Windhoek 1, Grahamstown 1, Northern Cape 1.
5. Foreign: Britain 5, Rhodesia 2, Netherlands 2, Austria 2, Eire 1.

4. MEMBERSHIP OF A CONSERVATION SOCIETY

		<u>No. of Groups</u>	<u>% of Total</u>
4.1	Yes	59	34,9
4.2	No	110	65,1
		<u>169</u>	<u>100,0</u>

4.3 Conservation Organisations:

	<u>No. of Groups</u>	<u>% of 169</u>
Wildlife Society of Southern Africa	55	32,5
Others	15	8,9
	<u>70</u>	

Natal Bird Club (7), Veldtrust, Land Service, SACCAP, Valley Trust, Organic Soils Association, Farmers Conservation Committee, Natural History Society in the Netherlands, Okavango Wildlife Society.

(Some respondents belonged to more than one organisation).

5. FREQUENCY OF VISITS TO NATURAL AREAS/NATURE RESERVES

	<u>No. of Groups</u>	<u>% of Total</u>
5.1 Approximately once a week	24	14,2
5.2 Approximately once a month	63	37,3
5.3 Approximately 2-3 times a year	63	37,3
5.4 Approximately once a year	17	10,0
5.5 Never	2	1,2
	<u>169</u>	<u>100,0</u>

6. FREQUENCY OF VISITS TO PALMIET NATURE RESERVE

	<u>No. of Groups</u>	<u>% of Total</u>
6.1-6.3 Never	63	37,3
Once	11	6,5
Twice	13	7,7
3 Times	15	8,9*
4 Times	17	10,0
5 Times or more	50	29,6
	<u>169</u>	<u>100,0</u>

\*106 (62,7%) have visited previously.

6.4 How visitors became aware of the Reserve:

	<u>No. of Responses</u>	<u>% of Total</u>
Wildlife Society publicity, trails and guide book	28	15,6
Street sign	24	13,4
Press (20) and other publicity (2)	22	12,3
Reserve Management Committee	17	9,5
Westville resident	14	7,8
Live nearby	13	7,3
Mentioned by friends	13	7,3
Result of school visits (8) and school cross-country (3)	11	6,1
Result of visits by various groups	10	5,6
By chance motoring	10	5,6
Local Chemist (sells guide book)	9	5,0
From students at University of Durban-Westville	8	4,5
	<u>179</u>	<u>100,0</u>

(Some respondents gave more than one reason)

7. LENGTH OF TIME SPENT IN RESERVE

	<u>No. of Groups</u>	<u>% of Total</u>
7.1 1 hour or less	36	21,3
7.2 1 - 2 hours	59	34,9
7.3 2 - 3 hours	39	23,1
7.4 3 - 4 hours	23	13,6
7.5 4 hours +	12	7,1
	<u>169</u>	<u>100,0</u>

Of those who spent more than 4 hours in the Reserve, 3 spent approximately 5 hours, 7 approximately 6 hours, 1 approximately 7 hours and 1 approximately 11 hours.

8. NUMBER OF PEOPLE RESPONDENTS WOULD LIKE TO ENCOUNTER

	<u>No. of Groups</u>	<u>% of Total</u>
8.1 0 - 2 people	87	51,5
8.2 3 - 10 people	47	27,8
8.3 11 - 20 people	12	7,1
8.4 20 people+	23	13,6
	<u>169</u>	<u>100,0</u>

Comment by a respondent: Although it is ideal to have few people for solitude qualities, the remoteness of the Reserve renders it desirable to have more people around for security reasons.

9. PATHS USED IN RESERVENotes:

1. The data collected in this section has been used in the compilation of Figure 4.2 which shows the density of visitors surveyed using the trails.
2. To accommodate the fact that some parties follow circular trails while others return along the same path, the number in the party was doubled at the entrances and on the stretches of trail where return journeys occurred.
3. The codes of the paths and entrances are indicated on the map accompanying the questionnaire (MAP A4.1).

Numbers of people using the entrances and trails in the Reserve:

	<u>No.</u>	<u>% of Total</u>
Entrance in David McLean Drive (10)	1 127	87,4
Entrance in Faurea Place (20)	113	8,7
Entrance in Old New Germany Road, via River (labelled 30 - Map A4.1)	50	3,9
	<u>1 290 *</u>	<u>100,0</u>

\* This is double the 645 people represented by the total number of people in the 169 groups interviewed.

	<u>Path No.</u>	<u>No.</u>		<u>Path No.</u>	<u>No.</u>
Palmiet Trail	11	787		33	306
	12	756		34	57
	13	652		35	78
	14	491	Link Paths	36	17
	15	460		37	81
	16	564		38	105
				39	32
Ridge Trail	21	138			
	22	140	Nkankane Trail	41	269
	23	120		42	284
			Link Paths	43	22
Nkawu Trail	31	401		44	33
	32	296		45	11

Extent to which visitors follow a circular trail:

	<u>No.</u>	<u>% of Total</u>
Numbers following a circular trail	439	68,1%
Numbers returning along the same route	206	31,9%
	<u>645</u>	<u>100,0%</u>

10. PURPOSE OF VISIT

	<u>No. of Groups Responding</u>	<u>% of 169 Groups Interviewed</u>	<u>% of All Responses</u>
Nature study and observation	90	53,2	23,6
Recreational activities	291	172,2	76,4
	<u>381</u>	<u>225,4</u>	<u>100,0</u>

Detailed analysis:

## NATURE STUDY AND OBSERVATION

	<u>No. of Groups Responding</u>	<u>% of 169 Groups Interviewed</u>	<u>% of All Responses</u>
General nature study	34	20,1	8,9
Bird watching	31	18,3	8,1
Flora	14	8,3	3,7
Fauna, butterflies, insects, soil	6	3,5	1,6
Leading school or youth group	5	3,0	1,3
	<u>90</u>	<u>53,2</u>	<u>23,6</u>

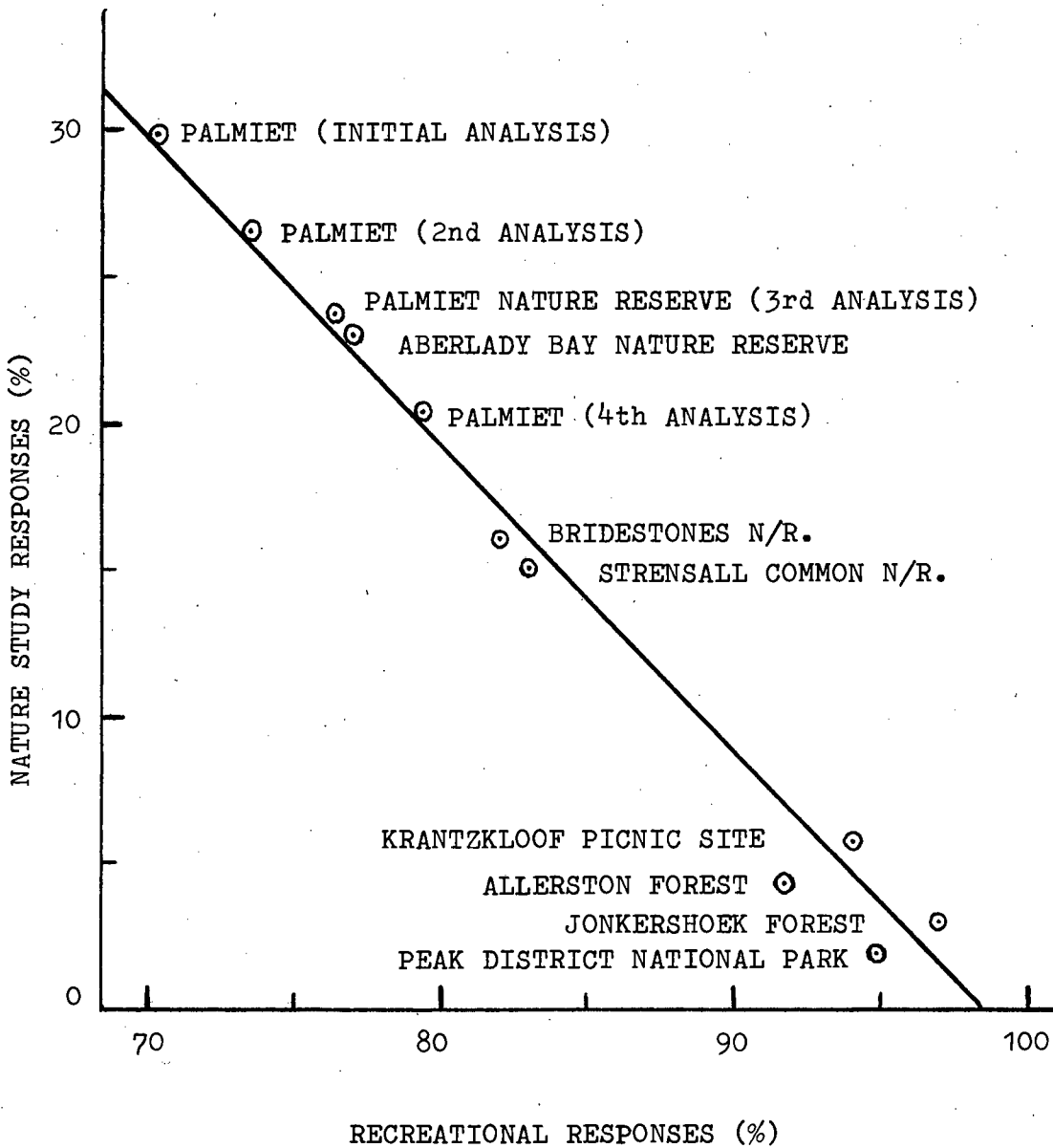
## RECREATION

Walking	113	66,9	29,7
Getting away from city, noise etc.	93	55,0	24,4
Picnicking	31	18,3	8,1
Exploration/curiosity	18	10,7	4,7
Photography	14	8,3	3,7
Cross country, climbing cliffs, orienteering	9	5,3	2,4
Relaxation, drawing, painting, music	9	5,3	2,4
Other: play by river, search for someone	4	2,4	1,0
	<u>291</u>	<u>172,2</u>	<u>76,4</u>

FIGURE A4.1

PALMIET VISITOR SURVEY

ANALYSES OF RECREATIONAL AND NATURE STUDY RESPONSES



	<u>No.</u>	<u>% of Total</u>
Number of groups recording nature study only	16	9,4
Number of groups recording nature study and recreation	54	32,0
Number of groups recording recreational activities only	99	58,6
	<u>169</u>	<u>100,0</u>

A note on the analysis of the activities of visitors and the adjustments made.

In the initial analysis of the activities of visitors to the Palmiet Nature Reserve, the proportion of nature study and observation categories in relation to recreational activities was high in comparison to similar surveys undertaken, mainly in Britain, and summarised in Table 2.1 and Figure 2.1. The results of the initial and alternative analyses of the Palmiet Nature Reserve survey in relation to the surveys depicted in Figure 2.1 are shown in Figure A 4.1 and are tabulated as follows :

<u>Palmiet Nature Reserve</u>	<u>Activity of Visitors (%)</u>	
	<u>Nature Study</u>	<u>Recreation</u>
Initial analysis	29,7	70,3
2nd analysis	26,5	73,5
3rd analysis	23,6	76,4
4th analysis	20,3	79,7

The percentage of 29,7% for nature study activities in the initial analysis seems excessive when compared to the range of 23% to 1,9% for this category in the other surveys. It is unlikely that visitors to the Palmiet Nature Reserve are more prone to study nature than in Reserves in Britain. The figure is therefore suspect and probably results from faulty questionnaire structure and the recording of the responses.

Examination of the nature study responses offers the prospect for modification. The questionnaire was designed so that respondents were shown a card which indicated some of the reasons why people visit the Nature Reserve (refer to question 10 in the questionnaire). This could have the effect of influencing a visitor, pursuing a recreational activity, to select a nature study category. Had the categories not been suggested to the respondent, purely recreational reasons might have been given. The nature study categories were bird-watching and other nature study where respondents were required to state which they were studying. In the analysis there were 49 responses for bird-watching and 49 respondents stated that they were studying all or no specific aspects of nature. The latter were classified as general nature study. The 49 responses in each of these two categories represent 98 out of a total of 414 responses or 23,7%. In 18 instances both general nature study and bird-watching were recorded. Realising that it is possible to do bird-watching and to study nature in general, bird-watching may also be regarded as part of the general study of nature. These 18 cases may be eliminated from the bird-watching category which has the effect of reducing the nature study proportion to 26,5%. This is recorded as the second analysis.

A second possibility, as reflected in the third analysis, is to remove the 18 bird-watching responses as suggested previously and 15 suspect cases from general nature study which are vaguely recorded and associated with purely recreational responses. It is possible that these respondents were motivated more by walking or picnicking in a natural area than by specific nature study. The 34 general nature study responses are made up of 18 associated with bird-watching and 16 which can be positively identified with nature study. The removal of 33 responses has the effect of reducing nature study to 23,6% and the total responses from 414 to 381.

A third adjustment (in the fourth analysis) is to retain all the 49 bird-watching responses and to eliminate all 49 cases in the general nature study category on grounds that some responses are suspect. This reduces nature study to 20,3%. However such an adjustment is drastic as it excludes the 16 adequate responses mentioned in the previous paragraph

The third analysis is selected for use in this thesis as it reduces the nature study category significantly to a similar figure obtained by Usher (1967) at Aberlady Bay Nature Reserve, the highest of all the surveys cited.

#### 11. OPINION OF THE RESERVE IN RELATION TO USE.

Extent to which the Reserve serves respondents, in the category selected in question 10:

	<u>No. of Groups</u>	<u>% of Total</u>
11.1 Very well	70	41,4
11.2 Satisfactory	76	45,0
11.3 Could be improved	22	13,0
11.4 Not at all	1	0,6
	<u>169</u>	<u>100,0</u>

Two respondents qualified their choice of 11.1 by taking into consideration the small size of the Reserve and its urban location. A weakness of this question is that it assumes that the category selected by respondents applies uniformly to all the reasons for visiting the Reserve given in question 10. It does not allow for a variation in opinion, for example, in the choice of 11.3 for picnicking (10.2) and 11.2 for walking (10.1).

12. VALUES OFFERED BY THE RESERVE.

	<u>No. of Groups Responding</u>	<u>% of 169 Groups Interviewed</u>	<u>% of All Responses</u>
12.1 Solitude	98	58,0	24,0
12.2 Aesthetic enjoyment	98	58,0	24,0
12.3 Learning about nature	109	64,5	26,6
12.4 Exercise	103	60,9	25,2
12.5 No or little value	1	0,6	0,2
	<u>409</u>	<u>242,0</u>	<u>100,0</u>

A respondent added that the solitude value is lost when schools visit the Reserve and another mentioned that solitude is only possible on week-days when fewer people visit. A respondent felt that the Reserve is too small to be of value for exercise.

12.6 Other values suggested:

A refuge for birds.

Important for preserving local flora. Preserves natural vegetation, ruthlessly destroyed in Natal and Westville.

Emphasises the destruction of our natural environment.

An unspoilt area.

A refuge from the city. Allows a break from the house.

Provides adventure for children.

Provides close contact with nature and with God.

13. PREFERENCE: PALMIET NATURE RESERVE TURNED INTO A FORMAL PARK WITH WILDLIFE IN ENCLOSED AREAS.

	<u>No. of Groups</u>	<u>% of Total</u>
13.1 Yes	7	4,1
13.2 No	161	95,3
13.3 No opinion	1	0,6
	<u>169</u>	<u>100,0</u>

This question resulted in strong reactions, with comments such as it is cruel to cage animals and birds, animals should be left in wild state, it would attract too many people and the Reserve is too rugged, being recorded. Three respondents suggested that a portion of the Reserve could be developed in a formal manner, with enclosed wildlife. Another agreed to the idea, but without a tearoom.

14. INCREASE ANIMALS IN THE RESERVE

	<u>No. of Groups</u>	<u>% of Total</u>
14.1 Yes	62	36,7
14.2 No	92	54,4
14.3 No opinion	15	8,9
	<u>169</u>	<u>100,0</u>

Additional comments to yes response: Provided it is kept natural with no artificial enclosures, only small animals (2), nice for children, provided no expense (2), provided fence not visible and no roads constructed.

No response: Not a zoo, leave Reserve as it is (2), prefer to see animals in natural state but would like to see more, no more animals than the area can support, too close to development, take care not to upset the balance of nature.

15. OPINION: WHETHER RESERVE SATISFIES THE REQUIREMENTS OF A NATURE RESERVE.

	<u>No. of Groups</u>	<u>% of Total</u>
15.1 Yes	137	81,1
15.2 No	11	6,5
15.3 No opinion	21	12,4
	<u>169</u>	<u>100,0</u>

15.4 Reasons why Reserve does not satisfy the requirements of a nature reserve:

It is not big enough to re-introduce former large animal life. The reserve is too small (7). It only partially fulfils the requirements. It lacks wildlife and a fence (2). It lacks animals (6). There is insufficient control. Too close to urban development (4). There is insufficient interesting flora and fauna.

Several respondents qualified their yes choice with comments such as:

It is wild, untouched, unspoilt, not commercialized, considering its urban situation (3), small size (2) and wide variety of vegetation and walks.

16. MANAGEMENT SUGGESTIONS

	<u>No. of Groups</u>	<u>% of 169 Groups</u>
16.1 Leave the Reserve as it is	122	72,2
16.2 Do not admit the general public	1	0,6
16.3 Clear the bush - like a park	7	4,1
16.4 Improve the trail markers	64	37,9
16.5 Improve the main paths	22	13,0
16.6 Improve all the paths	7	4,1
16.7 Provide more educational aids	112	66,3
16.8 Provide an interpretative centre	65	38,5
16.9 Provide benches	9	5,3
16.10 Provide rustic seats	73	43,2
16.11 Provide a tea-room	12	7,1
16.12 Provide toilet facilities	82	48,5
16.13 Provide swings	2	1,2
16.14 Improve the parking	56	33,1
16.15 Improve the access	64	37,9

(More than one suggestion possible)

16.16 Other suggestions:

In requesting improved access (16.15) 52 (or 30,8% of the 169 respondents) specifically stated that a bridge was needed over the river at the David McLean Drive entrance. Eight stipulated that the bridge should be rustic and two added that without a bridge the Reserve does not cater for older visitors.

Place Bilharzia warning sign at river at entrance.

Fence the Reserve (20), some adding that it would keep dogs out.

Locate toilet at entrance to lessen visual impact on Reserve (16), screen toilet with vegetation (3), attach it to interpretative centre (2). Pity if toilet is provided, but necessary for larger groups. There is a pollution danger if visitor numbers increase.

Provide drinking water (10).

Remove alien plants (14). Plant indigenous flora to replace alien plants (4). Improve the ground cover. Re-introduce Palmiet (Prionium serratum). Clear small areas for rest places, especially at the river and near the entrance.

Do not permit commercialization or too much development (10). Educational aids, tea-rooms, etc. attract too many people. Make it more attractive for people. Avoid catering for recreation (2). Admit the public only for educational purposes. Retain the natural character of Reserve (4).

Trails: Do not extend trails unless the Reserve becomes over-crowded. Extend the trails into Palmiet Wilds (7). Introduce a one-way system. Remove obstacles. Improve dangerous trails, e.g. Nkawu Trail on the edge of a cliff. Check soil erosion on steep trails (4), e.g. with natural steps. Improve in wet areas. Indicate difficulty, grade and length (in time) of trails. Provide a map of trails at the entrances (6).

Trail markers and signs: Use rustic markers which blend. Use colour markers. Have regular confidence markers. Remove all signs and markers. Trail markers and signs are crude - improve (3). Provide a better street sign at the entrance (3).

Outdoor educational aids: Should be unobtrusive and blend (3). Have simple aids. Provide more information boards. Provide more variation on trails. A self-guided trail would generate interest. Restrict self-guided trail to a part of the Reserve. Do not provide too many aids (5). Limit aids to a special trail or a portion of the Reserve (3). Do not provide aids, e.g. tree numbers. Have numbers on trees only (3). Have names on trees rather than numbers (4). Give common names of trees. Place a list of trees and numbers at the entrance. Many plants are not marked. Highlight rare and unusual species.

Interpretative centre: Locate at the entrance (9). Locate outside the Reserve (2). It is not a priority (5). Provide it in the future. Agree, provided it does not divert funds from more essential needs. A guide or handbook could serve the same function. Provide more information in the guide book (2) e.g. guide to spoor (2), animal droppings, butterflies, insects and value and uses of plants. Improve literature on the flora (2), birds and geology. Provide Reserve literature at the municipal library. Literature on the Reserve should be more readily available. Provide a free pamphlet for those who cannot afford the guide book.

Provide a bird, including habitat, display. Erect an aviary in a small portion of the Reserve. Improve habitats to increase birds. Provide a pond and a hide for bird observation. Build boulder weirs to increase water-life. Fence a small portion of Reserve to introduce animals.

Provide guided trails on Sunday afternoons as well as the present morning trails. Publicise guided trails better. Publicize the Reserve better (2).

Tea-room. Locate at the entrance (7). Locate outside the Reserve to attract people away (2). Some form of refreshment should be available. Establish it as source of revenue (2) especially if run by volunteers.

Benches: Necessary for the elderly (2). Place at the entrance (2) and picnic site.

Picnic site: Improve the present site. The present site is too desolate and unnatural. Provide a site accessible by car (3). Provide a larger picnic site with braai facilities (8). Remove present picnic area.

Camping: Allow camping in a special area - a few sites (3). Provide camping for groups but not for the general public.

Litter: Clear litter (6) especially along river. Provide litter bins (7) especially at picnic site.

Parking: Establish a road so that visitors can drive into the Reserve to park (2). Provide shade. Improve the eroded approach road (Faurea Place).

Overhead water pipelines (which cross the river in the Reserve): Cover with creepers or screen them with vegetation (3). Place them underground (2).

Charge an entrance fee to exclude casuals not interested in nature (4). Charge entrance fees as a source of income and to restrict the numbers entering (4). Exercise better control on number of people allowed to enter. Restrict entry to conservation groups and small school groups. Exclude children under 10 years old. When it becomes overcrowded, limit entry to Wildlife Society members. Restrict visitors during the breeding season. Organise subscribers to raise funds for essential needs e.g. a fence.

Better control and supervision is needed by Ranger (3). Better control of the Ranger is needed - he is never seen. More Rangers are needed. Control damage to flora by herbalists. Penalize offenders. Have a regular Guide or Public Relations Officer to assist visitors, especially at week-ends. Ban cross-country running in the Reserve. Enforce the ban on dogs (2). Why not allow dogs on a lead? (2).

Acquire land on both sides of the river. Enlarge the Reserve. Acquire Lot 192 to prevent the penetration of housing development into the Reserve.

17. SELF-GUIDED TRAIL

Extent to which such a trail would be used:

	<u>No. of Groups</u>	<u>% of Total</u>
17.1 Yes	128	75,8
17.2 No	32	18,9
17.3 No opinion	9	5,3
	<u>169</u>	<u>100,0</u>

Amount respondent is prepared to pay for self-guided trail booklet:

	<u>No. of Groups</u>	<u>% of 128</u>	<u>% of Total</u>
17.4 A typed sheet at approximately 5c	14	11,0	8,3
17.5 A small typed booklet at approximately 25c	73	57,0	43,2
17.6 A printed booklet at approximately 75c	41	32,0	24,3
No of groups which responded to 17.1:	<u>128</u>	<u>100,0</u>	<u>75,8</u>

18. OVERALL ASSESSMENT OF THE RESERVE.

	<u>No. of Groups</u>	<u>% of Total</u>
18.1 Excellent/very favourable	51	30,2
18.2 Good/favourable/satisfactory	100	59,2
18.3 Poor/unfavourable	5	2,9
18.4 Unable to assess	13	7,7
	<u>169</u>	<u>100,0</u>

Other comments made:

The Reserve lacks fauna, but the flora is good.

Birdlife is disappointing (3). Hear birds but do not see them (2).

Disappointed not to see wildlife - too many people present on a Sunday.

Too many people in Reserve - prefer the remote bush.

The Reserve is too small (2).

Object to houses and development so close to Reserve (11). They detract from solitude and privacy. Object to houses on cliffs overlooking Reserve. Hofmeyr Heights shopping centre is an eyesore. Development particularly visible from Grass Ridge.

A well advertised Reserve. Excellent guided trails offered.

The Reserve is ideal for walking.

A safe place to walk. Westville lacks suitable places for walking.

The Reserve lacks a focal feature to which one can walk.

It is difficult to find places like Palmiet for walking in Durban.

There is a need for more natural areas like Palmiet in Durban.

The Reserve is easily accessible (5), especially from Durban; an important consideration with petrol restrictions. Used to travel further afield, but this is close by.

It is difficult for a visitor to Durban without a car to visit Reserve.

The Reserve is well managed (2).

The Reserve is not what it used to be - too overgrown.

Will not re-visit Reserve (4). Bilharzia danger (2). Too overgrown. Trails too steep and strenuous.

Object to exposed water pipelines across the river (5).

Agree with the ban on dogs (4).

It is a pity about the flood damage caused by the river.

REFERENCES

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## APPENDIX 5

SURVEY OF EDUCATIONAL INSTITUTIONS USING THE PALMIET NATURE RESERVE

Purpose of the survey: To consider the extent to which local educational institutions within a 3 km radius of the Reserve and others situated further afield use the Palmet Nature Reserve, the problems encountered, suggested improvements and other field sites used. The survey was conducted by means of informal personal interviews during October, 1976.

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QUESTIONNAIRE

1. Is any field work (biological and geographical) undertaken?
2. Have any classes/groups used the Palmet Nature Reserve?
3. If yes, give details including studies done in the Reserve.
4. Suitability of the Reserve and problems.
5. Suggested improvements, e.g. toilets, interpretative/ educational centre, teacher guide notes, pupil worksheets.  
Other comments.
6. Are other natural areas used for field work? Which?

ANALYSIS OF RESULTS1. INSTITUTIONS LOCATED WITHIN 3 km RADIUS OF THE RESERVEKey to symbols used:

- A. Indian  
 W. White  
 E. College of Education  
 H. High School  
 J. Junior Primary School  
 P. Primary School (Indian)  
 PP Pre-Primary School  
 S. Senior Primary  
 U. University

Column Headings:

1. Name and type of institution.  
 2. Indian or White.  
 3. Road distance to Reserve (km).  
 4. + Use in 1976.  
 5. No. of groups, 1976.  
 6. Total number involved, 1976.  
 7. Whether used in past.  
 8. + Use of other natural areas.  
 9. Comments.

1	2	3	4	5	6	7	8	9	
Univ. of Durban- Westville	U	A	1,3	+	33	232	+	+	
Westville Boys'	H	W	1,4	+	6	147	+	+	Geog. river studies.
Westville Girls'	H	W	3,1	-	-	-	+	+	Sc. symposium project 1974.
Reservoir Hills	H	A	4,2	-	-	-	-	-	
Pitlochry	S	W	1,0	+	1	150	+	+	4 Classes Std. 4 1976.
Berea West	S	W	3,0	-	-	-	+	+	All Stds. 3, 4 & 5 1974/75.
Westville	S	W	3,4	+	1	40	+	+	Std. 2 class every year.
Sanathan Sabha	P	A	2,3	-	-	-	-	-	Individual pupils visit Reserve.
Hillview	P	A	2,7	-	-	-	-	-	
Durwest	P	A	4,8	-	-	-	-	-	
Durban Heights	P	A	4,9	-	-	-	-	-	
Restmount	P	A	5,1	-	-	-	-	+	
Avon Drive	J	W	3,2	-	-	-	-	+	
Berea West	J	W	3,4	-	-	-	+	+	Used once in 1975.
Westville	J	W	3,5	-	-	-	-	+	
St. Elizabeth's	PP	W	1,3	-	-	-	-	+	
Westville	PP	W	3,6	-	-	-	-	+	
Cygnat	PP	W	4,2	-	-	-	-	+	
Totals: 1			4	41	569	7	14	18 institutions	

2. INSTITUTIONS LOCATED BEYOND 3 km RADIUS OF THE RESERVE

		2	3	4	5	6	7	8	9
Univ. of Natal	U	W	10	-	-	-	-	+	
Edgewood	E	W	11,5	-	-	-	+	+	Geog. river studies 1974.
Jockey Academy	H	W	34	-	-	-	+	+	Geog./Biol. studies.
Carrington Heights	J	W	12,5	+	1	44	-	+	
Montpelier	PP	W	10	+	2	27	-	+	
(Hillary	S)	(W)	(15,5)	(+)	(1)	(22)	-	?	Not surveyed - excluded.
Totals: 2				2	3	71	2	5	5 institutions
TOTALS: 1+ 2				6	44	640	9	19	23 institutions

OTHER SITES USED BY EDUCATIONAL INSTITUTIONS WITHIN 3 km RADIUS OF PALMIET NATURE RESERVE

Column headings

1. Category of site.
2. \*Site in metropolitan Durban.
3. Road distance from Palmiet N/R (km).
4. No. of institutions using site.

- A. Nature Reserve.
- B. Natural area.
- C. Commercial Park.
- D. Public Park.
- E. Educational Centre.

SITE	1	2	3	4	USAGE BY TYPE OF INSTITUTION					
					U	H	S	P	J	PP
				18	1	3	3	5	3	3
PALMIET N/R	A	*	-	7	1	2	3	-	1	-
PARADISE VALLEY N/R	A	*	5	1	-	1	-	-	-	-
STAINBANK N/R	A	*	16	1	-	1	-	-	-	-
BLUFF N/R	A	*	20	1	1	-	-	-	-	-
LONG SHADOWS PVT.N/R	A	*	20	3	-	2	1	-	-	-
INANDA GAME PARK(PVT.)	A	-	48	3	1	1	1	-	-	-
HLINZA FOREST N/R ESHOWE	A	-	140	1	1	-	-	-	-	-
MOOR PARK N/R, ESTCOURT	A	-	165	1	1	-	-	-	-	-
DRAKENSBURG N/RESERVES AND FOREST RESERVE	A	-	215+	2	1	1	-	-	-	-
ST. LUCIA ESTUARY	A	-	256	1	1	-	-	-	-	-
ZULULAND GAME RESERVES	A	-	277+	2	1	1	-	-	-	-
BEACHWOOD MANGROVES	B	*	15	2	1	1	-	-	-	-
UMHLANGA LAGOON	B	*	26	1	-	1	-	-	-	-
TREASURE BEACH REUNION ROCKS	B	*	28	2	1	1	-	-	-	-
ISIPINGO ESTUARY	B	*	29	1	1	-	-	-	-	-
TWIN STREAMS, MTUNZINI	B	-	138	1	1	-	-	-	-	-
CEDARA FIELD CENTRE	E	-	84	3	-	1	2	-	-	-
UMGENI VALLEY, HOWICK	E	-	96	4	-	3	1	-	-	-
MOUNTAIN LEADERSHIP SCHOOL, GOLDEN GATE	E	-	370	2	-	-	2	-	-	-
BOTANIC GARDENS	D	*	10	2	1	-	-	1	-	-
MITCHELL PARK	D	*	10	7	-	-	-	1	3	3
JAPANESE GARDENS	D	*	16	1	-	-	-	-	-	1
UMHLANGA BIRD SANCTUARY	C	*	25	2	-	-	-	-	-	2
LION PARK	C	-	62	5	-	1	-	-	2	2

Q.4 ASSESSMENT OF SUITABILITY OF PALMIET NATURE RESERVE.

The response to this question is covered in Chapter 3, under the educational value of the Palmet Nature Reserve.

Q.5 SUGGESTED IMPROVEMENTS (discussed in Chapter 4).

Of the 11 institutions which responded to this question, the following improvements were suggested, with the number of institutions requesting the improvement given in brackets:

Provide toilet facilities (7). Many suggested that they be attached to an interpretative centre.

Provide an interpretative/educational centre (9, of which 4 added that it is not essential).

Teacher guide notes (9).

Pupil worksheets (5).

Other improvements suggested, apart from those above which were specifically stated in the questionnaire:

Employ a qualified teacher/guide (6, of which 2 stated that such an officer is more important than an interpretative centre).

Improve river crossing with a bridge (5).

Provide drinking water (3).

Supply a map at the entrance (3).