

ENVIRONMENTAL EDUCATION IN SECONDARY SCHOOLS
IN METROPOLITAN DURBAN:
OPPORTUNITIES AND CONSTRAINTS IN THE USE
OF THE NATURAL ENVIRONMENT.

by

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of the requirements for the degree of Master of Arts in
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ABSTRACT

The study is placed in the context of the development of Environmental Education and the integral role of fieldwork in fulfilling its objectives. The requirements of teachers regarding the use of natural areas for environmental/ecological fieldwork were investigated by means of two surveys which used open-ended questions and numerical rating scales.

An exploratory postal survey of school principals was used to investigate the current use of natural areas by schools and the relative importance of constraints upon fieldwork. It was found that, while most White schools made some formal use of natural areas, fewer Asian and Coloured schools did so, and fieldwork amongst Black schools was almost non-existent. Extra curricular fieldwork was primarily a phenomenon in White schools. Constraints varied in importance between schools in different education departments but overall a lack of teacher training in fieldwork was the major constraint.

Interviews with a sample of teachers who had used natural areas provided detailed information on their environmental/ecological fieldwork requirements. Three hypotheses relating to factors influencing teacher choice of fieldwork sites were tested. In this regard it was found that certain intrinsic characteristics of natural areas, and the availability of teaching resources (including site-specific training and educational field officers) were important influences. Increasing transport costs, while often a secondary consideration, may increase the future demand for local fieldwork sites. The specific characteristics and facilities required of natural areas were investigated in detail.

The study concluded that the Durban Metropolitan Open Space System has considerable potential to meet the environmental fieldwork requirements of schools. Towards this end a set of criteria for selecting appropriate natural areas, and a list of priorities for developing them, were established.

To

my wife, Karen
for her gentle touch of sanity!

and

my toddler son, Murray
without whose loving attentions this research report
could have been finished very much sooner!

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CHAPTER ONE

INTRODUCTION

1.1 THE PROBLEM

Against a background of growing concern about various forms of environmental degradation throughout the world, the need for Environmental Education has long been recognised in this country and abroad (Wheeler, 1975; Irwin 1982). The need for fieldwork as an integral part of Environmental Education has also been widely recognised for some time and a growing body of research has affirmed the value of fieldwork in enhancing both cognitive and affective learning (Falk and Balling, 1982; Backman and Crompton, 1985; Opie 1979). Both cognitive and affective learning are important in promoting the attainment of the ultimate goals of Environmental Education; viz environmental literacy, environmental competence and environmental dedication in the whole human population (Harvey, 1977).

Recognition of the need for an environmental approach in education and for fieldwork is evident from trends in curriculum development, particularly in the subjects of Biology and Geography (NED, 1984) where increasing emphasis is being placed upon ecology which is seen to form the core of environmental principles (Hale, 1986; Trotman 1978).

Despite the fact that fieldwork is recommended or even required by certain subject syllabuses, and despite its proven value, fieldwork is still not fully exploited as a teaching methodology in South African secondary schools (Opie, 1986; Vakalisa, 1984).

Various reasons have from time to time been given for this (Nightingale 1977; Opie 1986), but few studies have attempted to establish what the fieldwork requirements of schools are regarding fieldwork sites and other teaching resources

(Nightingale, 1977). In South Africa, Nightingale (1977) has proposed a model for selecting fieldwork sites which offers a useful set of guidelines for matching the demands of subject syllabuses with potential fieldwork sites. Nightingale's model is based largely on personal experience in teaching and discussion with colleagues and no survey was undertaken to establish what factors actually influenced teachers' decisions with respect to choosing fieldwork sites in practice. Furthermore, while certain constraints inhibiting fieldwork were identified, the relative importance of the constraints was not established. It was necessary, therefore, to empirically establish the relative importance of factors inhibiting fieldwork, and equally important, the criteria actually applied by teachers in selecting sites for fieldwork.

In Durban a valuable set of opportunities for environmental fieldwork arose from the development of a Metropolitan Open Space System (MOSS), the background to which is given in Appendix A. One of the six objectives in the planning of MOSS was to provide for education "to enhance environmental awareness and knowledge by providing a setting and adequate facilities for the interpretation of environmental patterns and processes", (Cooper 1986, p. 3). Thus an overlap was evident between the needs of Environmental Education and the objectives of the MOSS planners. This study deals with the area of overlap between these two sets of requirements from an Environmental Education point of view. The focus is placed on fieldwork in 'natural areas' and the study establishes the fieldwork requirements of teachers in this context. A set of criteria for the selection of sites for environmental/ecological fieldwork is established, and priorities for the educational development of high potential sites are identified. This should facilitate that resources expended on developing fieldwork be directed towards the best sites in a way which is most likely to promote their effective use.

1.2 THE AIMS OF THE STUDY

The primary aims of this study are the following:

1. to investigate the current use of natural areas by secondary schools and the constraints which inhibit their use;
2. to investigate the factors which influence teachers' choices of natural areas for fieldwork;
3. to establish what characteristics of natural areas teachers regard as important for environmentally orientated fieldwork so that criteria can be formulated for evaluating the fieldwork potential of individual natural areas relative to one another. These criteria should serve to guide planners and educationists in developing natural areas and resources for their use;
4. to suggest ways in which potential fieldwork sites can best be developed.

The fulfilment of these primary aims enables the following secondary aim to be met:

5. to deduce the educational potential of MOSS in broad terms within the present secondary education context.

1.3 THE APPROACH

The approach used in this study was empirical in nature in that surveys were undertaken amongst school principals and teachers to provide the data necessary to fulfil the primary aims of the study. The surveys were carried out against the background of Environmental Education and rationale for fieldwork which is discussed in Chapter 2.

In Chapter 2 the study is placed within the context of Environmental Education in global and national perspectives. Definitions of Environmental Education are discussed and its aims and objectives are stated. Literature on relevant aspects of fieldwork is reviewed, viz: the value of fieldwork; the difficulties of implementing this method; and the advantages of using the local environment. Ecological concepts which are seen as central to Environmental Education are outlined briefly as a background against which to establish the characteristics which are required of natural areas for environmental/ecological fieldwork. A model of the teacher's decision-making process in selecting sites for fieldwork is proposed as a framework within which to understand the fieldwork requirements of teachers.

Chapter 3 involved a postal survey of all secondary school principals in Metropolitan Durban. In terms of scientific method, this survey, together with the literature reviewed and the author's teaching experience can be regarded as the observation stage of the research. Using open-ended questions, the survey of school principals investigated the use of natural areas for Environmental Education during the eighteen month period prior to the survey. The survey also sought to establish the relative importance of constraints inhibiting fieldwork. Most of the constraints had been identified in the literature and the importance of each was rated on a five point scale. Chapter 3 thus addresses the first aim of the study. On the basis of the survey results, hypotheses were generated which were tested in the second survey (Chapter 4).

Chapter 4 deals with interviews amongst a sample of teachers who had conducted fieldwork in natural areas. It investigates the fieldwork requirements of teachers by establishing firstly the factors which influence teachers' choices of natural areas, and secondly the characteristics of natural areas which are considered important for environmentally orientated fieldwork.

The survey made use of a combination of open-ended questions, and numerical rating scales. Chapter 4 addresses the second, third and fourth aims of the study.

Chapter 5 summarizes the conclusions drawn from the two surveys. Deductions based upon the results of these surveys are also made which deal with the fifth aim of the study concerning the educational potential of MOSS as a whole. Fieldwork requirements are of course dynamic in nature and this study must be seen in the context of the current educational milieu and state of curriculum development. Chapter 5 therefore considers current educational trends which may affect the future educational potential of natural areas forming part of MOSS.

1.4 SCOPE AND LIMITATIONS OF THE STUDY

The study was limited to fieldwork within 'natural areas', defined as any open space containing predominantly natural vegetation. This includes small areas of forest, bush, grassland, sections of river courses, estuaries, rocky or sandy shores. The areas need not be proclaimed nature reserves but must not be built up nor dominated by human activity eg formal parks are excluded. Areas smaller than approximately one hectare are also excluded except in the case of areas set aside within school grounds for ecological observations.

The limitation of this study to 'natural areas' may face the criticism that the study is biased towards bio-physical elements of the environment rather than covering the full range of fieldwork options which could be covered under the definition of Environmental Education adopted for this study (section 2.2). The focus of the study on 'natural areas' does not imply that these are the only, nor necessarily the best sites for fieldwork in Environmental Education. While other options for fieldwork exist in human-dominated systems, the focus on 'natural areas' was chosen for the reasons given in section 2.3.3. The most

important of these reasons is that ecology is seen to form the core of Environmental Education (Hale 1986; Trotman, 1978) and as such it is receiving greater emphasis in senior secondary syllabuses in Biology and Geography.

The 'study area' was limited to Metropolitan Durban, the area situated within a 30 km radius of the centre of Durban as shown in Map 1: Appendix C. This corresponds roughly to the Urban Planning Boundary as defined in the Metropolitan Durban Draft Guide Plan (NTRPC, 1974). This area was chosen for several reasons. Being the largest centre of population in Natal/kwaZulu it includes a substantial proportion of the schools in the province - a factor which enhances the wider applicability of the results. The study area also includes a good cross section of the racial groups represented in South Africa. Other practical reasons for choice of study area were the necessity of obtaining access to schools quickly and cheaply, and the author's prior knowledge of the area. Although the study concentrates on Metropolitan Durban, many of its findings will be applicable to other parts of the country.

The study was limited to secondary education simply because this was the area of the researcher's training and teaching experience. The study should later be extended to primary education.

The schools in the study area fall under the control of five separate education departments, divided primarily on racial grounds (Appendix B). It was originally intended to include all five groups throughout the study, but this could only be effected in the survey of school principals. The survey of teachers was limited to White, Asian and Coloured schools for the following reasons. Firstly a very low response rate to the survey of school principals was obtained from Black schools. This was attributed largely to the occurrence of political unrest in the Black townships and the fact that schools, if not actually

closed, had more pressing matters to consider. Unrest also made it unsafe to travel to schools in Black areas. Furthermore, the first survey showed that hardly any Black teachers had used natural areas for fieldwork - a prerequisite for the selection of teachers to be interviewed in the second survey. This regrettable limitation of the study should be remedied at a later stage as it may be that the fieldwork requirements of Black schools are different from those of other groups.

The terms 'White', 'Asian', 'Coloured' and 'Black' have been used throughout this research report (without quotation marks) to refer to racial groupings of people. It is an unfortunate fact that racial segregation permeates the whole of South African society, including the education system and it cannot be assumed that research findings which are applicable to one education department are applicable to all. For this reason it is necessary to distinguish between the various racially defined groups. The terms given above are those in common usage. The use of these terms here does not, however, imply the author's acceptance of racial segregation or the basis upon which racial classifications are made.

CHAPTER TWO

ENVIRONMENTAL EDUCATION AND FIELDWORK

2.1 THE ENVIRONMENTAL CRISIS AND THE GROWTH OF ENVIRONMENTAL EDUCATION

2.1.1 Global Perspective in Brief

Environmental Education has developed in response to a growing concern for environmental problems arising primarily from rapid population growth, especially in the Third World, but also from growth in per capita consumption of Earth's resources by the First World minority (Global 2000 Report, 1980, Vol 2). These trends and the resultant problems of environmental degradation and resource depletion have been documented by a number of classic works such as The Population Bomb (Ehrlich, 1968), Limits to Growth (Meadows et al, 1972), A Blueprint for Survival (Goldsmith ed, 1972) and The Global 2000 Report (1980). Environmental problems such as resource depletion, pollution and disruption of natural ecosystems interact with increasing stresses of a social, political and economic nature to damage the quality of the total human environment and its life support systems, thereby reducing the quality of life for humankind.

"If present trends continue, the world in 2000 AD will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today."

(Global 2000 Report, 1980 Vol 1, pl.)

Irwin (1984) has traced the modern concept of Environmental Education from its roots in nineteenth century Europe, where it emerged in response to the alienation of man from nature

following the Industrial Revolution and consequential industrialisation and urbanisation on a vast, unprecedented scale. The following brief summary of the development of Environmental Education as it relates to this study, is based on Irwin's article.

Patrick Geddes is regarded by Wheeler (1975) as the father of modern Environmental Education. His particular contribution lay in his holistic view of man-environment relationships, and his concern not only for the rural environment but also for the necessity of beauty and function in town and city; a concern which set him apart from the romantic tradition of his time. Geddes influenced educational theorists such as John Dewey, Sir John Adams and J W Adamson who later expounded the idea that learning, for young children at least, took place through contact with the environment. This involved "a shift in emphasis from the use of abstract to concrete situations and the fostering of observations through nature study" (Irwin, 1984, p 7) and first hand experience. Incidentally, this emphasis still clearly underlies a widespread belief in the value of fieldwork today, at least in theory, if not in practice (section 2.3).

Environmental Education developed slowly but surely in Europe, America and the USSR through the early part of this century when the focus was largely limited to the natural environment. Popular writers such as Leopold (1949) and Carson (1962) stirred greater interest in ecology by making it accessible to the understanding of ordinary people. From the sixties onwards the growing concern for environmental quality extended from the rural to the urban context and also from First World problems to those of the Third World.

Of vital importance to the development of Environmental Education was the formation of the International Union for the Conservation of Nature (IUCN) in 1948 and its sister organisation, the World Wildlife Fund (WWF) in 1961. Both have regarded Environmental

Education as integral to their functions. Together with the United Nations Environmental Programme (UNEP), founded in 1972, these organisations have contributed greatly to environmental awareness, especially in the Third World. The World Conservation Strategy (IUCN, 1980) produced jointly by these three organisations has made a most vital contribution to Environmental Education (Boote, 1980). The World Conservation Strategy made it clear that educational needs do not stop at the protection of plants, animals and landscapes. It declared that human behaviour towards the environment should be based on a new ethic and emphasised 'sustainability' as an essential criterion for evaluating development in harmony with natural processes (IUCN, 1984).

Since 1970 a number of international conferences on Environmental Education have been held (listed by Irwin, 1982) and at least two widely accepted statements of principles on Environmental Education have emerged; viz the Belgrade Charter (Fensham, 1976) and the Tbilisi Declaration (UNESCO-UNEP, 1978). These two statements have done much to clarify the purpose and direction of Environmental Education (section 2.2).

Governments too have recognised the need for Environmental Education. For example the United States Environmental Education Act of 1970 states that:

"We as a society, can no longer afford the luxury of not knowing the environmental consequences of our decisions. The citizens of this country, both present and future, must understand the ecosystem and the interrelationships between its parts. Each phase of education, from pre-school through adult and continuing education must be reordered to permit the introduction of ecological understanding."
(Quoted by Clayton, 1979, p114.)

Response to the need for Environmental Education from formal educational institutions has been slow. At school level the USSR, Europe, North America and later Australia have pioneered

the inclusion of Environmental Education into existing school curricula (Nightingale, 1977; Irwin, 1984). This development is now also evident in South Africa (section 2.1.2).

A factor which is likely to encourage the adoption of Environmental Education principles is that they are consistent with some modern attitudes to education in both First and Third World countries (Smyth, 1983; Okot-Uma and Wereko-Brobby, 1985). There is increasing emphasis on the relevance of education to social issues (Smyth, 1983); on science as a tool for the betterment of mankind rather than as pure science; on holistic rather than reductionist views of natural systems (Perrot, 1975; Smyth, 1983); and on quality and values rather than cognitive objectives only (Marker, 1984; Waddy, 1986). Greater emphasis is placed on concepts rather than content (Hill, 1986) and on functional literacy rather than conventional literacy (Opie, 1985) in order that pupils become skilled in the analysis and synthesis of knowledge (Degenaar, 1986) enabling them to become actively involved in problem solving and decision making processes where environmental quality is at stake (Schreuder, 1987). There is also a trend towards de-emphasising the role of subject disciplines in favour of a more interdisciplinary approach. In this regard, interest has been shown in Environmental Education because of its possible integrating role in the curriculum (Nightingale, 1987).

The above brief outline places Environmental Education in its global context and serves to illustrate that, although in more rigorous formulation it is a fairly recent advent on the world scene, its roots are grounded deeply in the history of both environmental concern and education. Furthermore Environmental Education is slowly being recognised as a major means of combating environmental deterioration and ensuring sustainable development within a stable ecological context.

2.1.2 The South African Context

South Africa suffers from many environmental problems which are characteristic of both industrialised and developing countries (Fuggle, 1983). Some of these problems pose a serious threat to the quality of life and economic wellbeing of the nation. For this reason a pressing need for effective Environmental Education in South Africa is argued in this section.

According to the Official Yearbook of the Republic of South Africa (RSA, 1980), South Africa's population is projected to increase from 25 million in 1980 to 40 million around 2000 AD (excluding Transkei, Bophuthatswana and Venda). Such growth will place considerable stress upon the country's natural resources (Fuggle, 1983). Added to the demands of population growth are the demands resulting from growing aspirations for material things, especially in the developing sector of the population which is the numerical majority.

Serious environmental problems are already evident as a result of population pressure upon resources. In rural areas, soil erosion, overexploitation of timber for firewood, declining crop yields and inadequate fresh water supply, and their effects upon poverty, health and nutrition of the people, are cause for grave concern (Fuggle and Rabie, 1983). In urban areas high levels of air and water pollution are experienced, and problems of solid waste disposal, noise and stress-induced illness are increasing. Such problems and more have been documented by Begg (1978), Clark (1974), Fuggle and Rabie (1983), Hanks (1976) and WLLSA (1980) to mention but a few. With regard to the solutions to these problems, Fuggle (1983, p28) has observed:

"The problem facing South Africa because of population growth, the need for social justice, and their consequent demands on the natural resource base will not be solved by politicians, businessmen, scientists or engineers working independently of one another. Co-ordinated multi-disciplinary approaches to planning for the future will be required."

In order to achieve such relevant planning approaches there is a need for environmental awareness, knowledge, skills and commitment in the population in general and not only amongst legislators and planning professionals.

Rabie and Erasmus (1983, p 51) have recognised that "environmental issues require the use of political action, which in turn usually gives direction to administrative action". However, in order to bring about political action, "making the electorate environmentally sensitive is a most important priority for those seeking greater government commitment to environmental conservation" (op cit, p 51).

The inability to solve environmental problems through legislation where such legislation does not have the support of the populace was recognised long ago by Leopold (1949, p 245):

"When one asks why no rules have been written, one is told that the the community is not yet ready to support them; education must precede rules. But the education actually in progress makes no mention of obligations to land over and above those dictated by self-interest. The net result is that we have more education but less soil, fewer healthy woods, and as many floods as in 1937."

A poignant illustration of Leopold's point can be found in the history of soil conservation in South Africa. According to Rabie and Theron (1983), a series of extensive soil conservation acts since the 1940's have failed to remedy the rapid loss of South Africa's topsoil. Rabie and Theron (p159) therefore, conclude that, "legislation is not per se sufficient to solve environmental - or other - problems". Legislation and its enforcement can only be effective in a situation of general public consciousness and concern for environmental problems. "This state of mind...can be fostered only through the education of every citizen of our country..." (op cit, p 159).

From the above it is evident that Environmental Education has a major contribution to make in solving environmental problems in South Africa. However, as Leopold pointed out, it is not only the quantity of education but also the nature of that education, which must be considered.

Although no comprehensive study of the level of knowledge, attitudes and commitment regarding environmental issues has been attempted in South Africa, the indications from various sources are that the population is both ill-informed and largely complacent (Irwin, 1982). Preston (1983) in a very restricted study of conservation awareness among visitors to three South African nature reserves, found that levels of knowledge on various conservation issues were very low, despite the fact that the sample consisted of a privileged, fairly well educated sector of the South African population. Irwin (1982), in his study amongst standard nine pupils in Natal, found that levels of conservation awareness were fairly low and that some teachers were even less informed than their pupils in this regard! He comments that; "teachers are as often as not uninterested or uninformed" with regard to environmental matters (p46). In a footnote to the same study, Irwin mentions an informal survey of 24 parliamentary candidates which he undertook in 1977. He found that; "not one was prepared to state an unequivocal commitment to environmental conservation" (p38). In A Policy and Strategy for Environmental Conservation in South Africa (WLSSA, 1980, p10) the observation is made that the level of awareness of certain professional groups such as teachers, town-planners and engineers is "considerably less than desired".

From the foregoing discussion, the need for Environmental Education is very much apparent.

The state of Environmental Education in South Africa in both formal and informal sectors has been assessed in part or in overview by a number of authors (Hurry, 1978, 1980 and 1982;

Clayton, 1981; Irwin, 1982). No attempt at a comprehensive overview is made here but a few important recent developments are considered.

Hurry's (1978) report to the Wildlife Society of Southern Africa was an assessment of the extent to which conservation awareness was generated by formal education in South Africa, particularly through the subjects of Biology and Geography.

Hurry found, inter alia, that:-

- although environmental awareness is referred to in school syllabuses, the focus was on awareness, reason and observation and did not extend to positive action in the pupils' daily lives. The aims, content and length of syllabuses, need revision in order to promote positive changes in behaviour patterns;
- subject committees exist which show concern for conservation awareness but there is insufficient communication between teachers and these committees, and between subject committees.
- there is a shortage of suitable environmental resource materials;
- the emphasis in fieldwork varies widely both in concept and practise as well as to teachers' abilities and interests;
- in teacher training colleges there was little evidence of a policy to develop a holistic overview of the environment by different subjects even in Biology and Geography.
- not a single teacher training establishment in the country offered a course in Environmental Education.

Hurry concluded that a national effort was needed to co-ordinate the efforts of all government and non-government bodies relating to conservation awareness and suggested the establishment of a National Conservation Awareness Committee.

Since Hurry's (1978) report a number of encouraging developments in Environmental Education have taken place.

With regard to the training of teachers, training institutions have begun to include Environmental Education courses in the curricula. For example, environmental electives have been included in fourth year curricula at the Johannesburg College of Education and Edgewood College in Natal (Nightingale, 1987). An environmental awareness component has been built into all courses at the University of Bophuthatswana, not only those concerned with teacher training (Irwin, 1982). Environmental electives have also been included in all teacher training colleges in Bophuthatswana (Irwin, 1987).

With regard to school syllabuses, a section on ecology has been included in the Joint Matriculation Geography Core Syllabus (JMB, 1983). This new syllabus was implemented in Natal at standard 10 level for the first time in 1986. This will greatly increase the number of pupils who are exposed to basic environmental principles since not all pupils take Biology at senior secondary level. There has also been an increased emphasis on ecology in senior Biology syllabuses, a trend which is set to develop further (Pienaar, 1987 pers comm).

In the researcher's experience there is an increasing interest in environmental matters amongst Natal teachers, at least at secondary level, and this interest is not entirely confined to Geography and Biology teachers. However, this interest and enthusiasm is seldom matched with adequate knowledge of environmental issues. This trend is also apparent elsewhere in the country (Irwin, 1982).

*The founding of the Environmental Education Association of Southern Africa (EEASA) in 1982, as a result of interaction between educationists and environmentalists, has made an important contribution to Environmental Education in South

Africa. Broadly, EEASA aims to improve Environmental Education in both formal and non-formal sectors (Hurry, 1983). Unlike various other bodies listed by Irwin (1982) as involved with aspects of Environmental Education, EEASA has a broad interest in the full range of activities which could be subsumed under this heading. It has provided a valuable forum for exchange of ideas and resources through its journal, The South African Journal of Environmental Education, and annual conference. EEASA has also been involved in making recommendations to the Planning Committee of the President's Council regarding the integration of Environmental Education into existing school curricula (Hurry, 1983).

Most importantly, the South African government has begun to take initiatives with regard to Environmental Education. A White Paper on a National Policy Regarding Environmental Conservation (RSADEA, 1980), has indicated strong support for Environmental Education, at least in principle. The Environment Conservation Act, No 100 (RSADEA, 1982), which emanated from that White Paper unfortunately makes little reference to Environmental Education but the Council for the Environment established in terms of the Act has a standing sub-committee on education now in operation. In response to a request from the government, this committee has drafted a White Paper on a National Policy on Environmental Education (RSADEA, 1986) although this draft has not yet been finalised.

Amongst the proposals by the Sub-Committee on Education already put forward are:-

- the establishment of a body for the co-ordination and administration of Environmental Education to be composed of members of the public and private sectors;
- that funds should be made available for co-ordinating programmes;
- that directories of information sources be published;

- that the co-ordinating body should give direction to curriculum design across all teacher training and school curricula in relation to the needs of Environmental Education;
- that attention be given to in-service training of teachers;
- that specialised Environmental Education diplomas be established; and
- that the co-ordinating body should promote the publication and exchange of resource materials (Fuggle, 1984).

Such a co-ordinating body would contribute greatly in drawing together the efforts of a diverse group of bodies involved in Environmental Education. The efforts of various groups have, to date, been fragmentary and often lacking a clearly defined direction (Irwin, 1982).

Although the above is not a comprehensive overview of Environmental Education in South Africa, it has highlighted major issues of concern in the country, viz. the need for Environmental Education in both formal and non-formal education. This section has also served to place the present study in its broader context.

2.2 DEFINITION, AIMS AND OBJECTIVES OF ENVIRONMENTAL EDUCATION

2.2.1 Definition

There has been much discussion about the meaning of 'Environmental Education' since it was first used in 1948 (Disinger, 1984). Initially a synonym for the older term 'conservation education' as defined by Brennan (1964), it has been broadened and added to over the years (see Hurry (1980) for a detailed discussion on the relationship between 'conservation education' and 'Environmental Education').

According to Disinger (1984, p110), Stapp's (1969) definition signalled a break with the past and has influenced the most widely accepted definitions formulated since then:

"Environmental Education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve those problems, and motivated to work toward their solution."

This definition broadened the target of Environmental Education beyond school level to the whole population and expanded its aims to the development of skills and motivation in an active sense.

Although there are numerous definitions today, the two most widely accepted are those put forward by the International Union for the Conservation of Nature (IUCN) and the United States Environmental Education Act of 1970 (Nightingale, 1977). These contain elements which are generally regarded internationally as essential to the concept.

The IUCN definition reads as follows:

"Environmental Education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture and his bio-physical surroundings. Environmental Education also entails practise in decision making and the self-formulation of a code of behaviour about issues concerning environmental quality." (Cerovsky, 1971, p17)

The USA definition reads:

"Environmental Education is an integrated process which deals with man's interrelationship with his natural and man-made surroundings, including the relationship of population growth, pollution, resource allocation and depletion, conservation, technology and urban and rural planning to the total human environment.

Environmental Education is a study of the factors influencing ecosystems, mental and physical health, living and working conditions, decaying cities, and population pressures. Environmental Education is intended to promote among citizens the awareness and understanding of the environment, our relationship to it and the concern for and responsible action necessary to assure our survival and to improve our quality of life." (quoted by Nightingale, 1977, p8)

The IUCN definition is relevant to this study with its focus on natural areas but it has been criticised for its orientation to the bio-physical world and to rural environments at the expense of greater emphasis on the socio-cultural environment and urban areas. Representatives of the Third World countries have also criticised this definition for implying "conservation by, and on behalf, of the middle classes of the developed world" (Nightingale 1977, p8).

The USA definition contains all the elements of the IUCN definition within a broader perspective and, for this reason, following Nightingale (1977) and Hurry (1980), it has been adopted as the working definition for this study.

2.2.2 Aims and Objectives

The Belgrade Charter of 1975 (UNESCO-UNEP, 1976, p2) states the long term aim of Environmental Education as follows:

"To develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively towards solutions of current problems and the prevention of new ones."

The Belgrade Charter lists six specific objectives to achieve this aim. In summary, Environmental Education should generate the following in individuals and social groups:

1. Awareness and sensitivity to the total environment and its problems;
2. Knowledge and understanding of the environment and humanity's critically responsible role in it;
3. Attitudes, values and a motivating concern in favour of environmental quality;
4. Skills in solving environmental problems;
5. Ability to evaluate environmental measures and education programmes in terms of ecological, political, economic, social, aesthetic and educational factors;
6. Participation in responsible action to solve environmental problems.

Harvey (1977, p67) saw as the expected outcome of Environmental Education "environmental literacy" which he defined at three levels. These are "environmental literacy", "environmental competence" and "environmental dedication". These three levels are comparable with Stapp's (1969) definition, quoted above, which emphasises knowledge, awareness and ability, as well as motivation to solve environmental problems.

Lucas (1972) classified Environmental Education into education about the environment, education for (the preservation of) the environment, and education in the environment. In a 1980 summary, Lucas outlined these three classes as follows. Education about the environment is concerned with cognitive understanding and skills necessary to obtain such understanding. Education for the environment is directed towards environmental conservation and therefore covers the affective concern for the quality of life and commitment towards conservation. Education in the environment refers to a technique of instruction in fieldwork. All three classes are shown, in section 2.3, to be important in relation to the fulfilment of the aims of the Durban Metropolitan Open Space System, as well as to the wider aims of Environmental Education stated above.

2.3 FIELDWORK IN ENVIRONMENTAL EDUCATION

2.3.1 The Value of Fieldwork

The need for fieldwork in Environmental Education is argued below on three grounds. Firstly, it is implicit in the objectives of Environmental Education. Secondly, fieldwork has long been recognised as a valuable teaching methodology - faith in this approach resting on the cumulative experience of generations of teachers. Thirdly, there is a growing body of research which supports the efficacy of fieldwork in meeting various educational objectives.

That fieldwork is implicit in the aims and objectives of Environmental Education (section 2.2.2) is apparent from a brief consideration of certain emphases contained therein. Sia, Hungerford and Tomera (1986) point out that all statements of objectives are in agreement in placing emphasis on cognitive, affective and behavioural objectives in order to achieve the ultimate goal, viz the promotion of responsible environmental behaviour. Practise in decision making and problem solving are emphasised in the IUCN definition and the Belgrade Charter (section 2.2). Clearly such goals imply practical, first hand experience in the environment. This recognition is incorporated in Lucas's (1972) classification of Environmental Education discussed earlier.

A belief in the value of fieldwork is certainly longstanding and widespread. Humphreys (1987) traces advocacy for this approach in Biology back to the mid-nineteenth century, while Nightingale (1977) has referred to a long list of protagonists of this approach, stating that there has been an upsurge of interest in fieldwork since World War II.

Hale (1987, p15) quotes George and McKinley (1974) as saying:

"Institutional education will not be complete until all

aspects of human society and the remnants of non-human nature have made their contributions. Somehow we have forgotten that the real classroom is the whole world and that we are all in it."

Mantle and Heath (1986, p279) see fieldwork as indispensable to the teaching of ecology; "Ecology without fieldwork is like medical training without patients - pointless". Ecology in turn, argues Hale (1986) is the core of integrated environmental studies and is central to the understanding of environmental processes.

Other recent proponents of fieldwork have been Lucas (1972) in the USA; Linke (1976) in Australia; Falk (1983) and Fido and Gayford (1982) in the United Kingdom; and, Clayton (1981), Hurry (1982), Nightingale (1987), Opie (1986), O'Donogue (1985) and Webster (1979) in South Africa.

Hurry (1982) has listed some of the arguments in favour of including fieldwork as an integral part of Environmental Education. These are summarised below. In brackets after each point key words from the Belgrade Charter's six objectives (section 2.2.2) show how fieldwork relates to the fulfilment of those objectives:

- Fieldwork provides a training in the accepted methodologies of the natural sciences (skills).
- Fieldwork helps to develop the critical faculties of learners (evaluation). By obtaining information at first hand they are able to record data and to hypothesise about relationships on the basis of that data (skills).
- Fieldwork develops an understanding of the terms and concepts which the learners have heard in the classroom (knowledge). Concrete situations in the field provide a frame of reference for deeper conceptual understanding as

well as reducing the risk of misconceptions of environmental terms.

- Fieldwork generates interest in a subject (awareness, attitudes and values). Learners are stimulated by contact with the real world and motivated by the realisation that the subject is relevant to their lives (Gayford, 1985).
- Fieldwork provides training in intelligent observation. The learner must do more than see, he must be able to comprehend the patterns of elements and relationships which occur at various levels of complexity around him (awareness, knowledge).
- Fieldwork exploits the well established principle of learning by doing. It involves a range of activities through which the child learns more about his environment (participation).
- Fieldwork enables learners to work at their own pace. Learners are motivated to work because of this.
- Fieldwork helps develop a concerned interest in the environment (awareness, values).
- Fieldwork provides meaningful experiences for the learner who is able to use all his faculties during the experience (knowledge, awareness, attitudes). Opie (1987) argues that use of all senses is valuable especially in promoting affective learning. The learner's involvement in the learning experience may also give him confidence in his own ability, thereby contributing towards the development of his personal autonomy.
- Fieldwork may contribute towards the sociological development of the learner, leading to improved

relationships with peers and teachers (participation).

There is of course a danger that these arguments in favour of fieldwork may be based purely on theoretical or experiential grounds and hence the need for research to validate the assumed efficacy of fieldwork in meeting various educational objectives is apparent. Boyd (1985, p35), in criticising the fieldwork approach, has observed that fieldwork "sometimes degenerates into unstructured picnics" and has emphasised the need for structure to ensure that certain pre-determined objectives are met. While this point is valid, Boyd's article indicates a lack of awareness regarding the growing body of research in support of the value of fieldwork. A brief account of some of this research is given below.

Forbes and Smyth (1984) have developed and successfully implemented an area studies strategy, involving fieldwork as an essential component, in Strathclyde schools in Scotland. They have found substantial evidence to justify the use of structured outdoor enquiry.

Falk and Balling (1982) showed that cognitive enhancement in certain content areas was best achieved through well structured fieldwork rather than classroom methodologies. Falk (1983), in a review of six studies, supports this conclusion and adds that not only is cognitive learning significant but that information acquired during fieldwork may be remembered for a long time. Furthermore, children may spend more time involved in learning activities in the field and get more out of informal learning experience than they do in a conventional classroom situation. Falk also concludes that differences in the novelty of the setting influences the learning process. Learning is optimum in settings which are neither too novel nor too familiar to pupils. Repeated visits to a particular site also enhance the benefits of fieldwork.

In the USA, Backman and Crompton (1985) have reviewed several

studies on the use of outdoor situations for Environmental Education, General Science and language development. The review suggests that the outdoor context was most useful for teaching Environmental Education. Fieldwork was shown to be effective in stimulating critical thinking, increasing problem-solving skills and developing concepts (ie higher order learning in terms of Bloom's (1956) theory) rather than rote memory. The benefits of fieldwork were greatest when pupils were given a clear sense of structure beforehand - a framework upon which they could organise the learning derived from the field situation. The review also contended that independent field research was likely to be most effective with more academic pupils while the more traditional guided learning approach in the outdoors, is likely to be more suitable for slow learners.

Backman and Crompton's review thus found qualified support for the value of fieldwork in facilitating cognitive development in the areas of Environmental Education and General Science. They found little evidence, however, in support of the use of the outdoors for language development. They also concluded that more research was needed in assessing the assumed merits of fieldwork as there is still a need to validate the use of particular fieldwork methodologies.

In Australia, MacKenzie and White (1981) found that fieldwork improved cognitive learning in Geography as compared with a control group which did not undertake fieldwork. The information and skills gained by the experimental group were well retained, even after twelve weeks.

Not only has fieldwork been found to be effective in promoting cognitive development but also affective development. In South Africa, Opie (1979) studied the effects of a fieldwork programme on the affective development of secondary school pupils. He found that the programme accelerated affective development compared with a control group which was exposed only to the

classroom situation, and that affective learning persisted over time. He also found that affective learning was enhanced when pupils were exposed to an ongoing fieldwork programme rather than one-off trips.

Disinger (1982) noted that even outdoor recreation and adventure programmes contributed to attitudinal changes towards environmental concern in the participants.

Other substantiated claims made for the value of fieldwork are:-

- an improvement in self esteem or self-image amongst senior secondary pupils and university students (Disinger, 1985a);
- students attach more importance to their academic work when involved in the field as compared with laboratory work (Disinger, 1985a);
- Gayford (1985) has also reported an increase in enthusiasm for work amongst pupils doing fieldwork;
- persons who have had experiences in the outdoors seem more likely to enter environmental occupations than those who have not (Disinger, 1985b);
- attitude changes in students are significantly higher in pleasant environments, especially if there is time for students to 'soak in' the environment (Disinger, 1986).

Although the foregoing research findings provide a strong body of evidence in support of the value of fieldwork, there is still a need for further research to investigate the most effective methodologies of field instruction (Humphreys, 1987). Without such data teachers are likely to persist in the use of traditional fieldwork approaches, some of which may not be effective in achieving the desired objectives.

Bearing in mind that the ultimate goal of Environmental Education is responsible environmental behaviour, one other aspect of fieldwork research deserves mention at this point. Disinger (1985b and 1986) has reviewed studies investigating the relationship between environmental knowledge (cognitive factors), environmental appreciation and concern (affective factors), and responsible environmental behaviour. Studies have shown that both knowledge of, and attitudes towards environmental issues significantly affect responsible environmental behaviour. Since it has been shown that fieldwork can be valuable in enhancing both cognitive and affective development, it can be deduced that it also has a significant role to play in encouraging responsible environmental behaviour. For this to occur, however, fieldwork must be incorporated throughout the duration of the pupils' school career (Opie, 1979; Webster, 1981). One-off trips without a clear sense of purpose are unlikely to be of great lasting value in achieving the objectives of Environmental Education.

2.3.2 The Problems of Conducting Fieldwork

The benefits of fieldwork argued above must be viewed against factors which act to deter teachers from taking advantage of this valuable method.

In South Africa, various constraints upon the use of fieldwork have been discussed and categorised by Nightingale (1977). These are summarised below.

Logistic constraints include the following:

- Time: competition from extra-mural and other duties leaves the teacher with little time for planning fieldwork and for preparing the necessary teaching materials. Similar demands upon the pupil's time are also an inhibiting factor;

- Cost: the cost of transport in particular is often inhibiting;
- Group size: most often whole standard groups are involved in field trips so that management of pupils in the field may be problematic. Opie (1979), however, found that the use of small groups and a clearly structured programme in the field overcame this problem;
- Facilities: parking, shelter and toilets are not always suitable;
- Disruption of school timetables usually results as pupils are often taken out of school for a whole day;

Educational factors acting as constraints are:

- Examinations: public examinations in particular, inhibit fieldwork because of the difficulty of setting questions applicable to a wide variety of fieldwork contexts. Furthermore teachers often only consider using fieldwork to elucidate certain sections of the syllabus, intending to improve examination results. This inhibits the use of a holistic, environmental approach;
- Syllabuses: fieldwork is often recommended by syllabuses in Biology and Geography but is not mandatory. To make matters worse, syllabuses may recommend an environmental approach to teaching but the content of the syllabus is often set out in such a way as to favour a topic by topic lecture-demonstration approach in the field instead (Opie, 1979). The fact that syllabuses are often overloaded also militates against fieldwork (Schreuder, 1977);
- Teachers: a lack of confidence in conducting fieldwork due to inadequate practical knowledge and experience of

fieldwork methodologies is largely due to inadequate training. A lack of interest and enthusiasm on the part of many teachers has also been identified, a factor which may also be related to training (Fido and Gayford, 1982). Teachers may also be unaware of many of the fieldwork sites which are readily available.

These problems are by no means unique to South Africa. Moss and Theobald (1979) and Mantle and Heath (1986) in the United Kingdom, and Disinger (1985a) in the USA have identified similar constraints.

Two other difficulties of teaching through the environment have been identified in the literature; both of which relate in some measure to teacher training.

- **Methodology:** there appears to be a limited range of suitable methodologies in practise for holistic teaching in the field. Unfortunately, when teachers do take pupils out, they still tend to stuff them with facts instead of developing concepts (Biggs and Tap, 1986). Such an approach is not suitable for attaining the objectives of Environmental Education.
- **The Nature of Ecology:** ecology, an important component of Environmental Education, is a complex subject with its own pedagogical problems (Moss and Theobald, 1979). In any ecosystem there are so many variables that field research becomes very difficult. Pupils often lack the necessary background knowledge for field research, and investigations are often inconclusive, however well the work is done. Research techniques are often taught for their own sake without a clear sense of purpose. Finding suitable habitats close to the school may also prove problematic, although this can largely be overcome by emphasising concepts rather than habitats.

Due to combinations of these various constraints fieldwork is still not put to full use in South African schools (Opie, 1986) nor even overseas (Disinger, 1985a; Gayford, 1985; Humphreys, 1987). This is particularly the case in Black schools where it is reported that fieldwork is largely unheard of (Opie, 1985). This is confirmed by Vakalisa (1984 and 1985) in the context of kwaZulu secondary schools.

In view of the considerable benefits of well structured fieldwork it would be unfortunate if the aforementioned constraints resulted in neglect of this valuable methodology. In the author's experience, the use of the local environment can help to alleviate some of those constraints, while contributing particular benefits of its own.

2.3.3 Fieldwork and the Local Environment; the MOSS Opportunity

"The local environment in urban and rural areas is undervalued as an ecological and an educational resource. Hence its use within the school curriculum is rarely maximised. Ecological investigations may be easily undertaken outside the classroom, using even the smallest open space. Environmental Education in both primary and secondary sectors may be substantially increased and enhanced by more intensive and extensive use of field resource areas." Monica Hale (1986, p179).

Fieldwork often involves travelling to distant residential or day sites in environments which are unfamiliar to pupils, and where, in some cases, pupils are under the guidance of specialised field officers. A list of such sites in Natal is given by Nightingale (ed), (1981). While there is undoubtedly a place for such trips (Clayton, 1979 and 1981) it is argued here that the local environment should constitute the major resource for fieldwork. A number of writers are in support of this principle. Some of these are mentioned briefly before discussing the particular benefits of using local sites.

Diepeveen (undated, p 42) believes that the best place to commence environmental studies is "in the pupil's immediate surroundings - the local environment should provide the learning situation in which knowledge is gained, skills developed and values structured. The direct impact of the local environment should be utilised to the full".

Biggs and Tap (1986, p 29) argue that: "Whatever the style of activity it should be related to the environment from which the student comes".

Opie (1986, p 9) states that: "there is a particularly pressing need for guidelines in using the outdoors in very local situations to be developed..."

Hurry (1983, p 1) submits that:

"In formal school curricula Environmental Education should be concerned with developing knowledge, skills, attitudes and positive behaviour relating to, inter alia: ...

- the quality of the environment as a human life support system (both in the urban as well as the rural environment).
- environmental problem-solving, with particular reference to the local environment."

Support for the use of the local environment is in accordance with the guiding principles for effective Environmental Education contained within the Tbilisi Declaration (EEASA, 1987, p 10). This states that Environmental Education should, inter alia:

"relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years."

The following practical reasons have been advanced for concentrating fieldwork endeavours upon the local environment.

- The use of local sites eases some of the constraints of time, cost and disruption of the school timetable, especially where fieldwork can be done in a double period or half-day.
- It allows teachers flexibility in planning in that topics completed in class can be immediately followed up in the field. Should weather conditions delay an outing it can easily be rescheduled.

Apart from these pragmatic considerations there are more important educational reasons for concentrating on the local environment.

- The results of various studies reviewed by Disinger (1985a) suggest that repeated visits to a site often produce the best learning results. Such repetition is not possible in the case of distant sites. Opie (1979) and Falk (1983) support Disinger's finding. Repeated visits enable long-
→ term experiments and monitoring of environmental factors to be undertaken. Changes in the environment such as colonisation and succession, seasonal variations, and variations in pollution levels can be monitored.
- A structured concept-based approach can be adopted, whereas in unfamiliar areas much time is taken up with description of the habitat, with the emphasis upon habitat type (Hale, 1986). Conceptual understanding of ecological principles such as succession, energy flow and food chains may form the basis of investigation.
- The novelty factor has been shown to have an important influence upon learning in the field situation. In settings where novelty is either extremely great or small, learning will be inhibited (Falk, 1983). Thus sites which are somewhat familiar because they are part of, or close to, the

pupils' neighbourhood are likely to be of optimal benefit in learning as compared with distant sites which are completely unknown to the pupil.

- Trips to distant sites may lead to a negative view of the city as being second best or worse still, the view that environmental issues are somewhere 'out there', and therefore the responsibility of someone else. If the cognitive, affective and behavioural objectives of Environmental Education are to be met then the pupil must appreciate what is of value in his home environment and understand that he has a role to play in conserving it.

- Working in the local area can foster a sense of 'belonging' and caring for the environment (Hale, 1986). It promotes a sense of place as fieldwork will then have direct relevance to the environment in which the children live. Lutts (1985, p 40) supports this view:

"We should ask whether our curricula incorporate the elements that foster the experience of home. Our students should become participants in a valued environment - through study, sensory and aesthetic involvement, and physical activity. We must help them to become familiar with their family of plants and animals, rocks, soils, landscapes, and sunlight, with their more traditional personal and cultural family, and with the intimate and wonderful interactive patterns that join them together as one."

- Finally, use of the local environment offers opportunities for pupils to become involved in "active participation in preventing and solving environmental problems" (Hurry 1982, p 57). Hurry cites Peyton and Miller (1980) as making the point that if an individual perceives that he is able/unable to bring about change through his own action, this perception will affect his behaviour. Some suggestions regarding pupil action which could stem from fieldwork are given in Appendix F. Pupil action is important if the

ultimate goal - responsible environmental behaviour - is to be achieved.

The focus upon the local environment in this study is thus firmly grounded in the literature. What remains to be done in this subsection is to justify the emphasis on ecology and the use of natural areas as part of that local environment.

The focus on natural areas in this study does not imply a denegation of the value of environmental fieldwork in the built environment. Ward and Fyson (1973) point out that the pupils' concern for the quality of life must start with a sympathetic understanding of his home environment, which for most will be one of man's creation - a built environment. Ballantyne and Attwell (1985) have commented that Environmental Education in Geography has for many years suffered from a natural or physical bias. Environmental studies in urban areas, they say, generally emphasise the negative impacts that the built environment has upon the natural environment, whereas pupils need to be made aware of the potential for living in an urban setting of high quality. Pupils should also realise that they can influence the quality of the environment in which they live, desiring to preserve qualitative aspects thereof and to create them where they are lacking. On this basis Ballantyne and Attwell (1985) have drawn attention to the merits of urban trails.

Although this study considers the natural rather than the built environment this does not imply that either area is more or less important than the other. The focus on natural areas in this study was taken for the following reasons.

- It has been argued that: "an ecological framework should form the core of integrated environmental studies" (Hale 1986, p 7). Trotman (1978) has also argued that ecology is fundamental to the understanding of environmental structure and the interplay of man with his environment. Trotman

showed how a range of topics can be developed from an ecological core study. These topics include social, ethical and economic issues as well as a range of biophysical aspects, all of which could be subsumed under the heading 'Environmental Education'. If ecology is the logical starting point for environmental studies, then natural areas, if they are close at hand, are a good place to begin environmentally orientated fieldwork. (This does not, however, mean that fieldwork should end with natural areas.)

- The increasing emphasis on ecology in Biology and Geography syllabuses mentioned in section 2.1.2, suggests that natural areas will become more in demand as fieldwork sites.
- The creation of the Durban Metropolitan Open Spaces System (MOSS) offers numerous sites to meet the demands of environmental/ecological fieldwork (Figure 2.1). The educational potential of such urban open spaces has been recognised by Mantle and Heath (1986) and, in South Africa, by Cottrell (1978). Since education is one of the express purposes of MOSS (Appendix A), the relationship between MOSS and the fieldwork requirements of schools needed investigation.
- Not only do local natural areas have potential for education but MOSS needs an environmentally educated public in order to survive. Many conservationists, environmentalists and planners believe in the value of MOSS for conservation, recreation, trailing, education, river protection and visual amenity (NTRPC, 1984 and 1987; Appendix A). Cottrell (1978), for example, has shown that small nature reserves offer considerable benefits for passive recreation, conservation, and potentially for education, all at very low cost to the community compared with active recreation facilities. Nevertheless the proclamation and maintenance of small nature reserves depends upon the willingness of

local authorities to commit resources to this cause. This in turn depends upon the public being sufficiently aware of the value of small nature reserves. Educational uses of these areas can help to create such awareness. The author recalls the boyhood thrill of his first sighting of a Purplecrested Lourie calling in flight in the Stainbank Nature Reserve. Such experiences undoubtedly contribute to the emotive impact of learning and create awareness of what there is which is worth conserving. The lack of such awareness is apparent in the continual pressure from development to eliminate remaining natural areas. The threat of road construction through part of the Stainbank Nature Reserve is a case in point (Lottering 1986). With the population of Durban projected to increase from 2 million in 1986 to 5 million by 2000 AD (Sunday Tribune 2/2/86) it is apparent that natural areas will not survive unless: (a) the local electorate is committed to persuading local authorities to conserve these areas, and (b) nature reserve users do so in a manner that will not lead to despoilation. The contribution which Environmental Education can make towards the success of MOSS is thus apparent.

In concluding this section, brief consideration of the geographical situation of schools in relation to Durban's natural areas is appropriate. Figure 2.1 shows the extent of the proposed Metropolitan Open Spaces System (on the basemap), with an overlay showing the number of secondary schools in each area of Metropolitan Durban.

The precise locations of many Black schools in rural areas could not be determined as only post box addresses could be obtained. In such cases arrows indicate that some schools lie beyond the local authority boundaries drawn. The shaded areas representing existing and potential open spaces were drawn after Nicolson (1987) but formal parks, golf courses and other active recreation

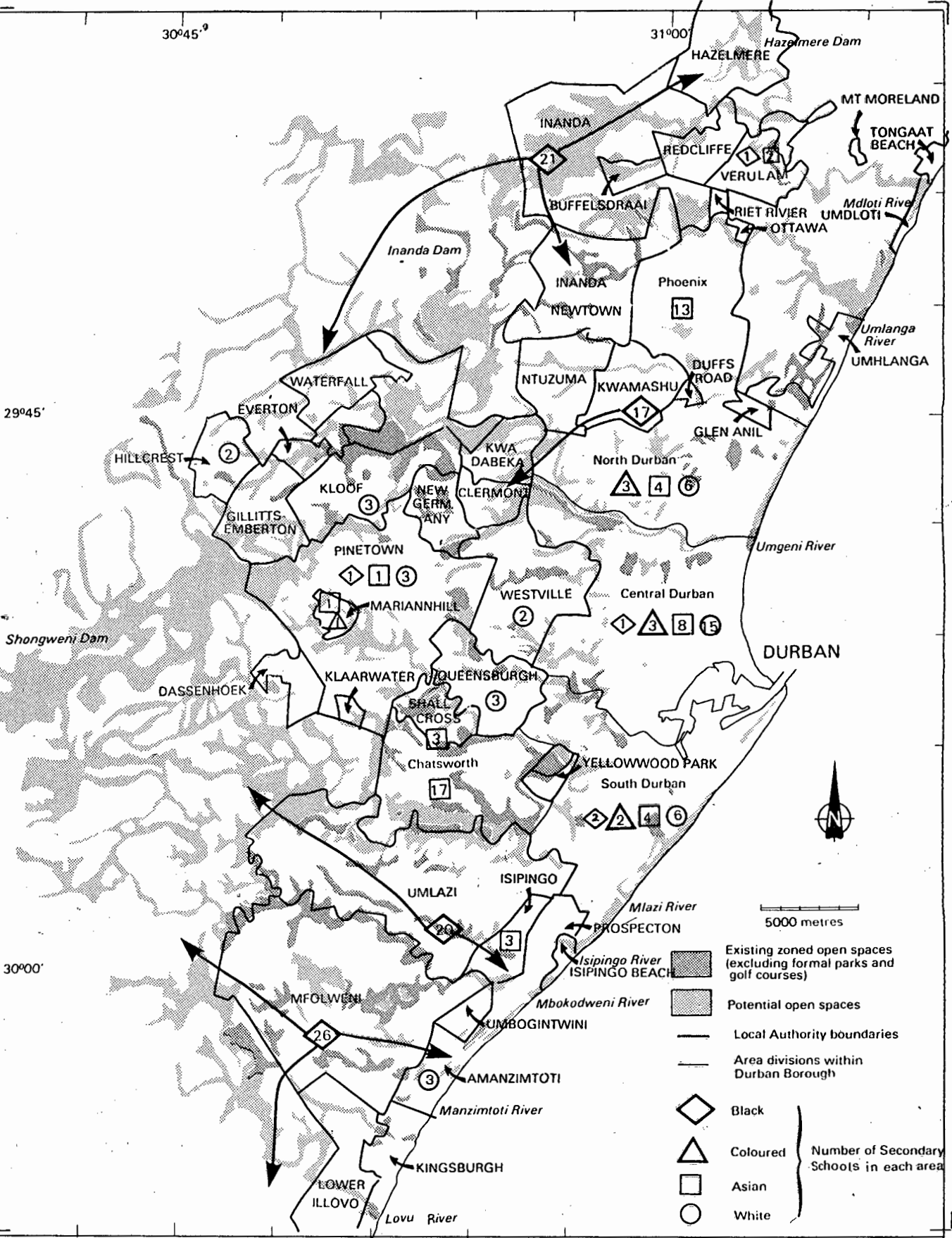


FIGURE 2.1 THE PROPOSED DURBAN METROPOLITAN OPEN SPACE SYSTEM IN RELATION TO THE DISTRIBUTION OF SECONDARY SCHOOLS (After Nicolson, 1987)

areas were excluded by referring to 1:10 000 orthophoto maps. Thus the shading represents essentially natural areas.

The map and overlay show that, because of the extensive nature of MOSS, all secondary schools are situated within close proximity to at least one natural area. What remains therefore, is to establish how the best teaching sites may be selected and developed for fieldwork.

2.3.4 Ecological Principles and Fieldwork Requirements for Environmental Education

Little has been written on the question of what characteristics of a natural area make it particularly suitable for environmental/ecological fieldwork. The features required will of course depend on what the teacher wishes to teach. However, the literature plus experience suggests that there are certain minimum requirements for good fieldwork sites. If ecological principles are seen to be the core of Environmental Education as proposed in section 2.3.3, and if a concept-based or process-based approach is adopted instead of a more descriptive habitat-based approach (Hale, 1986), then it can be argued that certain general characteristics of natural areas will lend themselves more than others towards elucidating environmental/ecological concepts.

Before proceeding to consider what the desirable characteristics of natural areas might be, a brief look at the basic ecological concepts which are fundamental to Environmental Education is necessary. These concepts can be found in almost any basic ecological or environmental text (eg Odum, 1971; Miller, 1982) and in environmental/ecological sections of secondary school syllabuses eg. the Natal Education Department's Senior Biology and Geography syllabuses (NED, 1984). The basic terms and

begin to be replaced by a greater diversity of climax species as the pioneers modify the environment and render it more habitable to other species.

Within an ecosystem there are continual cycles of water, carbon and various minerals. Such substances are taken up by plants as the producers which use the process of photosynthesis to transform the sun's radiant energy into chemical energy. This energy is passed on through various trophic levels to primary consumers (herbivores) and then to secondary and tertiary consumers (carnivores or omnivores). Energy is lost at each transfer from one trophic level to the next. An understanding of this leads to the concept of trophic structure eg an ecological pyramid and the concept of degradation and dispersal of energy. Feeding relationships can also be conceptualised as food chains or food webs. Decomposers (eg bacteria and fungi) break down dead organisms and release stored nutrients or process them into forms which may then be taken up again by plants to complete the nutrient cycle.

Since individual organisms or species compete for scarce resources of food, water, light, space and nesting materials the concept of competition, eg by means of slightly diverse feeding habits within an ecosystem, and the idea of niche can be developed. Various forms of co-operation between species such as mutualism, commensalism and parasitism may also come into play.

An understanding of man as a species which is part of a wider community of organisms, itself part of trophic structures, and having the ability to modify energy flows; a species which is forced to compete and co-operate, leads to an appreciation of the concept of conservation as 'wise use' of natural resources and sound management of ecological systems, whether natural or man-altered.

With the major ecological concepts thus highlighted, the characteristics of natural areas which best lend themselves to elucidation of these concepts can now be considered. Some of these characteristics are 'intrinsic' to the natural functioning of the ecosystem, while others are capable of being developed in order to enhance or facilitate the use of a site for education. The latter characteristics will be referred to as 'facilities'.

Usher (1973) cites a study by the Nature Conservancy of the United Kingdom in 1963 which examined the needs of schools and tertiary institutions in relation to nature reserves. The study found that nature reserves used for intensive educational purposes should ideally:

- contain a wide diversity of habitats, communities and species;
- not be liable to irreparable damage by controlled but heavy use, eg by trampling;
- not contain rare features or species which ought to be permanently conserved.

The following 'facilities' were also found to be desirable:

- easy access to a large number of schools;
- paths for rapid, safe movement of parties;
- field museum or similar centre; and
- a qualified warden.

In a recent study, Mantle and Heath (1986) also produced a list of desirable characteristics which concurs with that of Usher while adding to it. They suggested that fieldwork sites for ecological studies should display the following 'intrinsic' characteristics:

- a diverse flora and fauna showing clearly defined communities;

- distinct patterns of distribution showing gradients of change;
- easily observed adaptive variations in particular plants and animals;
- obvious interrelationships between organisms and their environment, and between different species;
- populations robust and large enough to allow sampling without seriously depleting numbers, yet small enough to allow realistic estimates of population size; and
- teaching use should not be able to cause significant disturbance to the site nor threaten rare species.

Mantle and Heath also saw a need for the following 'facilities':

- ease of access and of supervision of pupils;
- a safe site;
- footpaths, shelter and proximity to toilets;
- a situation at a convenient distance from schools.

Two other desirable attributes of natural areas have already been mentioned in section 2.3.1. Disinger (1986) noted that attitude change was higher in pleasant environments than in unpleasant environments. Thus it is inferred that good aesthetic qualities are a desirable characteristic with respect to affective educational objectives.

An intermediate degree of novelty in fieldwork sites was reported by Falk (1983) to be optimum for learning, whereas in sites which were too familiar or too novel, learning tended to be inhibited.

The above discussion has highlighted the basic principles of

ecology and some characteristics of natural areas which are helpful in teaching those principles. This discussion serves as a basis for comparison with, and a background to, the examination of Durban teachers' perceptions regarding the characteristics required of natural areas (Chapter 4).

2.3.5 A Model of the Teacher's Decision-Making Process in Selecting Natural Areas for Fieldwork

Sections 2.3.1 through 2.3.4 are drawn together here in a proposed model of the way in which teachers make decisions about selecting natural areas for fieldwork (Figure 2.2). This model serves as a framework within which to understand the fieldwork requirements of teachers. It may be compared with Nightingale's (1977, p 40) idealised model of the way in which a potential fieldwork site becomes a resource, but it emphasises practical factors affecting teachers' choice of sites. While the model particularly considers natural areas it also has wider applicability to the selection of other types of sites used in Environmental Education.

STAGE 1	MOTIVATION FOR FIELDWORK IN ENVIRONMENTAL EDUCATION	Belief in the value of fieldwork Syllabus content (eg ecology)
STAGE 2	CONSTRAINTS	Teacher factor (interest, training, confidence) Educational factors (syllabus too big or not insisting on fieldwork, exams, timetable) Logistics (time, cost) Local natural areas (unsuitable) Decision to do fieldwork
STAGE 3	CONSIDERATION OF OPPORTUNITIES	Natural areas (eg MOSS)
STAGE 4	SITE SELECTION	Teacher factor (training, field knowledge) Perception of opportunities Availability of resources and facilities Intrinsic characteristics Logistics (especially transport)
STAGE 5	PREPARATION, IMPLEMENTATION, FOLLOW UP	Fieldwork methods

FIGURE 2.2: MODEL OF THE TEACHER'S DECISION-MAKING PROCESS
SELECTING NATURAL AREAS FOR FIELDWORK

Description of the Model

STAGE 1: MOTIVATION FOR FIELDWORK

Surveys have shown that there is widespread belief amongst teachers in the positive value of fieldwork (Fido and Gayford, 1982; Falk, 1983). This belief, together with the requirements of syllabuses, eg sections on ecology, provides the motivation for fieldwork amongst teachers. Whether this motivation is translated into action depends on whether various constraints can be overcome.

STAGE 2: CONSTRAINTS

Constraints inhibiting whether fieldwork is done and how much is done can be grouped into those relating to 'teacher factors' (teacher interest, training and confidence), 'educational factors' (size of syllabus, syllabus not insisting on fieldwork, examinations not testing fieldwork, timetable), 'logistic factors' (time and cost), and 'natural area factors' (those factors pertaining to the nature and availability of natural areas). Section 2.3.2 and Chapter 3 deal in detail with 'constraints'.

STAGE 3: OPPORTUNITIES

In the context of this study opportunities for environmentally orientated fieldwork are offered by a variety of small natural areas forming part of MOSS, although the model has wider applicability to other sites.

STAGE 4: SITE SELECTION

Five factors affecting teachers' choice of natural area are identified as follows (these are not necessarily independent factors).

(a) The 'teacher factor' is again operative. A teacher's

training will not only affect whether he/she attempts fieldwork, but will also influence the site chosen. If, for example, teachers have been exposed to a particular site during training, they may be predisposed towards the use of that site due to increased site knowledge and confidence, and awareness of the value of the site.

- (b) The 'perception factor' will be affected by teachers' own inclinations to explore new ground, their training, the degree to which they keep up to date with their field eg by reading local journals, and, not least of all, whether the body controlling a natural area publicises what it has to offer.
- (c) 'Resource availability' includes teaching resources such as worksheets, site specific literature and availability of field officers, as well as a range of facilities such as interpretive centres or self-guided trails. The availability of such resources may predispose teachers towards selecting particular sites.
- (d) 'Intrinsic characteristics' of natural areas which make them more useful for environmental/ecological fieldwork are dealt with in section 2.3.4 and Chapter 4.
- (e) 'Logistics', in particular transport, may also affect the choice of fieldwork site although it is suggested that this has a relatively small influence upon choices between sites within Metropolitan Durban.

STAGE 5: PREPARATION, IMPLEMENTATION AND FOLLOW UP

Once a site is chosen fieldwork is planned and executed. The amount of preparation by teachers and pupils before, and the follow up work done after fieldwork, may vary considerably. Consideration of this stage in the model falls beyond the scope of

this study.

2.4 CHAPTER SUMMARY

This chapter has considered the need for Environmental Education and has reviewed arguments for the importance of fieldwork as well as some of the research which supports those arguments.

A case for the use of the local environment in preference to distant fieldwork sites has been presented. The focus of this study upon natural areas to the exclusion of other potential fieldwork sites has also been justified.

A model of the teacher's decision-making process in approaching fieldwork and the selection of natural areas has been proposed, and some of the components of that model have been considered as a background to the surveys in Chapters 3 and 4. The model as a whole serves as a framework within which to understand the environmental fieldwork requirements of teachers.

CHAPTER THREE

SURVEY OF SECONDARY SCHOOL PRINCIPALS

3.1 INTRODUCTION

The survey of secondary school principals was designed to fulfil the first aim of the study, namely, to investigate the current use of natural areas by secondary schools and the constraints which inhibit their use. In doing so the survey also contributes towards an evaluation of the educational potential of the natural areas forming part of MOSS.

In addition to the fulfilment of these aims, the survey of school principals (together with personal experience and discussion with colleagues) can be regarded as the observation phase of the study in terms of scientific methodology. The results of the survey lead to the formulation of specific hypotheses at the end of this chapter. These hypotheses are then tested by means of the teacher survey (chapter 4).

The first step in the survey was to establish which natural areas were being used and for what purposes. It was also necessary to determine which teachers were using natural areas so that a more probing survey of teachers could be carried out later. A survey of all secondary school principals in the study area was considered to be the simplest and quickest way of achieving this dual task.

The second step was to establish what constraints acted to inhibit the use of natural areas in the Durban area. This was important because it had been noted that although fieldwork was an important methodology in Environmental Education, relatively little fieldwork was being done (Nightingale, 1977; Vakalisa, 1984).

Insights provided by this survey should also be of benefit to educationalists and the planners of MOSS since one of the objectives of MOSS was to provide for the needs of Environmental Education (Appendix A).

The following terms and abbreviations are used to represent the various groups of schools which were surveyed.

Whites (NED)	= Natal Education Department
Whites "private"	= Autonomous White schools
Asians	= Department of Education and Culture: House of Delegates
Coloureds	= Department of Education and Culture: House of Representatives
Blacks (DET)	= Department of Education and Training
Blacks (kZ)	= Department of Education and Culture: kwaZulu

3.2 METHOD

3.2.1 Questionnaire Design

The complete questionnaire can be found in Appendix C.

In designing the content and layout of the questionnaire, the guidelines offered by Babbie (1973) with respect to the design of self-administered questionnaires were followed. Since the questionnaire was a fairly long one, the layout was designed to lead respondents through it as quickly as possible.

In the preamble to the questionnaire the terms 'natural area', 'Metropolitan Durban' and 'Environmental Education' were defined. A simplified definition of 'Environmental Education' was used so that respondents were not daunted by the much lengthier definitions given in section 2.2.1.

"Environmental Education is any educational activity

which aims to increase the pupils' awareness, knowledge, concern for and responsible action towards his/her environment."

In the preamble respondents were asked to make their answers inclusive rather than exclusive if they were in any doubt about the location of natural areas (ie "within" or "beyond" Metropolitan Durban) or whether or not an activity should be regarded as Environmental Education. In this way a comprehensive report could be obtained and information could, if necessary, be filtered at a later stage.

The questionnaire was designed in four parts:

questions 1 - 4 deal with fieldwork as part of the formal curriculum; questions 5 - 10 consider the activities of environmentally orientated clubs and societies operating on an extra-curricular basis; questions 11 - 13 are concerned mainly with the constraints which inhibit the use of natural areas; and questions 14 - 15 serve to gather general information for use during the second phase of the study - the survey of teachers.

A detailed explanation of the questions is given below.

3.2.1.1 Questions 1 - 4: Natural areas used within and beyond Metropolitan Durban for formal fieldwork

Questions 1 and 3 were used to investigate which schools had used natural areas and whether predominantly local or distant sites had been exploited.

Since the questionnaire was administered in June 1985, the questions required information only for the period 1984-1985. There were two reasons for this. Firstly, some schools do not keep records of fieldtrips, and as staff changes may occur over

time it was necessary to ensure that the information required would still be accessible to school principals. Secondly, it was necessary to identify teachers using natural areas with a view to follow up in the teacher survey later. Thus making the questions applicable to only a short period ensured that a minimum of staff changes would have taken place during the period for which data was required.

Questions 2 and 4 identified natural areas used, and the teachers who used them. The subjects and standards of pupils involved, and the timing and frequency of fieldwork were also established.

Although the subject specialities of teachers involved were expected to be mostly Biology and Geography, this could not be assumed. The reason for this is the embryonic move towards environmental teaching across the curriculum discussed by Hurry (1980) in which subject integration is proposed in order to achieve holistic teaching, an approach with which some schools may have experimented.

The standard of pupils involved was expected to be dominantly senior pupils (Standards 8-10) ie ages 15-17 years, as pupils at this stage have chosen their subjects, class groups tend to be smaller, and teachers often feel that older pupils, by virtue of greater powers of conceptualisation, are able to gain more from fieldwork at that age.

With respect to the frequency of use of each area, it was expected that one major field trip would be carried out to one natural area per standard group each year because this is the minimum requirement in terms of most Geography and Biology syllabuses. It was anticipated that visits would take place during school hours despite disruption to the timetable because of the difficulty of making trips compulsory outside of school hours.

Question 4 required similar information to question 2, but for areas beyond Metropolitan Durban. Although the use of those areas was not of central concern to this study, it was deemed necessary to collect this data so that the teachers using such areas could be included in the teacher survey. It was important to establish, for example, teachers' reasons for their choice of distant sites as this would throw light on the use or non-use of local natural areas and their educational potential.

3.2.1.2 Questions 5 - 10 : Extra-curricular fieldwork within and beyond Metropolitan Durban

A number of schools were known to be using natural areas on an extra-curricular basis. Small groups of pupils under the guidance of interested teachers were participating in activities such as the following:

- research for an annual conservation symposium;
- the running of informal guided trails;
- active conservation action such as the removal of alien plant species and the development of amenities such as paths, bridges etc.

Questions 5 - 10 sought to establish the nature and extent of such activities.

3.2.1.3 Questions 11 - 13: Constraints upon the use of natural areas for fieldwork

Question 11 was intended to gauge the attitudes of principals to fieldwork in natural areas by asking them whether such activities made a positive contribution to the 'image' of the school. The question relates to question 13 on constraints inhibiting fieldwork, as the possibility that some principals were not in

favour of trips to natural areas could not be ruled out. In a small sample of teachers in the Western Cape, Opie (1986) found that the value of fieldwork was not universally agreed upon. This could presumably have applied to principals in the present context as well. Opie also found that Afrikaans teachers perceive it to be more difficult to obtain permission for fieldwork than their English-speaking colleagues. It was therefore considered probable that one of the constraints inhibiting regular fieldwork in the Durban context was a lack of support on the part of school principals. However, this was difficult to establish directly and so responses to question 11 were used as an indicator of principals' attitudes and the degree to which they valued the contribution made by the use of natural areas to the life of the school.

Question 12 investigates whether schools had set aside small areas within their grounds for Environmental Education.

A number of educationalists with whom the author had held discussions pointed to the school grounds as a potentially valuable site for environmental fieldwork (Hurry, 1984 pers comm., and Diepeveen, 1984 pers comm.). Vinden (1985) has presented some useful exercises for using the school grounds for teaching ecology. Although the use of the school grounds is not of central concern to this study, it was considered valuable to know whether any schools chose to overcome the constraints of time and transport by using areas set aside in their own school grounds.

As a lack of fieldwork has often been reported (section 2.3.2), question 13 sought to establish the relative importance of the constraints inhibiting fieldwork.

Hurry (1984, p 10) has made the comment, based on his own research and that of Irwin (1982), that "teachers are frequently uninterested in, or uninformed about, environmental matters".

Teacher training in Environmental Education and in fieldwork is frequently cited as an important need (WLSSA, 1980) and the lack of it, by implication, is a constraint upon fieldwork.

Nightingale (1977) identified various constraints which he grouped into "logistic" and "educational" categories. These are summarised as follows:

Logistic constraints

1. Time (teacher and pupil time)
2. Sport and other extra-curricular activities
3. Timetabling in school
4. Cost of transport

Educational constraints

1. Subject syllabuses do not place adequate emphasis on fieldwork
2. Public examinations do not examine fieldwork
3. Lack of teacher expertise and hence lack of confidence in the field

The list of constraints in question 13 was based largely on the abovementioned sources with the addition of two possible constraints of the author's own devising. It was considered possible that not all education departments would be equally supportive of fieldwork (question 13h), and that local natural areas were perhaps unsuitable or were perceived to be so (question 13j).

Question 13 aimed to evaluate, within the Durban context, the relative importance of the ten constraints listed (a-j). Respondents were therefore asked to rate the importance of each constraint on a five point scale ranging from 'insignificant' to 'extremely important'. The option of giving 'no opinion' was also allowed for in case the respondent felt unqualified or unwilling to answer a particular question. Space was also provided for 'other' constraints to be listed and rated (k-m).

The ten constraints (a-j) fall for convenience into four categories, though these are not mutually exclusive. These are:-

- | | | |
|-------|---------------------------|---|
| (i) | The teacher factor: | (a) teacher interest |
| | | (d) teacher training |
| | | (g) teacher confidence |
| (ii) | The educational factor: | (c) difficulty of assessment |
| | | (e) subject syllabuses |
| | | (h) education departments
unsupportive |
| (iii) | The logistics factor: | (b) disruption to school
timetable |
| | | (f) cost of travelling |
| | | (i) teachers' lack of time |
| (iv) | The natural areas factor: | (j) unsuitability of local
natural areas |

To ensure an independent response to each constraint these were arranged in random order rather than in the categories listed above.

3.2.1.4 Question 14 and 15 : Name and address of school

The name and street address of the school was required only for the purpose of locating schools during the teacher survey.

3.2.2 Pre-administration

Translation

The questionnaire was translated into Afrikaans but unfortunately the time and expertise needed for a Zulu translation was not available. However, it was assumed that Zulu speaking principals would be adequately conversant in English as much of their training and teaching was received and given through that medium.

Permission from Education Departments

Before the survey could be implemented it was necessary to obtain permission from the five education departments having control over the schools in the study area (Appendix B). Permission was duly obtained together with lists of all the secondary schools in the study area.

Pilot test

The English and Afrikaans versions of the questionnaire were pilot tested on five schools in Cape Town, the wording 'Metropolitan Durban' was simply changed to 'Metropolitan Cape Town' for this purpose. No test could be done on Zulu schools as there were none in Cape Town. Pilot testing was done in Cape Town for two reasons. Firstly the author was resident in Cape Town, and as a time constraint prevailed it was expedient to avoid delays in posting. Secondly, since all secondary schools in Durban were to be surveyed, it was preferable to avoid 'contaminating' the sample by premature exposure to a draft of the questionnaire.

The pilot test confirmed that the questions were understood and that appropriate responses were elicited.

3.2.3 Administering the Questionnaire

The questionnaire was posted to the principals of all secondary schools early in June 1985. A response rate close to 80% was considered necessary to provide a comprehensive picture of current use of natural areas and to provide an adequate basis for the selection of teachers to be interviewed in the teacher survey. As the initial postal response was not adequate, principals were contacted per telephone and the questionnaires were collected by the author. In this way a high overall return

was achieved. Table 3.1 gives the number of secondary schools in each education department within the study area, and the number of responses obtained.

TABLE 3.1 RESPONSE RATES TO THE SURVEY OF PRINCIPALS

	WHITE Natal Education Dept plus 9 Govt aided "private" schools	ASIAN Dept of Education and Culture	COLOURED Dept of Education and Culture	BLACK Dept of Education and Training (DET)	BLACK kwaZulu Dept of Education and Cul- ture (kZ)	<u>TOTAL</u>
Number of Schools	43	56	9	7	82	197
Number of Completed Returns	39	51	7	4	23	124
% response	91	91	78	57	28	63

The reasons for non-responses were investigated. In the case of White, Asian and Coloured schools, some principals declined to complete the questionnaire because they were "too busy" and it would take "too long", or because "the school did not keep records of field trips".

Unfortunately, Black schools at the time of the survey were affected by civic/political unrest with the result that the response rate from principals was low. KwaZulu schools in the study area are divided into five "circuits". The fact that no returns were received from the Umlazi North and Umlazi South circuits - the most troubled areas where some schools were closed for a time - suggests that the low response rate was largely unrest related and that principals had more pressing matters to attend to. As a result of the unrest it was also unsafe to enter Black townships to collect outstanding questionnaires. Therefore

apart from sending out reminders, no follow-up to the postal approach was made except in the case of the Umbumbulu circuit. Here the researcher was offered the opportunity by the circuit inspector to address a meeting of principals. The result was that 15 returns were received from 26 schools in the Umbumbulu circuit.

The low response rates from Black schools means that a very incomplete picture of the use of natural areas by this group is represented.

In White, Asian and Coloured schools the high response rates provided large samples which can be considered well representative of those groups.

3.3 RESULTS OF THE SURVEY OF SCHOOL PRINCIPALS

The results of this survey are presented question by question.

3.3.1 Questions 1 and 3

Table 3.2 summarises the results of questions 1 and 3, giving an indication of the extent to which natural areas 'within' and 'beyond' Metropolitan Durban have been used during the study period.

A number of inferences can be drawn from these results.

- Large differences are found between education departments with respect to fieldwork in natural areas.

Why? White schools clearly used natural areas more than any other department, only 5% (ie two schools, one of which was a technical school) making no trips to natural areas. This contrasts with 22% in the case of Asian respondents and 83% in the case of the kwaZulu schools. For Coloured schools this figure is 43% and in Black (DET) schools 50% of respondents made no trips to natural areas.

TABLE 3.2 NUMBER OF SCHOOLS USING NATURAL AREAS WITHIN AND BEYOND METROPOLITAN DURBAN

		WHITE	ASIAN	Education COLOURED	Department BLACK (DET)	BLACK (kZ)	TOTAL
Total Number of Respondents		39	51	7	4	23	124
No. of Schools which had visited at least one natural area	<u>Within</u> Metro. Durban	33	14	2	1	0	50
	<u>Beyond</u> Metro. Durban	26	33	3	2	4	68
	<u>Both</u> <u>Within &</u> <u>Beyond</u> Metro. Durban	22	7	1	1	0	31
Number of Respondent Schools <u>not</u> using any natural areas		2	11	3	2	19	37

- Local natural areas were more popular amongst White schools than amongst other schools. Of White schools, 85% had used local natural areas. For Asian schools this figure is 27%; for Coloureds, 29% and for Blacks (DET) and kwaZulu, 25% and 0% respectively.
- White schools not only made greater use of local natural areas than other schools, but more of them visited local areas (85%) than sites farther afield (67%). These figures include the 56% who used both. Other groups by contrast mainly used areas beyond Metropolitan Durban eg 27% of Asian schools used local areas while 65% used distant areas, with

only 14% using both. Black schools used no areas within Metropolitan Durban, and only one Coloured school did so.

- In total, 40% of respondents had used local natural areas, while 55% had used areas beyond Metropolitan Durban. (These figures include the 25% who used both). Therefore not a great deal of use is made of natural areas, while areas beyond Metropolitan Durban were given slight preference over those within Metropolitan Durban (except as already indicated in the case of White schools). A possible explanation for this preference was suggested in discussions with Asian teachers who proposed that for the economically disadvantaged communities (the majority of Coloured, Asian and Black communities) pupils wanted to travel further afield as they rarely had the opportunity, and teachers considered travelling to be educational for this reason.

Since the purpose of this section of the questionnaire is primarily exploratory in nature, no further explanations of the patterns observed are offered here. The reasons for teachers' choices of sites are investigated in Chapter 4.

3.3.2 Question 2

Table 3.3 lists the natural areas used WITHIN Metropolitan Durban and the number of schools within each education department using them.

Table 3.3 shows that White schools made widespread use of local natural areas (19 areas) while Asians had used about half that number, and Coloured and Black schools hardly used local areas at all. With four exceptions the areas listed in the Table were used once per annum involving one class or standard group, and the visits were made during school hours.

For the more popular sites, further details of their use are given below. These are dealt with in order of popularity.

TABLE 3.3 NATURAL AREAS USED WITHIN THE CURRICULUM IN METROPOLITAN DURBAN

Natural Area	Number of Schools using the area					TOTAL
	WHITE	ASIAN	COLOURED	BLACK (DET)	BLACK (kZ)	
Beachwood Mangroves	23	1				24
Treasure Beach	3	7	1			11
Stainbank N/R*	5	1				6
Umgeni Estuary	3	3				6
Isipingo Beach/ Mangroves	2	2	1			5
Palmiet N/R	3	1				4
Umdloti Beach/ Rock Pools	4					4
Krantzkloof N/R	2	1				3
Karridene Beach/ Lagoon	2	1				3
Pigeon Valley N/R	3					3
Virginia Bush N/R	2					2
Silverglen N/R		1				1
Happy Valley N/R	1					1
Umbilo Valley	1					1
Paradise Valley	1					1
Illovo Beach	1					1
Cheesman N/R	1					1
Amanzimtoti Beach	1					1
Umbogintwini Beach	1					1
Northpark N/R	1					1
Demot area				1		1
Mawelewele district				1		1
Phumphele area				1		1

*N/R = nature reserve

Beachwood Mangroves and adjacent sand dunes

All 24 schools (23 White, 1 Asian) which had used this area had involved Biology groups in the senior school (standard 8-10). The schools involved were distributed throughout all parts of the metropolitan area so distance was evidently not a factor in the choice of site vis-a-vis other local areas.

Treasure Beach

The 11 schools involved here had conducted senior Biology fieldwork trips only. Once again, they were distributed throughout the metropolitan region.

Stainbank Nature Reserve

This area was used by 6 schools, one of which had used it for senior art classes. Five White schools used it for junior Biology/General Science (ie Standards 6 and 7) while one Asian school used it for Standard 9 Biology.

Umgeni River Estuary

The 6 respondents involved did not specify which part of the estuary was used; it may or may not have included the Beachwood Mangroves. The estuary had been used equally for Geography, Biology and Geography/Biology combined excursions involving senior standards. One Asian school had used the area for a History trip. Only one of the schools was situated next to the estuary, while others had travelled from as far as Chatsworth and Phoenix.

Isipingo Beach

Various parts of this area including the sand dunes, rocky shore and mangroves were used by a total of 5 schools. Subjects involved included junior and senior Geography, senior Biology, and junior General Science. With the exception of one Coloured school, those using this area were relatively close to it (ie within an estimated 20 minutes travelling time).

Umdloti Rock Pools/Beach

Senior groups from four White schools made use of this area. Two were combined Biology/Geography groups, one Biology and one Geography. Two of these schools were situated within an estimated 20 minutes travelling time and two were further afield.

Palmiet Nature Reserve

Four schools used this small reserve, two for junior Geography, one for senior Biology, and one for senior Biology /Geography. All four schools were situated within an estimated 20 minutes travelling time.

Krantzkloof Nature Reserve

Three schools used Krantzkloof, two for junior Geography and one for junior English classes. Two of these schools were situated less than 20 minutes travelling time away.

Karridene Beach/Lagoon

Two senior Geography trips and one senior Biology trip was made to this site. Only one school was far from the site.

Pigeon Valley Nature Reserve

From three user schools, one junior Geography trip and two senior Biology trips were made. All were situated close to the site.

From the analysis of the ten most popular areas several conclusions can be drawn.

- The most popular areas draw users from all parts of Metropolitan Durban, while the less used draw, more commonly, from schools fairly close to them.
- The Beachwood Mangrove/Dunes stand out clearly as the most popular area for Biology fieldwork. (Subsequent to the survey the area's popularity has increased amongst Geography teachers due to the introduction of ecology into the matric syllabus and an in-service training course which introduced teachers to the area).
- There were far more schools using local natural areas for Biology than for Geography. (This situation has begun to change slightly since the introduction of ecology into the matric Geography syllabus in 1987).

- Shoreline areas constitute 6 out of the ten most popular areas (or 9 out of the total of 23 areas used). These include rocky and sandy shores, dunes and mangrove habitats. The reason for the popularity of such areas is investigated in Chapter 4. Most of the other popular areas consisted of a range of habitats such as grassland, bush and forest.

The possible effects of racial segregation on the use of sites listed in Table 3.3 were investigated. Telephone calls to local authorities established that restrictions applied to some beach areas. Umdloti and Amanzimtoti beaches were restricted to Whites at the time of the survey but have since been opened to all races.

3.3.3 Question 4

Table 3.4 lists the natural areas used beyond Metropolitan Durban and the number of schools using each site. Although some respondents were vague regarding the location of sites, nevertheless some interesting patterns emerge from the following analysis of the nine most popular sites.

Umgeni Valley Nature Reserve, Howick

This area, owned and run by the Wildlife Society of South Africa, was by far the most popular area beyond Metropolitan Durban. The reserve was patronised by 26 schools, largely Asian, and mostly for fieldwork in Biology. Some schools, however, combined Biology/Geography aspects in each trip. The reserve holds Environmental Education as one of its prime aims and offers guides, most of whom are qualified teachers. Their teaching is geared to the requirements of subject syllabuses, and appropriate worksheets are also provided if required. It is assumed therefore that these factors, together with relative proximity to Durban (± 2 hours by bus) account for the popularity of this site.

TABLE 3.4 NATURAL AREAS USED WITHIN THE CURRICULUM BEYOND METROPOLITAN DURBAN

Natural Area Used	Number of schools using the area				
	WHITE	ASIAN	COLOURED	BLACK (DET)	BLACK (kZ) TOTAL
Umgeni Valley N/R, Howick	6	18	2		26
Drakensberg (various localities)	8	5			13
Oribi Gorge	2	4			6
Hammarsdale (various parts)	5				5
Thompsons Bay	5				5
Nyala Game Reserve	3			1	4
Umfolozi Game Reserve	2	1		1	4
St Lucia	2	1		1	4
Crocworld, Umkomaas		2	1	1	4
Valley of 1000 Hills	1	2			3
Hluhluwe Game Reserve		2		1	3
Midmar Dam and N/R	2	1			3
Mpushini Lion Park				1	1
Nagle Dam	1	1			2
Eastern Transvaal (various places)		2			2
Umfolozi Flood Plain	1				1
Fanies Island	1				1
Wagondrift Dam	1				1
Umdoni Park	1				1
Umkomaas	1				1
Spionkop	1				1
Zululand Battlefields	1				1
N Natal Historic Sites	1				1
Vernon Crookes N/R	1				1
Ifafa Beach	1				1
Longshadows Private N/R	1				1
Richards Bay		1			1
Shongweni Dam		1			1
Natal N Coast		1			1
Natal Midlands		1			1
Royal National Park		1			1
Albert Falls Dam and N/R		1			1
Tugela		1			1
Howick Falls				1	1
Mtunzini - Twin Streams				1	1

* N/R = Nature Reserve

Drakensberg areas

At least four different sites within the Drakensberg range were used but not all respondents were specific. White and Asian schools used the area more for Geographical than Biological studies. The area was used almost entirely by senior groups.

Oribi Gorge

This area was used by White and Asian schools for Geographical studies, being of great geomorphological interest. It was used only by senior pupils.

Hammersdale (various unspecified parts)

This area was used by White schools for senior Geography only.

Thompson's Bay

Only White schools visited this rocky coastline for Geographical studies. It offers 'text book' examples of features of coastal erosion, rock types, and faulting. It was largely used by Standard 9 groups presumably to teach the geomorphology section of the Standard 9 syllabus.

Nyala Game Ranch

This reserve was used for Biology and General Science across all standards. White and kwaZulu groups were involved.

Umfolozu Game Reserve

White, Asian and Coloured schools patronised this reserve for studies in Biology and General Science.

St Lucia

White, Asian and kwaZulu schools used this reserve mainly for Biology and General Science, and to a lesser extent for senior Geography. The area offers tours, films and a crocodile centre as a focal attraction.

Crocworld, Umkomaas

This was used by Asian, Coloured and kwaZulu schools for Biology.

From this analysis of the most popular sites beyond Metropolitan Durban several conclusions can be drawn.

- The nine most popular areas appear to fall into two categories. In the first category are those sites with striking geomorphological features such as the Drakensberg, Oribi Gorge and Thompson's Bay. These are popular amongst Geography groups. The second category consists of nature reserves with more evident wildlife, and educational facilities geared towards instruction about wildlife and conservation. These are popular amongst Biology groups. Umgeni Valley Nature Reserve combines both these categories which probably helps to account for its popularity.
- When all trips to natural areas beyond Metropolitan Durban are considered they are divided equally between Biology and Geography. This contrasts with the use of local natural areas which were used more commonly for Biology.
- As for fieldwork within Metropolitan Durban, most excursions involved senior pupils, and were conducted during school hours (although some extended into weekends or holidays).
- Excursions were typically made once per annum and involved one standard or class group.

3.3.4 Questions 5, 7 and 9

Table 3.5 shows the number of schools operating environmentally orientated clubs/societies and the number of schools which had used natural areas.

TABLE 3.5 ENVIRONMENTAL CLUBS/SOCIETIES AND THE USE OF NATURAL AREAS

		Education Department					TOTAL
		WHITE	ASIAN	COLOURED	BLACK (DET)	BLACK (kZ)	
Number of Respondents		39	51	7	4	23	124
Number of schools operating an environmentally orientated club		31	9	0	0	0	40
Number of schools using at least one natural area	WITHIN Metro. Durban only	8	2	0	0	0	10
	BEYOND Metro. Durban only	2	4	0	0	0	6
	BOTH within and beyond Metro. Durban	18	0	0	0	0	18
Schools with environmental clubs not using any natural areas		3	3	0	0	0	6

Three points emerge from Table 3.5.

- Environmental clubs are predominantly a phenomenon in White schools, where 79% reported the operation of such clubs. This figure was only 18% for Asian schools and 0% for Coloured and Black schools.
- Only White schools were making extensive extra-curricular use of natural areas, with 28 out of 39 (i.e. 72%) of respondent schools using at least one natural area. For Asian schools this figure was 6 out of 51 (i.e. 12%). No Coloured or Black schools had used natural areas extra-

curricularly.

- A large majority of the White schools with environmental clubs had used natural areas both within and beyond Metropolitan Durban.

3.3.5 Question 6

Question 6a asked for the name of the club or society. This was used to exclude a few clubs with no specific environmental interest before constructing Table 3.5. For example, a few "science" clubs were excluded unless these indicated by their activities that they were environmentally orientated.

Question 6b investigated the subject specialities of the teachers in charge of environmental clubs. It was found that 30% were Biology teachers and 29% Geography teachers. These percentages are lower than one would expect from the results so far. The remaining 41% were distributed widely between 12 different subjects. Clearly there is a significant group of teachers who are interested but untrained in environmental matters. The 41% presumably consists of teachers who are either self taught regarding environmental matters or who simply have an interest but very little knowledge in this field. A need for informal training for interested teachers who have not specialised in environmentally allied subjects is therefore apparent.

3.3.6 Questions 8 and 10

Questions 8 and 10 provided information on the natural areas used by environmental clubs, the frequency with which these areas were used and the types of activities practised therein. This information is presented in Table 3.6 for local sites and Table 3.7 for sites beyond Metropolitan Durban.

Within Tables 3.6 and 3.7 the activities of environmental clubs have been categorised and represented by the letters A,B,C,D,

These categories are:

<u>Category</u>	<u>Description of Activity</u>
A PRIMARILY RECREATIONAL ACTIVITIES	recreational rather than study orientated activities, eg trailing, walking, rock climbing.
B PRACTICAL CONSERVATION	physical labour in the cause of conservation eg. litter clean-ups, removal of alien vegetation, cutting trails, tree planting.
C INFORMAL LEARNING	walks and talks of a general interest nature eg. on ecology, reserve management, plant and animal identification, and bird watching.
D FIELD RESEARCH/ PROJECT WORK	academic pursuits eg research papers presented at an annual conservation symposium.

Where an activity fell into two categories it was represented by two letters. For example, some clubs were participating in developing nature reserves and presenting papers on their work at a conservation symposium. These activities were represented as 'B/D'.

Several conclusions can be drawn from an analysis of Tables 3.6 and 3.7.

- Only White schools have made extensive use of natural areas both within and beyond Metropolitan Durban. A partial explanation for this is the fact that many White schools have their own mini-buses. Although vehicles can be hired for occasional trips, the availability of school-owned transport is a considerable asset to those groups wishing to make regular use of particular sites.

TABLE 3.6 EXTRA-CURRICULAR USE OF NATURAL AREAS WITHIN METROPOLITAN DURBAN

Natural Area	Total no. of schools using the area	Frequency of use and types of activity*	
		WHITES	ASIANS
Stainbank	8	1A, 2B, 1C, 1C, 1C, 2C, 2C, nC	-
Palmiet	6	1A, 1B, 1C, 1C, 2A/C, nB/D	-
Krantzkloof	6	1A, nA, 1C, 1C, 2C, 1A/C	-
Happy Valley, Bluff	6	1C, 1C, 1C, 1C, 1C, 3C	-
Pigeon Valley	4	1C, 2C, 6C, 1D	-
Virginia Bush	3	nB, 3C, 10C/D	-
Paradise Valley	3	2B/C, 1C, 1D	-
Beachwood			
Mangroves	3	3B/C, 1C, 2C,	-
Umgeni Estuary	4	4C, 3D	1C, 1C
Umbilo Valley (Westville)	2	1A, nB/D	-
Umbilo Valley (lower)	2	nB, nB/D	-
Treasure Beach	2	1C, 4C	-
Isipingo			
Mangroves	2	3D	1B
Ingweni Trail area	2	1B, 25B	-
Northpark	1	12B/D	-
Springside	1	nD	-
Silverglen	1	-	nB
Burman Bush	1	1C	-
Marion Wood	1	1C	-
Roosfontein	1	1A	-

NOTE: No natural areas were used by Coloured or Black schools for extra-curricular activities.

*KEY: - Each number/letter combination represents one school.
 - In each number/letter combination, the number represents the number of times a site was visited during the study period. An 'n' denotes that numerous visits were made but the respondent did not specify exactly how many.
 - The letters A, B, C or D or combinations thereof, represent the category of activity as described above.
 - Example: 'nB/D' means that numerous visits were made to the relevant site for the purpose of practical conservation and field research.

TABLE 3.7 EXTRA-CURRICULAR USE OF NATURAL AREAS BEYOND METROPOLITAN DURBAN

Natural Area	Total no. of schools using the area	Frequency of use and types of activity*	
		WHITES	ASIANS
Drakensberg (6 sites)	15	1A, 1A, 1A, 1A, 1A, 1A, 2A, 3A, 4A, 1C, 1C, 3C	1C, 1C, 1C
St Lucia Game Res.	7	1A, 1C, 1C, 1C, 1C, 3C	1C
Nyala Game Res.	5	1A/C, 1C, 1C, 2C, 2C	-
Fannies Island	4	1C, 1C, 2C, 4C	-
Umgeni Valley N/R	3	1C, 1C, 1C	-
Oribi Gorge	2	1C, 1C	-
Ngele Trail	2	1A, 1A/C	-
Hluhluwe	1	2C	-
Spioenkop N/R	1	1C	-
Vernon Crookes N/R	1	1C	-
Chakas Rock	1	1C	-
Albert Falls	1	1C	-
Chobi Game Res.	1	1C	-
Kalahari	1	1C	-
Wagendrift			
Educ. Centre	1	1C	-
Golden Gate	1	1C	-
Weza Forest	1	1C	-
Valley of 1000 Hills	1	-	1C
Estcourt			
Veld & Vlei	1	-	1C
Howick Falls	1	-	1C
Crocworld	1	-	1C
Rosetta area	1	1A/C	-
Hella Hella	1	1A/C	-
Kamberg	1	3A	-
Nagle Dam	1	1A	-
Umlalazi	1	1A	-
Blyde River	1	1A	-
Stanger N/R	1	1A	-

Note: N/R = Nature Reserve; Res. = reserve

*KEY: - as for Table 3.6

- Excursions to distant sites usually took place only once per annum, whereas use of local sites was often made on a regular basis. Approximately 25% of the entries in Table 3.6 indicate that schools used particular local sites 2-5 times during the study period, while a further 20% used them on 6 or more occasions. For distant sites (Table 3.7) these figures are 19% and 0% respectively.
- Differences are evident in the type of activities carried out in local compared with distant sites. Distant sites were used only for 'A' and 'C' activities, i.e. primarily recreational and informal learning (Table 3.6). Local sites on the other hand were often used for 'B' and 'D' activities as well, i.e. practical conservation and research, (Table 3.7). It is suggested here that 'B' and 'D' activities have the greatest value in terms of achieving the objectives of Environmental Education, particularly in promoting responsible environmental behaviour (section 2.2). This view is in line with the widely accepted pedagogical principle of learning by doing rather than learning by seeing and hearing only. If the view stated above is accepted, then it follows that local natural areas have greater potential value than distant areas for Environmental Education, since they permit greater pupil involvement in practical issues.
- { Field research/project work was only carried out in local sites because proximity permits frequent visits to be made. It is therefore evident that local sites have greater potential for 'in-depth' studies than distant sites. }
- The most popular sites for extra-curricular excursions are not necessarily the same as those used within the curriculum (Tables 3.3 and 3.4 cf. Tables 3.6 and 3.7 respectively). Of the most popular sites for formal fieldwork (i.e. Beachwood Mangroves, Umgeni Valley Nature Reserve, Treasure Beach and the Drakensberg), only the Drakensberg ranks high on the list of popular sites for extra-curricular use. It is suggested that the greater flexibility possible for

environmental clubs may account for such differences in popularity. These clubs are not constrained by syllabuses or examinations and they are less constrained by time since they operate outside of school hours, often at weekends. Group sizes are also small. With fewer constraints in operation, the clubs are able to choose sites which are perhaps more exciting, more complex, less accessible, or which are not geared specifically for education.

3.3.7 Question 11a and b.

This question was designed to gauge the attitudes of principals regarding the value of fieldwork in order to establish whether fieldwork enjoyed their support.

Principals were asked to give a 'yes' or 'no' response to the question; "does the educational use of natural areas make a positive contribution to the 'image' (or reputation) of the school in the eyes of pupils, staff, other schools, parents, and the public". Table 3.8 gives the number of affirmative responses expressed as percentages of the number of respondents.

Overall, the figures in Table 3.8 reflect good but not universal support, on the part of principals, for fieldwork in natural areas. Principals feel that the pupils more than any other group value these excursions. The responses of principals suggest that non-use of natural areas can not be attributed, to any great extent, to a lack of support from school principals. Even in those schools which had not used natural areas, principals were still largely in favour of such use.

Question 11b asked principals to give details regarding the way in which the use of natural areas contributed to the 'image' of their school.

TABLE 3.8 PRINCIPALS' PERCEPTIONS OF THE CONTRIBUTION MADE BY FIELDWORK TO THE REPUTATION OF THE SCHOOL

Contribution made by the use of natural areas in the eyes of:	% of 'yes' responses from principals					
	WHITES	ASIANS	COLOUREDS	BLACKS (DET)	BLACKS (KZ)	ALL GROUPS
(i) pupils	83	92	86	75	86	87
(ii) staff	75	88	80	75	86	83
(iii) other						
schools	59	85	80	67	86	76
(iv) parents	81	83	86	75	84	81
(v) public	77	81	83	75	86	80

Note: The number of non-responses to this question was small in relation to the sample size in each case. Nevertheless, to eliminate non-respondent bias, the percentages were calculated after subtracting the number of non-respondents from the dominator in each calculation of the % of 'yes' responses.

Several White schools which had been involved in conservation symposia or practical conservation in local natural areas had received favourable reports in the press, or had appeared on television. Some had also made representations to local authorities, which in at least one case had led to the proclamation of a small nature reserve. Several schools which were thus involved in practical conservation said that their involvement generated interest amongst, and involvement with, the community and so benefited the school.

Many principals responded that the use of natural areas was an important extension of the classroom into reality, and was thus important for the balanced education of the child. Others said that parents liked to see a variety of activities offered by the school; a wider range of activities being indicative of a better school. (This argument could, however, be applied to any extra-

curricular activity.)

Several Asian and Black schools commented that making pupils more aware of nature had prevented vandalism of plants in school gardens! In a few cases pupils had been encouraged to become involved in maintaining school gardens or planting indigenous trees and shrubs.

In the less privileged communities fieldwork gave pupils opportunities, not afforded by their own families, to visit new places and broaden their horizons.

A few school principals contributed that the study of natural areas offered an opportunity for the integration of various subjects. In this way they encouraged a sense of "relevance" and enhanced the image of the school by improving its educational benefit and enjoyment for pupils.

3.3.8 Question 12

A number of schools claimed that they had small areas set aside within the school grounds for Environmental Education as shown below:-

- 7 White schools
- 9 Asian schools
- 1 Coloured school
- 3 Black (DET) schools
- 3 Black (kwaZulu) schools

The use of such small areas was often stated in rather vague terms and it was doubtful whether they made much contribution to Environmental Education in the school.

In most cases the small areas were used only as a source of certain types of organisms eg rockeries for examples of xerophytic plants. These small areas amounted to little more

than formal gardens where little or no ecological work was done.

However, four schools allowed a small area of the grounds to be left unmanaged in order to monitor ecological succession, or to illustrate certain biotic and abiotic factors. One "private" school had an area of natural bush/forest on the property through which they had developed a nature trail. Two schools used their small area for individual ecology projects by pupils.

It is concluded that the use of small study areas within the school grounds is not at this stage offering an alternative to excursions nor even providing a focus for the activities of environmental clubs within schools.

3.3.9 Question 13

Respondents rated the importance of each of the constraints listed (a-j) on a five point scale ranging from 'insignificant' to 'extremely important'. A 'no-opinion' option was also provided. A few respondents named other constraints as well (k-m), and rated these in the same way.

The results of this question were analysed as follows.

A mean rating was calculated for each constraint. This was done after excluding the number of 'no-opinion' responses from the denominator in each calculation so that non-respondent bias was avoided. The mean ratings were then plotted on histograms, Figures 3.1 - 3.7. These will be referred to as 'constraints profiles'. Figure 3.1 gives a composite 'constraints profile' for all groups, while Figures 3.2 - 3.7 give separate profiles for the schools in each education department. White "private" schools (Figure 3.3) are represented separately from White government schools (NED) since the autonomous nature of the "private" schools may affect the relative importance of various constraints. The results from Black (DET) schools should be

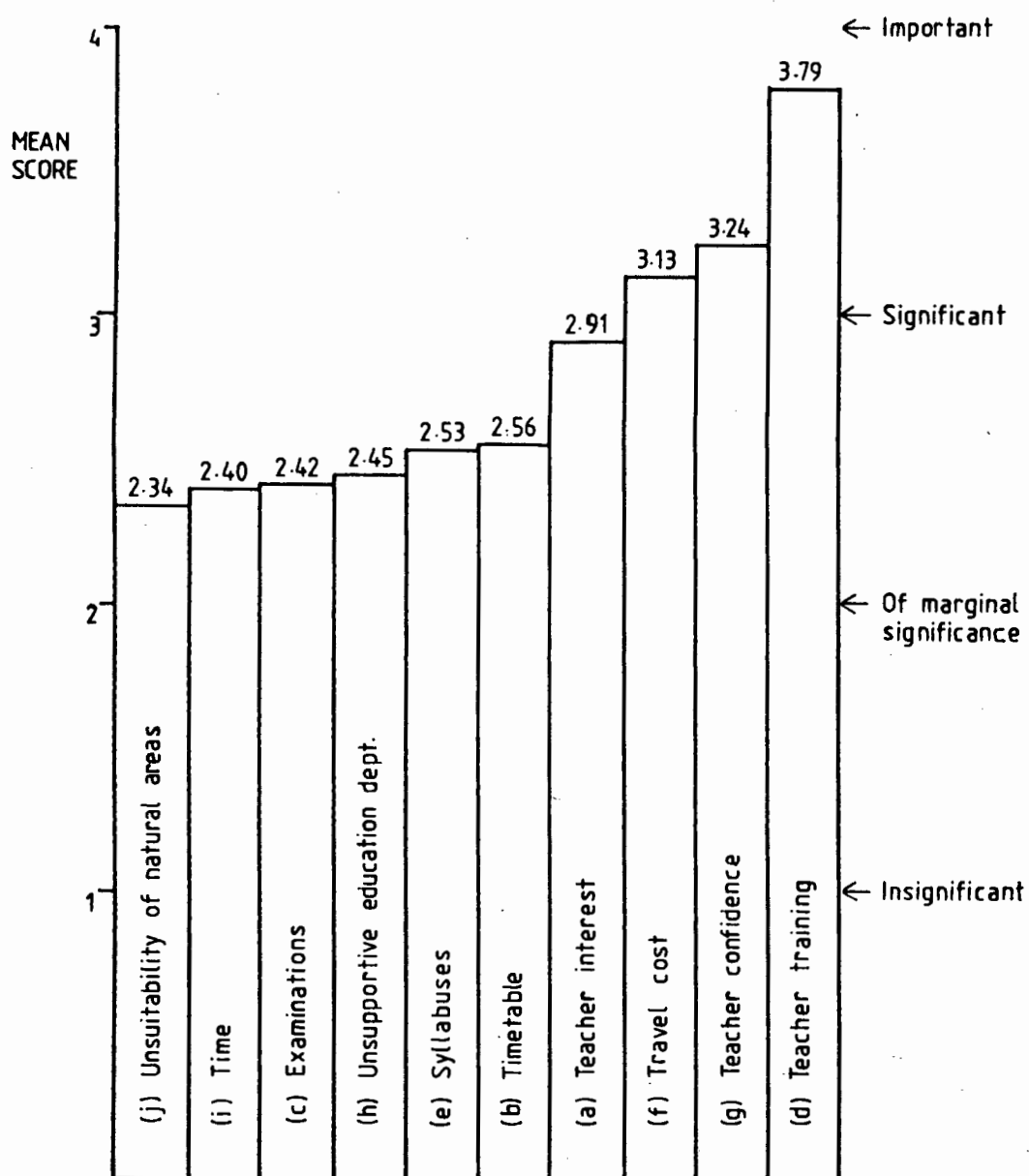


FIGURE 3.1 CONSTRAINTS PROFILE: ALL GROUPS

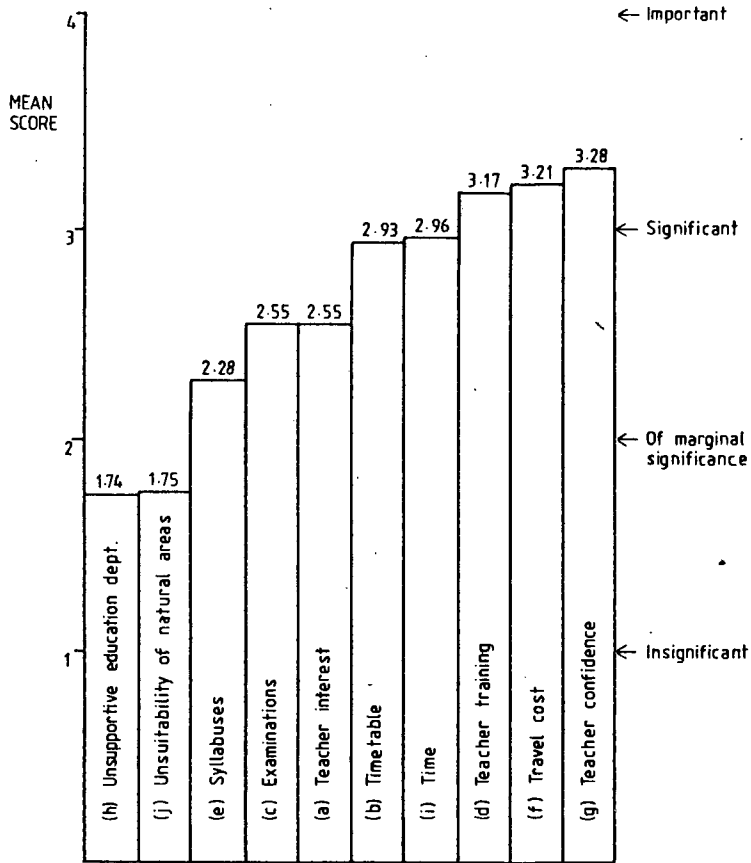


FIGURE 3-2 CONSTRAINTS PROFILE: WHITES (NED)

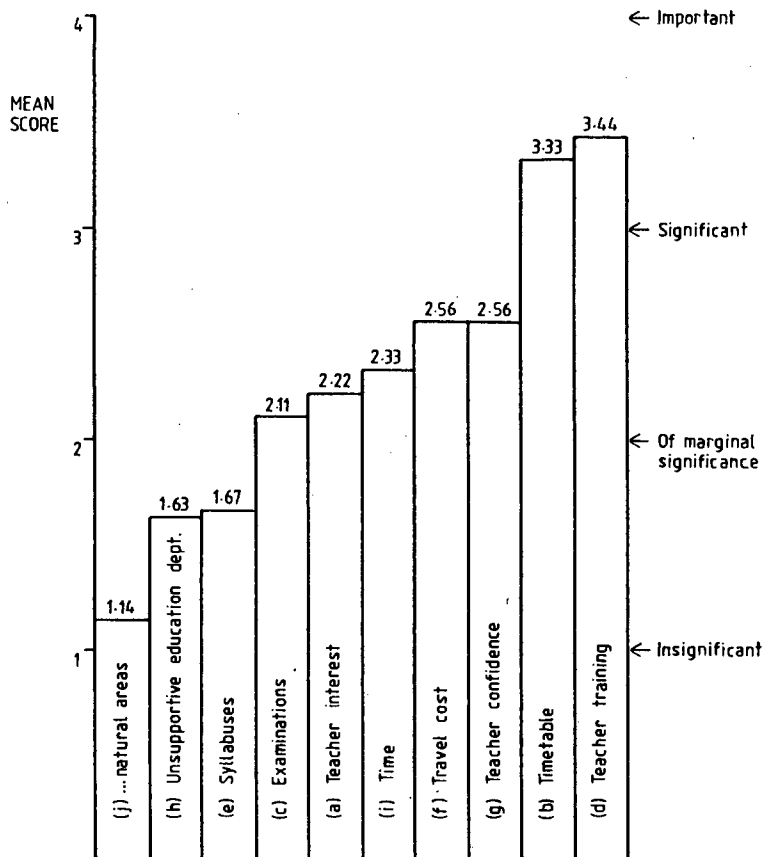


FIGURE 3-3 CONSTRAINTS PROFILE: WHITES (PRIVATE)

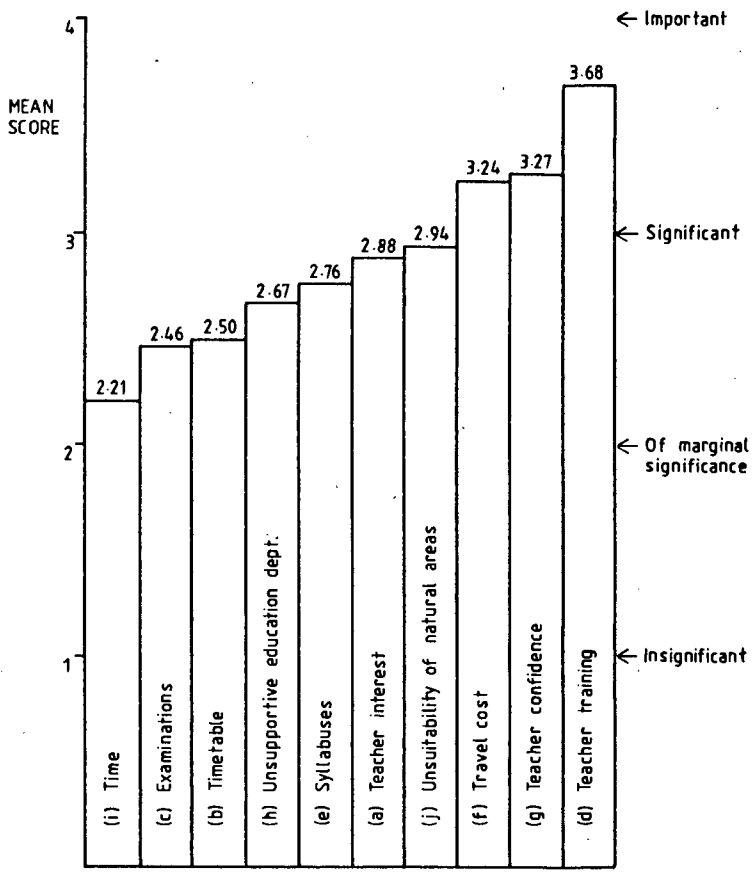


FIGURE 3.4 CONSTRAINTS PROFILE: ASIANS

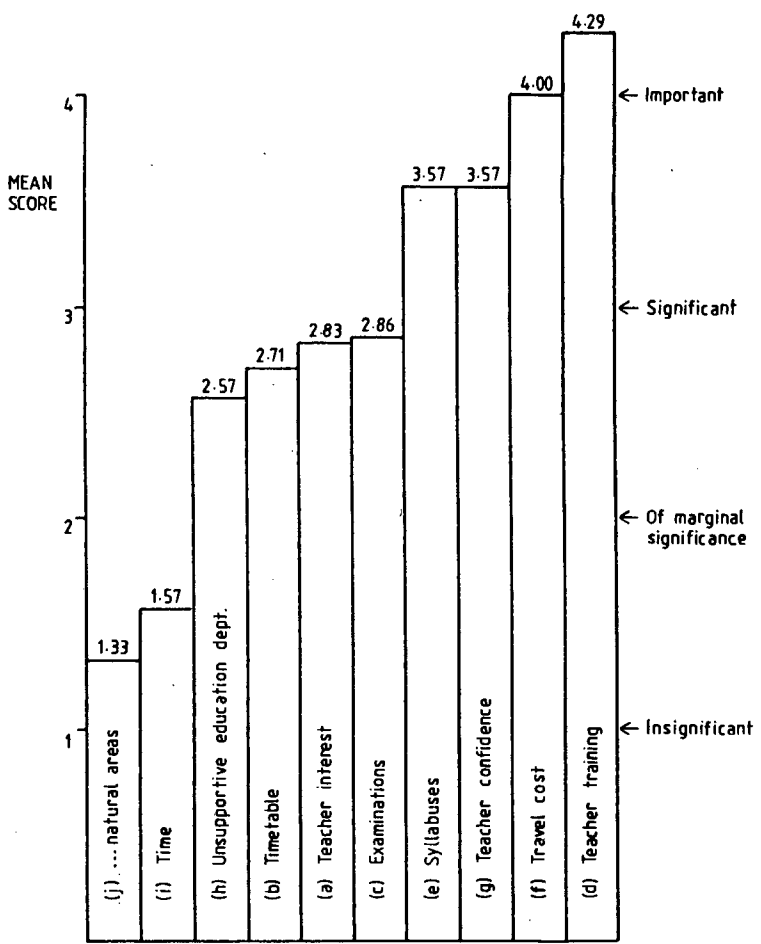


FIGURE 3.5 CONSTRAINTS PROFILE: COLOURED

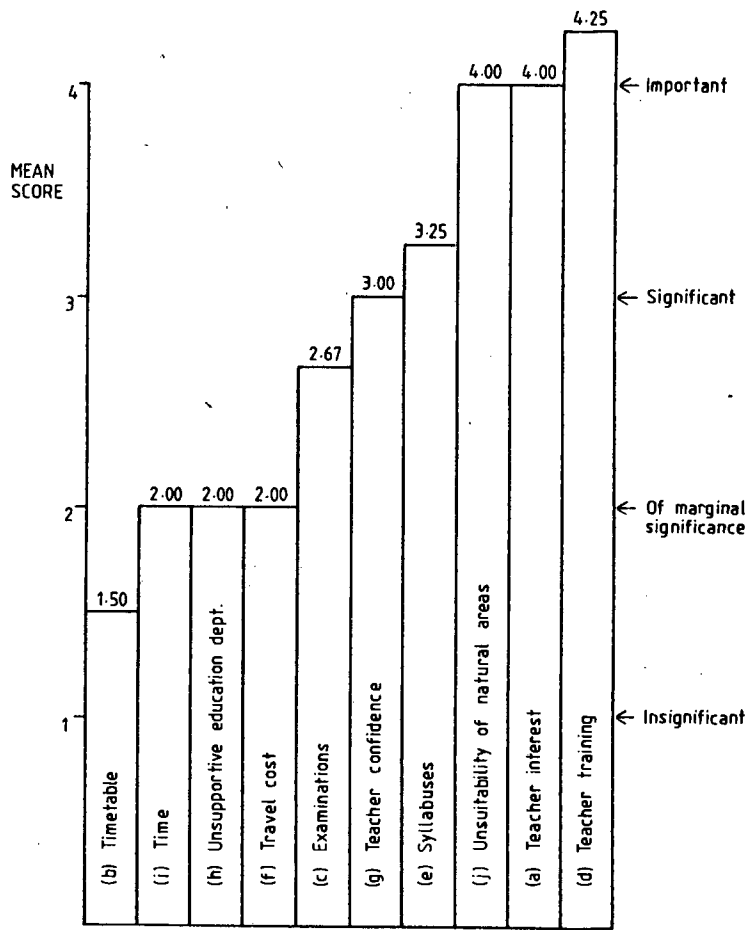


FIGURE 3.6 CONSTRAINTS PROFILE: BLACKS (DET)

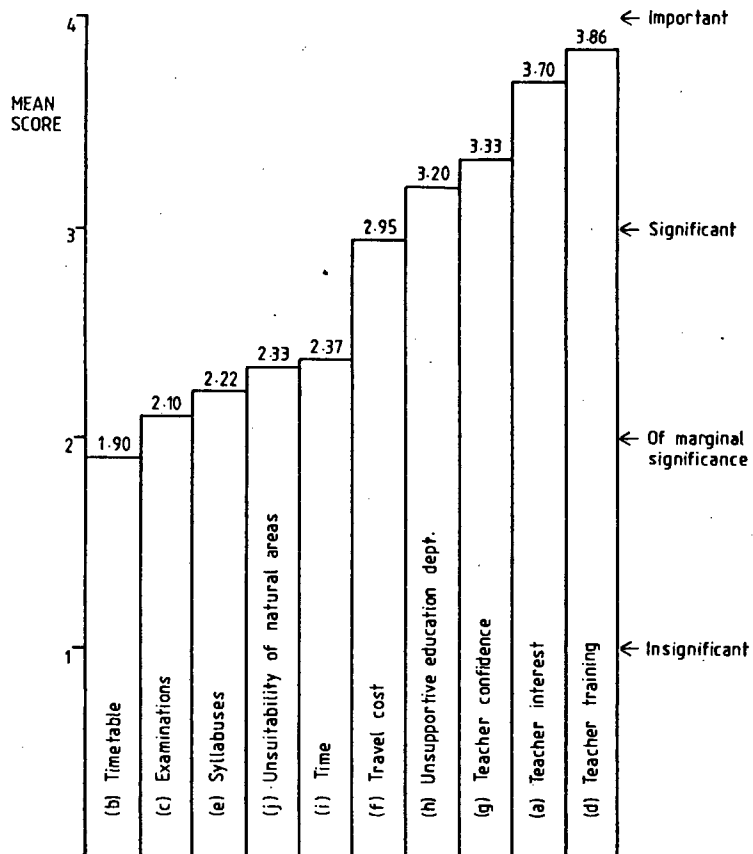


FIGURE 3.7 CONSTRAINTS PROFILE: BLACKS (K7)

regarded with caution as the sample is small, both in absolute and percentage terms, ie only 4 schools out of 7 responded, which is a 57% sample.

The following analysis of question 13(a-j) is based on the composite 'constraints profiles' especially; Figure 3.1 representing 'all groups'. However, where the results for different groups differ markedly from the composite profile, these differences are given individual comment relating to Figures 3.2 - 3.7. The constraints are discussed in order from the most important to the least important according to Figure 3.1. Four constraints stand out clearly above the others. They are 'teacher training', 'teacher confidence', 'cost of travelling' and 'teacher interest'.

A lack of 'teacher training' in fieldwork emerges as the most important constraint overall (mean rating = 3.79 ie 'important'). All except White (NED) schools considered it the most important constraint. White (NED) schools considered it a 'significant' constraint.

'Teacher confidence' in their environmental knowledge in the field was the second most important constraint overall (mean = 3.24: 'significant'). This constraint ranked in the top three for all groups except Black (DET) schools (Figure 3.6) where it was nevertheless given a mean rating of 3.00.

The 'cost of travelling' emerged as the third constraint overall (mean = 3.13: 'significant'). The Coloured group, however, gave this a mean rating of 4.00 (ie 'important'). The White "private" schools rated it only 2.56. This lower mean is not surprising as these schools draw most of their pupils from families with a high socio-economic status. The low rating of 2.00 from the Black (DET) schools is difficult to explain since these schools do not have abundant financial resources. However, as mentioned earlier, the results for that group must be treated with caution

because of the very small sample size in both absolute and relative terms.

A lack of 'teacher interest' in Environmental Education was the fourth constraint, with a mean of 2.91 (ie 'significant'). It is interesting to note that White (NED and "private") schools considered this a less important constraint than Black schools, while Asians and Coloureds rated it somewhere in between these extremes. The mean scores were: Whites ("private") = 2.22, Whites (NED) = 2.55, Coloureds = 2.83, Asian = 2.88, Blacks (kZ) = 3.70 and Blacks (DET) = 4.00. A possible explanation for these broad differences could lie in socio-economic differences between the groups. The less privileged Black groups are probably more concerned with aspects of education which will enable them to improve their standard of living while environmental conservation is given a lower priority.

The constraints imposed by 'timetables', 'syllabuses', 'unsupportive education departments', 'examinations' and 'lack of time' were all given similar ratings in the composite constraints profile ie. all were rated midway between 'of marginal significance' and 'significant'. Some obvious differences between responses from different groups should, however, be noted. White (NED) and "private" schools rated the constraints of time and school timetable more highly than other groups. Most White teachers are involved in extra-curricular activities such as sport and cultural pursuits within the school whereas these activities receive less emphasis in other education departments. White "private" schools, being free of restrictive syllabuses except with respect to the matric year when public exams are written, rated this constraint much lower than other groups. Few White (NED) principals felt that their education department was unsupportive of fieldwork, while "private" schools, being autonomous were virtually free of this constraint. All groups experienced a similar difficulty with examining what is taught during fieldwork.

'Unsuitability of local areas' was rated the least constraint overall being little more than 'of marginal significance' (mean 2.34). Asian schools, however, considered that this constraint was 'significant' (mean = 2.94) while Black (DET) schools rated it 'important' (mean = 4.00). This latter figure, however, represents the responses of only 2 schools, the others having given 'no-opinion'.

The above discussion of the constraints profiles is further elucidated by the 'other constraints' mentioned in response to question 13(k-m). These 'other constraints' are grouped for convenience into the following categories: 'teacher factor', 'educational factor', 'logistic factor', 'natural areas factor' and 'community factor'.

Three of the constraints mentioned under question 13(k-m) relate to the 'teacher factor'.

- The most commonly mentioned constraint in this category was the lack of educational aids in the form of guidebooks, worksheets and nature trails. This was mentioned a total of six times - representing most education departments. In addition, a lack of literature on the fauna and flora of specific areas was mentioned once. This lack of resource material was rated consistently as 'extremely important'.
- The need for teachers to have a thorough knowledge of the natural area they wish to use was mentioned once, and related to this, the need for more in-service courses was also expressed. Both these points were rated 'extremely important'.
- Some teachers are not aware of the need for, or the benefits of Environmental Education. This point was raised three times and rated between 'significant' and 'important'. One of these said that some teachers had the attitude that

Environmental Education should be the responsibility of other organisations and interest groups like the Wildlife Society.

Five constraints pertain to the 'educational factor'.

- The constraint that syllabuses are too long and too inflexible to permit time for fieldwork was mentioned by three schools (White and Asian) and was rated between 'important' and 'very important'.
- The need for greater emphasis on Environmental Education in syllabuses was mentioned by three respondents who all rated it 'very important'. It was suggested that Environmental Education be included from standard 6 upwards, not only in the senior secondary schools.
- Departmental "red tape" was mentioned by two Asian and one Coloured school as inhibiting fieldwork. Written notice of at least a month, with details of activities and transport arrangements must be given to education departments. This constraint was rated 'important' by the two Asian schools and 'of marginal significance' by the Coloured school concerned.
- One Coloured and one Black mentioned a lack of financial support for fieldwork from their education departments and rated this constraint 'very important'.
- Two schools, one Coloured, one Black, mentioned the emphasis on examinations and the preoccupation with gaining certificates as an overriding concern (the implication being that fieldwork was regarded as an educational luxury).

Three logistic constraints were mentioned.

- The large numbers in class groups was proposed by ten schools (across all education departments) as an 'important' to 'extremely important' constraint upon fieldwork. Large group size poses a problem of pupil management, both in terms of discipline and adequate supervision, to ensure that pupils derive the maximum benefit from fieldwork.
- The large amount of time required for preparing, organising and executing fieldwork was commented on by five schools and rated between 'significant' and 'extremely important'.
- The responsibility upon the teacher of ensuring the safety of pupils in natural areas was mentioned by one school and rated a 'significant' constraint.

The following constraints pertaining to the 'natural areas factor' were mentioned once each, and rated as shown in each case.

- The absence of trained personnel at the natural areas ('very important').
- The natural areas need to be fenced and managed by local authorities as not all of them are proclaimed nature reserves ('very important').

Some of the constraints grouped under the 'community factor were rather nebulous but are mentioned here because they hint at the complexity of the Environmental Education issue in the South African context.

- Five schools (two Asian, three Black) mentioned that parents were either environmentally unaware or were indifferent to environmental issues. Two of these stated that this was due to their low socio-economic status but none elaborated further. The implication was that parents did not give their full support to excursions to natural areas.

- One Black school principal stated; "Absence of leisure time, time for reflection, and for appreciation of natural areas is swallowed by fear of future instability". This was rated 'extremely important'.
- "A sense of appreciation of natural areas is superceded by awareness of not belonging anywhere", was rated 'extremely important' by another Black school principal.

In Summary, the following generalisations are drawn from the results of question 13.

- The most important set of constraints upon fieldwork is the 'teacher factor', especially the 'teacher training' component and, to a lesser extent, 'teacher confidence' and 'teacher interest'. The difficulties teachers have in developing resource materials for fieldwork, and the need for training in this area have been highlighted.
- 'Transport costs' are considered a 'significant' constraint. Some schools see a need for funding from education departments for fieldwork. Only the Natal Education Department provides a small subsidy for fieldwork.
- Several 'educational' and 'logistic' constraints are rated between 'significant' and 'of marginal significance'. Teachers recognise the difficulties created by overloaded syllabuses, departmental regulations, and the quest for certificates. The great amount of time needed for the preparation and planning of fieldwork, and the difficulty of supervising large groups in the field are also expressed.
- 'Unsuitability of natural areas' is the least constraint over all, although Asian schools regard this as a 'significant' factor and Black (DET) schools regard it as

'important'. Two particular needs are highlighted in this regard: viz. trained personnel to instruct pupils in the field, and adequate management of natural areas as nature reserves.

3.3.10 Questions 14 - 15

Names and addresses of schools supplied in response to questions 14 and 15 were used only for locating schools during the teacher survey.

3.4 SUMMARY AND FORMULATION OF HYPOTHESES

- (i) Sections 3.3.1 - 3.3.3 show that limited use is made of natural areas both within and beyond Metropolitan Durban. Considering all fieldwork in natural areas, the single most popular site for White schools is the Beachwood Mangroves, and the Umgeni Valley Nature Reserve (Howick) for Asian schools. Coloured and Black schools make little use of natural areas. Except in the case of White schools, more use is made of distant sites than local ones.

- (ii) Sections 3.3.4 - 3.3.6 show that the use of natural areas for extra-curricular activities is primarily a phenomenon in White schools and is almost absent in other schools. A large number of White schools make regular use of local natural areas, as compared to the typically once-per-annum approach to formal fieldwork within the curriculum. A wide range of local natural areas is used for extra-curricular work. These areas are in many cases used for higher order activities (in terms of the goals of Environmental Education) viz. research and practical conservation, whereas distant areas are used for more recreational purposes and

casual study. These facts suggest that local natural areas offer far greater potential for informal learning activities than distant areas. The realisation of this potential is probably dependent on the enthusiasm, organisational and motivational skills of interested teachers.

- (iii) A number of constraints are shown to inhibit the use of natural areas (sections 3.3.7 - 3.3.9). Notwithstanding some differences between education departments, the 'teacher factor' is the most important group of constraints, especially the 'teacher training' and 'teacher confidence' components. The cost of transport is also considered a 'significant' constraint. Despite this, more use is made of distant sites than local sites (except in the case of White schools). This is apparently not due to local sites being seen to be unsuitable, for 'unsuitability of local natural areas' is regarded as the least constraint, rated 'of marginal significance' overall.

Based on current patterns of utilisation of natural areas and perceived constraints upon such use, three hypotheses were formulated regarding teachers' choice of fieldwork sites.

The hypotheses relate primarily to the use of natural areas within the curriculum. The field of enquiry was narrowed for two reasons:

- It is only within the curriculum that large numbers of pupils can be exposed to Environmental Education. This is important in view of the aims of Environmental Education, viz. to achieve an environmentally literate population. Environmental clubs usually involve only small groups of pupils.

- Extra-curricular activities are subject to fewer constraints than formal fieldwork.

It is in the context of fieldwork within the curriculum that the following hypotheses are framed.

HYPOTHESIS 1:

'RESOURCE AVAILABILITY' is an important factor in predisposing teachers towards the choice of particular natural areas for fieldwork.

'Resource availability' refers to those resources which are intrinsic to the natural ecosystems in question and which are of assistance to teachers in preparing for and conducting fieldwork eg. availability of site-specific resource literature, worksheets or other educational aids, field officers to instruct pupils, and interpretive centres. Site-specific training is also regarded as a 'resource' in this context since it provides teachers with the necessary knowledge and skills to use a site.

The rationale for this hypothesis stems from the fact that the 'teacher factor' is found to be the most important constraint inhibiting fieldwork. It is therefore logical that resources which make the difficult task of implementing fieldwork easier for the teacher will be welcomed. If those resources relate to particular sites they will provide a strong incentive for teachers to use those sites rather than others for which teaching resources do not exist.

HYPOTHESIS 2:

Certain 'INTRINSIC CHARACTERISTICS' make some natural areas more suitable for environmental fieldwork than others.

'Intrinsic characteristics' are those biotic and abiotic factors which are inherent within ecosystems and do not require development.

Certain fieldwork sites are very popular, while others are unused. It is therefore hypothesised that certain characteristics are more suitable for environmental fieldwork than others. The teacher survey (Chapter 4) tests this hypothesis as well as establishing what characteristics are required of natural areas.

HYPOTHESIS 3:

While 'TRANSPORT COSTS' may limit the number of fieldwork trips which take place in schools, this is only a secondary consideration influencing teachers' choice of natural areas for fieldwork.

The rationale for this hypothesis is based on the fact that few schools are using the natural areas closest to them and many are conducting trips beyond Metropolitan Durban. Yet their reasons for doing so apparently have nothing to do with local natural areas being unsuitable.

CHAPTER FOUR

SURVEY OF SECONDARY SCHOOL TEACHERS

4.1 INTRODUCTION

Chapter 4 deals with a survey of a sample of teachers who had used natural areas for fieldwork. In doing so this chapter seeks to fulfil the second, third and fourth aims of the study (section 1.2) as outlined below.

The factors which influence teachers' choices of natural areas for fieldwork are investigated (aim 2), and in relation to these factors, the three hypotheses, formulated in section 3.4, are tested.

The characteristics which teachers require of natural areas for environmental/ecological fieldwork are established. The results of the teacher survey, together with insights provided by the literature discussed in section 2.3.4, are synthesised to provide a list of criteria for evaluating the fieldwork potential of natural areas (aim 3).

Priorities for the educational development of natural areas are also identified in fulfillment of the fourth aim of the study.

As mentioned in section 3.4, the survey of teachers is concerned primarily with the use of natural areas within the curriculum although two questions on extra-curricular activities are included. The hypotheses are tested only in the context of fieldwork within the curriculum.

4.2 METHOD

Interviews were chosen as the method of survey as they are

commonly acknowledged as providing higher response rates and permitting more probing inquiry than self-administered questionnaires. The number of non-responses to questions is reduced, as is the possibility of questions being misunderstood (Babbie, 1973).

4.2.1 Choosing the Sample

For the reasons given in section 1.4 this survey was limited to teachers from White, Asian and Coloured schools. Since the empirical nature of the study required that the factors actually influencing teachers' choices of natural areas were established, only teachers who had used natural areas were interviewed. A further reason for this was that only teachers who had used natural areas were considered competent to respond to questions regarding the desirable characteristics of natural areas. Anyone else may not have given any thought to this matter prior to the survey.

The schools and teachers who had been 'involved' in using natural areas were identified by means of the survey of school principals (Chapter 3). In order to select teachers to be interviewed, a numbered list of 'involved' schools was first produced and a sample of these schools was chosen using a table of random numbers obtained from Arkin and Colton (1963). In the case of White and Asian schools, samples of just under 40% were chosen. In the case of Coloured schools the small number of 'involved' schools necessitated that a 100% sample be chosen to ensure that the sample was truly representative of the 'involved' teachers (Table 4.1).

Within each school thus selected, all the teachers who had undertaken fieldwork in natural areas were interviewed.

Table 4.1 shows the number of schools using natural areas (as

indicated by the survey of principals), the number of schools included in the sample chosen, and the numbers of teachers in the sample.

TABLE 4.1 THE SAMPLE

	WHITES	ASIANS	COLOUREDS
Number of schools using natural areas:	36	40	4
Number of schools sampled:	14	15	4
% Of 'involved' schools sampled:	38,9%	37,5%	100%
Number of teachers using natural areas:	114	96	8
Number of teachers sampled:	44	39	8
% Of 'involved' teachers sampled:	38,6%	40,6%	100%

These sample sizes are considered adequate to represent the population of teachers 'involved' in using natural areas (Butler-Adam, 1985 pers comm).

4.2.2 Designing the Interview Questionnaire

The complete interview questionnaire can be found in Appendix D. Following the guidelines of Babbie (1973, p150) with respect to the sequence of questions, mundane factual questions were asked first in order to establish rapport .

In addition to establishing rapport with the interviewees, the main purpose of questions 1 to 4 was to provide information regarding the nature of the sample. These questions provide a useful background to understanding the responses to the survey.

Question 1: Teaching subject: The interviewee's subject speciality was required to identify respondents from different subject backgrounds. This was considered necessary as there may have been differences between the responses of different subject specialists.

Question 2: Subject training: It is well known that many teachers become involved in teaching subjects in which they are not qualified. As lack of training in appropriate subjects could affect a teacher's competence in answering some of the survey questions, this factor needed to be established.

Question 3: Teaching experience: The relationship of the sample to the population of teachers is useful to know since length of experience is likely to affect the teachers' competence in conducting fieldwork. One of two opposing trends could be expected: either it is the more experienced, more confident teachers who conduct fieldwork; or it is the younger teachers, with more modern training and exposure to the possibilities afforded by fieldwork, who are thus involved.

Question 4: Training institution attended: It was of interest to establish whether any particular training institution has a marked influence upon fieldwork practise or upon the use of particular natural areas.

Questions 5, 6 and 7 deal with teacher training in fieldwork and the manner in which teachers were introduced to various natural areas. Site specific training is regarded here as a resource enabling teachers to use a site. Introductions to sites in other ways could also influence the choice of site for fieldwork. The extent of such influences is investigated.

Question 5: Training in fieldwork: The survey of school principals established that a lack of teacher training in fieldwork was the greatest constraint inhibiting fieldwork. It remained to be seen whether training received had influenced choice of fieldwork site.

Question 6: Natural areas visited in training: This question assesses the extent to which teachers have the opportunity to visit natural areas during training and, of particular interest,

which natural areas are most used for training. Together with questions 7 and 8 the influence of such exposure on the teacher's choice of fieldwork site could be established.

Question 7: Manner of introduction to natural areas used:

Understanding the way in which teachers were introduced to the natural areas which they later used for fieldwork contributes to the testing of hypothesis 1. Question 7 also offers insight into ways of promoting natural areas for school use by throwing light on the way in which teachers recognise the potential of sites and are induced to use them.

Question 8: Reasons for choice of site: Question 8 required

teachers to indicate why particular natural areas were chosen for fieldwork. A dilemma was faced here regarding the use of an open-ended or a closed-ended question. There was a possibility that open-ended questions may have elicited responses which were not appropriate to the testing of the hypotheses formulated in section 3.4. Closed-ended questions on the other hand, ran the risk of missing key issues in the minds of the respondents and thus introducing bias. A combination of open- and closed-ended questions was therefore chosen according to the information required.

The responses to question 8a allowed a full list of factors influencing teachers' choice of area to be obtained without their responses being biased.

Question 8b elicited a rating of the relative importance of factors which the researcher had reason to believe were significant in determining teacher choice of fieldwork sites.

Question 9: Teacher awareness of local natural areas: Before

possible fieldwork sites can be used and developed, teachers must be aware of them and of their educational potential. Therefore in considering factors affecting choice of site, the possibility

that teachers were simply unaware of the natural areas near to their school, or at least unaware of the opportunities which they afforded, required investigation.

Question 10: Reasons for not using sites close to school: Where teachers were well aware of the natural areas closest to their school but chose other areas instead, the reasons for choosing non-local sites were examined by means of an open-ended question.

Question 11: Characteristics required of natural areas: This question relates directly to the third aim of the study in establishing those characteristics of natural areas which are regarded by teachers as desirable for fieldwork in Environmental Education.

An initial list of characteristics believed to be important was obtained from Usher (1973). This list is summarised in section 2.3.4. Through discussion with Environmental Education colleagues, in particular Vinden (1985, pers comm), Usher's list was modified and extended. The result was a list of nineteen characteristics of natural areas which were considered of possible value to Environmental Education in secondary schools. The relative desirability of those characteristics could be tested through the teacher survey.

The list was divided into ten characteristics which were 'intrinsic' to natural areas, and nine 'facilities' which could be developed (eg field museums), or which related to logistics of access to the natural area (eg being within 20 minutes travelling time from school). A travelling time of 20 minutes was chosen for two reasons. Firstly it represented half a 40 minute school period so that travelling time occupied only one period of a school day, and secondly 20 minutes should give all the schools in the study area access time to reach at least one natural area, and in many cases a choice of two or three sites (Figure 2.1).

Interviewees were asked to rate each characteristic on a scale from 1 (very undesirable) through 3 (unnecessary) to 5 (very desirable). A 'no opinion' option was also provided. The rating of these characteristics provides an indication of the relative desirability of each characteristic.

Questions 12 and 13: Extra-curricular activities: Whereas questions 1 - 11 deal with formal fieldwork within the curriculum, questions 12 and 13 consider some aspects of extra-curricular fieldwork.

The survey of school principals suggested that the use of natural areas extra-curricularly was subject to fewer constraints than was true of intra-curricular fieldwork. Extra-curricularly a wider range of natural areas was used, visits were often made on a more regular basis, and studies were often more 'in-depth' than was true for formal fieldwork involving whole class groups (section 3.3). It was noticeable, however, that extra-curricular use of natural areas was primarily a phenomenon in White schools. Questions 12 and 13 probe the reasons for teachers not making more use of the extra-curricular option and ask whether they would require the same characteristics of natural areas as for intra-curricular fieldwork.

4.2.3 Conducting the Interviews

The interviews were conducted during October 1985. Appointments were made with schools in advance and teachers were interviewed, as far as was possible, during their non-teaching periods or breaks. Each interview required about 20-25 minutes. The purpose of the survey was explained early in the interview. All interviews were conducted by the author.

4.3 RESULTS

In this section the results of the teacher survey are presented and discussed question by question. The implications of these results in relation to the aims of the study and the testing of hypotheses are discussed in section 4.4.

4.3.1 Question 1: Teaching Subject:

Table 4.2 shows the division of interviewees according to their subject specialisations.

TABLE 4.2 INTERVIEWEES' TEACHING SUBJECTS

	WHITES	ASIANS	COLOUREDS	TOTAL
Biology	27	24	6	57
Geography	17	14	1	32
Other	-	1	1	2

A predominance of Biology teachers is evident with Geography teachers making up almost the entire remaining group. This distribution of the sample between subjects parallels that shown by the survey of school principals and therefore suggests that the sample of teachers is representative of the population of teachers involved in using natural areas. There will of course be some Geography teachers who have used agricultural or built environments who are not included in this survey. Where slight differences in perspective are evident between Geography and Biology teachers they are dealt with under the questions concerned. It should be born in mind, however, that the inclusion of ecology into the matric Geography syllabuses in 1987 will have brought the fieldwork requirements of Geography closer to those of Biology.

4.3.2 Question 2: Subject Training

With only two exceptions, teachers had been trained in the subjects they were currently teaching. In the two cases excepted, the teachers had many years experience in that subject. Thus the possibility of a distortion of the results, arising from a lack of teacher competence to answer the survey questions, is ruled out.

4.3.3 Question 3: Teaching Experience

Figure 4.1 shows the percentage of interviewees in each length-of-experience category for White and Asian teachers (shaded histograms). These profiles may be compared with similar histograms for the populations of all White and Asian secondary teachers (superimposed dotted lines).

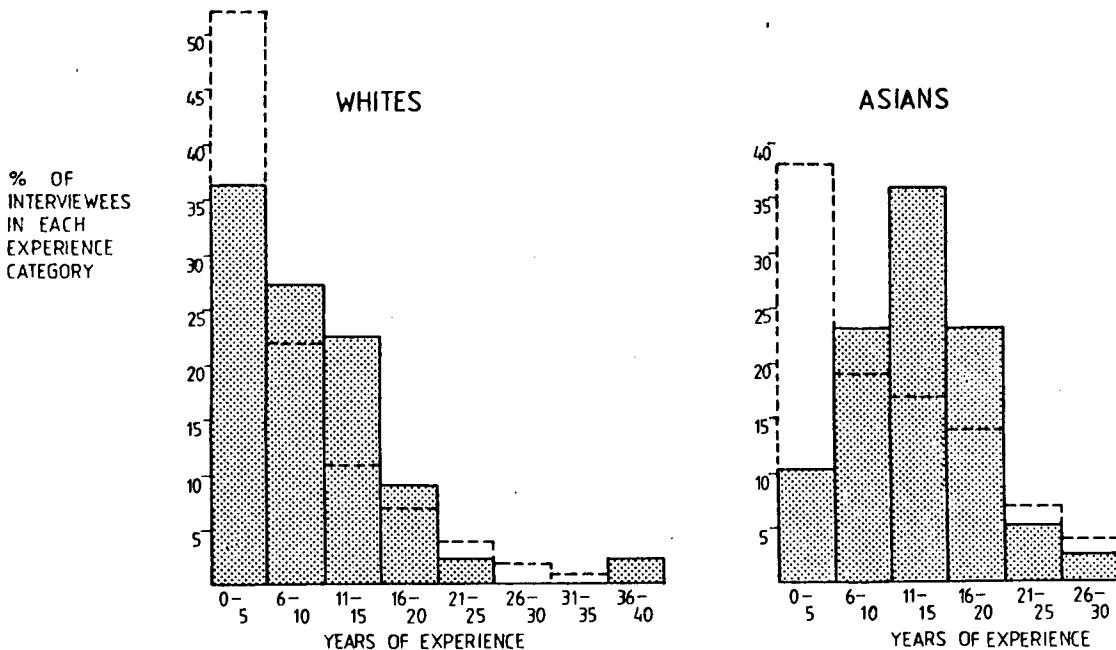


FIGURE 4.1 Teaching experience: the sample (shaded) compared with the population of teachers (dotted lines)

As the small number of teachers in the Coloured sample makes interpretation unreliable for that group, the following analysis is limited to White and Asian groups.

In general Figure 4.1 shows that the samples are more experienced than the population of all teachers. This means that increased experience tends to increase the likelihood of a teacher conducting fieldwork. There are, however, substantial differences between the White and Asian groups as indicated by the mean lengths of experience for the two groups; ie. 9,3 years for Whites and 13,2 years for Asians.

For the White group, the histogram for the sample approximates that for the whole population. Thus experience has a small influence on the likelihood of a teacher undertaking fieldwork. The graph does, however, show a tendency towards greater experience favouring the likelihood of a teacher undertaking fieldwork. Teachers with only 0-5 years experience are less likely to conduct fieldwork than their more experienced colleagues. In the 6 - 20 years categories the advantage of experience is apparent. However, beyond 20 years added experience does not increase the likelihood of a teacher conducting fieldwork. These findings are in broad agreement with those of Ballantyne (1987).

For the Asian group, the role of experience is shown to be far more important. In the 0-5 year experience category, the proportion of teachers in the sample is very small (10%) compared to the relevant proportion of the teacher population (38%). In the 11-15 and 16-20 year categories the proportion of teachers in the sample is almost twice as high as the relevant proportions of the teaching population. As for the White group, experience beyond 20 years offers no further advantage.

Suggested reasons for the trends shown in Figure 4.1 are as follows. As teachers gain experience, their subject knowledge,

confidence and pupil management improve so that they are more inclined to undertake fieldwork. The fact that the role of experience is more important for Asians than for White teachers can be explained by referring to the results of question 5. Most White teachers sampled had received some form of training in fieldwork. Thus for younger teachers, training partly compensated for lack of experience. Therefore, the mean experience in the White sample was lower than that for Asians. Experience beyond 20 years does not increase the likelihood of fieldwork being carried out, presumably because the more competent teachers at that stage have been promoted to senior posts where they are involved in much administration and little teaching.

4.3.4 Question 4: Training Institution Attended

Table 4.3 shows the training institutions attended by the teachers interviewed; and the percentage attending each institution who had received pre-service training in fieldwork.

Table 4.3 shows the following:

- By way of background information, the great majority of teachers interviewed had been trained in Durban or Pietermaritzburg (column a).
- The fact that percentages in column (b) are generally low suggests that few local training institutions have made a marked contribution to fieldwork in secondary schools. In those cases where percentages in column (b) exceed 31%, they represent only 1 or 2 individuals. Such small numbers prevent conclusive comment regarding the contribution made by the institutions concerned.
- Training in fieldwork was particularly lacking amongst Asian training institutions.

TABLE 4.3 FIELDWORK TRAINING AT TEACHER TRAINING INSTITUTIONS

	Training Institution	(a) % of Inter- viewees who attended	(b) % of attenders who had received fieldwork training there
WHITES	University of Natal, Durban	34,1	26,7
	University of Natal, Pmb	29,5	31,0
	Durban Teachers Training College	6,8	33,0
	Edgewood College of Education, Durban	2,3	100,0
	Other South African institutions	22,7	30,0
	Institutions in the United Kingdom	4,6	100,0
ASIANS	University of Durban- Westville	38,5	6,7
	Springfield Training College, Durban	33,3	15,4
	Salisbury Island	20,5	12,5
	Other South African Universities	7,7	0,0
	COLOUREDS	Bechet Training College, Durban	62,5
	University of Durban- Westville	12,5	100,0
	University of Western Cape, Cape Town	25,0	50,0

With respect to the influence of training institutions upon the use of particular fieldwork sites, the following observation can be made. Relating the results of question 4 to those of questions 6 and 7 supplies substantial evidence that certain institutions had favoured the use of the Beachwood Mangroves. The use of this, the most popular site, by the University of Natal (Durban and Pietermaritzburg centres) and Edgewood College, could account for 33,3% of White Biology excursions to the Beachwood Mangroves. No other site had been used by training institutions to a comparable extent. Thus the role of training institutions in contributing to the popularity of natural areas is shown to be important especially when one considers that many school groups travel great distances to reach the Mangroves.

In summary, relatively few teachers received training in fieldwork, especially amongst the Asian group, and it is not clear whether any particular training institution had excelled in this regard. However, amongst those Biology teachers who had received pre-service fieldwork training, there is substantial evidence that institutions had influenced their choice of fieldwork site later on, notably with respect to the Beachwood Mangroves. The influence of training upon choice of site is further elaborated under questions five, six and seven.

4.3.5 Question 5: Training in Fieldwork

Table 4.4 shows the percentage of teachers in the sample who had received fieldwork training in various categories; viz: pre-service, in-service, or informal training.

A number of observations can be drawn from Table 4.4:

- A fairly high degree of training is apparent amongst the White sample, 84,1% of interviewees having received some training in fieldwork as compared with only 46,2% for

TABLE 4.4 TEACHERS' FIELDWORK TRAINING

Category of training	% Of interviewees in each category of training		
	WHITES	ASIANS	COLOUREDS
(i) Pre-service	34,1	10,3	62,5
(ii) In-service	52,3	15,4	12,5
(iii) Informal	36,4	30,8	0
Training in at least one of the above categories	84,1	46,2	75,0
Training in two of the three categories	29,5	10,3	0
Training in all three categories	4,5	0	0
No fieldwork training	15,9	53,8	25,0

Asians and 75,0% for Coloureds. Furthermore over a third of the White group had received training in two or even three categories.

- A substantial proportion of teachers, especially in the Asian group received no training in fieldwork. It is notably in this group that a heavy reliance was placed upon trained personnel to instruct pupils in the field (see Table 4.7).
- The manner in which training was received was different for the three sample groups. For the White group, in-service training reached the greatest number of teachers (52,3%). In the case of Asians training had been dominantly of the informal kind, reaching 30,8% of the sample. For Coloureds pre-service training reached 62,5% of the sample.

The significance of these results, especially regarding the influence of training upon the choice of site, will become apparent from the results of questions 6 and 7. However, one

preliminary observation is made here. It is apparent that training in fieldwork is by no means reaching all teachers (especially remembering that these results deal only with the 'involved' teachers). Asian teachers in particular have had to rely on informal training rather than any supplied by their Education Department. The Natal Education Department (Whites), however, has begun to address the lack of training by means of in-service courses, although these have concentrated on very few sites.

4.3.6 Question 6: Natural Areas Visited in Training

Table 4.5 lists the natural areas visited during training (ie pre-service, in-service, and informal training) and gives the number of teachers who had visited them in each case.

The outstanding feature in Table 4.5 is that, in total, far more teachers had been exposed to the Beachwood Mangroves in training than to any other site. This was particularly true for White teachers. Exposure had taken place mainly through pre-service and in-service training but in some cases also through informal training.

Umgeni Valley Nature Reserve and St Lucia had also been popularly used, mainly through in-service courses.

Table 4.5, parts (A) and (B) are most informative when compared with Tables 3.3 and 3.4 respectively. Tables 3.3 and 3.4 show all the field sites which were used according to the survey of school principals.

There is a marked parallel between Table 4.5 (A) and Table 3.3 dealing with natural areas within Metropolitan Durban. In both these Tables Beachwood Mangroves tops the list of local areas by a large margin, with Treasure Beach and Stainbank ranking second

TABLE 4.5 AREAS VISITED DURING TRAINING (PRE-SERVICE, IN-SERVICE, AND INFORMAL TRAINING)

Natural Area	WHITES	ASIANS	COLOURED	TOTAL
(A) Within Metro. Durban				
Beachwood Mangroves	25	3	2	30
Treasure Beach	1	5	2	8
Stainbank	5	2	1	8
Palmiet/Palmiet extension	1	5	1	7
Reunion Rocks	4	1	-	5
Isipingo/Tiger Rocks	1	1	2	4
Isipingo Mangroves	-	3	-	3
Happy Valley	1	2	-	3
Pigeon Valley	2	-	-	2
Silverglen	-	2	-	2
Marionwood	2	-	-	2
Inanda Game Res (now closed)	-	2	-	2
Umdloti Rocks	1	-	-	1
Paradise Valley	-	-	1	1
Burman Bush	-	-	1	1
Hazelmere Dam	-	1	-	1
(B) Beyond Metro. Durban (only the more popular training areas listed)				
Umgeni Valley Nature Reserve	9	4	2	15
St Lucia	10	1	-	11
Nagle Dam/Valley of 1000 Hills	2	5	-	7
Cathedral Peak	5	-	-	5
Drakensberg (other than Cathedral Peak)	2	2	-	4
Oribi Gorge	-	3	1	4
Hluhluwe and/or Umfolozi	2	2	-	4
Wagendrift Dam	3	-	-	3
Mtunzini	1	1	-	2

and third respectively. To a lesser degree Table 4.5(B) corresponds with Table 3.4 dealing with natural areas used beyond Metropolitan Durban. In this case Umgeni Valley Nature Reserve is clearly ahead of other sites.

The inference drawn from these comparisons is that there is a strong relationship between the exposure to specific sites in training on one hand, and the subsequent use of those sites for fieldwork. This does not necessarily mean that there is a one-to-one correlation between a particular teacher visiting an area during training and later using that site. But it does mean that site-specific training increases the level of awareness and knowledge of certain field sites in the teaching community. The result is that teachers are predisposed to use those sites during their teaching career. Planning and executing fieldwork usually involves several teachers from a school staff, so that although only one teacher in a school may have visited a site prior to using it, others do so in the execution of fieldwork and so the awareness of opportunities and field knowledge of all the involved teachers increases.

The observation that exposure to particular sites during training predisposes teachers towards using those sites is further born out by the fact that 55,3% of White teachers who visited any natural areas during training, had used at least one of those sites for fieldwork during the study period.

In the case of Asian interviewees, 23,1% of those who visited natural areas during training had later used at least one of the areas for fieldwork. It is interesting to note that, while Umgeni Valley Nature Reserve was by far the most popular site used by Asian teachers, only four had visited it during training. Question 7 helps explain this fact as many Asians were introduced to Umgeni Valley Nature Reserve through recommendations from colleagues or tradition in the school, and there is a heavy reliance on field officers in the area to instruct pupils

(Question 8). Accordingly there is no necessity for teachers to visit the area prior to taking pupils there.

Amongst Coloured teachers interviewed, 25% had later used areas which they visited during training. If one excludes two teachers who completed their pre-service training in the South West Cape, this figure rises to 50%.

It is concluded on the basis of question 6 that site specific training predisposes teachers towards the subsequent use of those sites. This is to be expected as the teacher gains specific field knowledge, ideas for fieldwork methods and therefore confidence, through such training.

4.3.7 Question 7: Manner of Introduction to Sites Used

Table 4.6 shows the results of asking teachers how they were introduced to the natural areas which they had used.

Table 4.6 shows that the dominant manner in which teachers were introduced to sites was through 'colleagues or tradition in the school.' This category comprised 47,2% of the entries in the Table. A further 23,6% recorded 'training' as the manner of introduction, the more formal types of training being more likely to lead to the use of a natural area than informal training. 'Own exploration' constituted only 18,7% of introductions, predominantly in the White group. A mere 10,6% were introduced to the relevant natural area through 'published material', mainly in the Asian group. In 7 out of 13 cases the published material was in the form of publicity brochures distributed by Umgeni Valley Nature Reserve and Crocworld.

It is interesting also to analyse the manner of introduction to the three most popular sites used, viz: Beachwood Mangroves, Umgeni Valley Nature Reserve and Treasure Beach. In all three racial groups, with few individuals excepted, teachers using

TABLE 4.6 MANNER OF INTRODUCTION TO SITES USED

Manner of introduction	Number of interviewees			TOTAL
	WHITES	ASIANS	COLOUREDS	
(i) Pre-service)	7)	5)	2)	
In-service) Training	7) = 18	4) = 9	0) = 2	29
Informal)	4)	0)	0)	
(ii) Colleagues or tradition in the school	25	27	6	58
(iii) Published material	2	9	2	13
(iv) Own exploration	14	6	3	23
Total Number of Entries	59	51	13	123

Note: In some cases more than one manner of introduction was applicable eg a teacher who read about a site and then explored it. Furthermore, many teachers had used more than one area, each of which had been introduced to them in different ways. Thus raw scores are used here rather than percentages of the sample size.

these areas were introduced either through training or through colleagues/tradition in their school. In the case of Umgeni Valley Nature Reserve the distribution of advertising brochures also played a minor role.

These results clearly indicate a reluctance on the part of teachers to break new ground with respect to choosing fieldwork sites. This is apparent from the heavy reliance upon 'training' and 'colleagues/tradition' and the very limited degree to which teachers carried out their 'own exploration' of sites. There is, of course, a relationship between 'training' and 'colleagues/tradition' in that site-specific training received by

some teachers is passed on to others, often together with resource materials such as information sheets and worksheets. The very limited degree to which teachers had been introduced to sites through 'published material' reflects primarily upon the lack of site-specific literature and the fact that literature which exists is not readily accessible due to its specialised nature, or it is not in a form which can easily be used by teachers.

A clear reliance upon available resources is therefore apparent from teacher responses to Question 7. Many teachers simply do not have the time, energy, background knowledge, or training in fieldwork methodology to develop their own teaching resources for the field situation.

4.3.8 Question 8: Reasons for Choice of Site

Whereas questions 5 to 7 were used to infer certain reasons for teachers' choice of site from facts they supplied, question 8A and B required them to state their reasons directly and to rate the importance of factors affecting their choice.

4.3.8.1 Question 8A

Question 8A elicited a list of reasons for teacher choice of site through the use of an open-ended question. This was analysed in two ways. Firstly a simple list, containing all the reasons given, and the number of times each reason was stated, is provided in Table 4.7. The most common reasons are discussed in detail. The second analysis breaks down the list of reasons according to the most popular fieldwork sites so that the cause of attraction to particular sites becomes apparent (Table 4.8).

The reason most frequently given for the choice of natural area was the need to teach something required by a syllabus

(Table 4.7). The syllabuses (eg in Biology and Geography) do not, however, specify the content to be taught in the field. So while syllabuses offer a range of possible topics for fieldwork, reference to syllabuses does not explain particular site choice. Teachers select from syllabuses the material they wish to teach in the field.

The second most commonly stated reason for site selection is proximity. However, in many cases where teachers mentioned this factor, the natural areas chosen were not amongst those closest to their school i.e. groups travelled right across Metropolitan Durban or even beyond to reach particular sites. For this reason the figures in the second row of Table 4.7 are slightly misleading. Of the 47 teachers who stated 'proximity' as a reason for their choice, 21 had travelled considerable distances instead of using local sites. Nevertheless, proximity is taken into consideration by many teachers, given the constraint of transport time and cost (section 3.3). The fact that many travelled to distant sites suggests that a conflict exists between the requirement of proximity and other factors which are considered important.

Reasons 3 and 4 in Table 4.7 indicate reliance upon available resources. The need for field guides to instruct pupils was particularly notable amongst the Asian group, while habit or tradition in the school was a reason frequently given by White and Asian teachers. If visits to the same sites are repeated year after year, there is no necessity to generate new resources or to discover new sites.

Reasons 5 - 9 and 16 - 17 relate to certain intrinsic characteristics of natural areas which teachers regard as important. These are discussed in detail under question 11. It is sufficient to note here, however, that White teachers show a preference for 'simple ecosystems' in which a 'limited range' of both plants and animals can easily be seen.

TABLE 4.7 REASONS FOR CHOICE OF SITE

Reason given	Number of times reason given			
	WHITES	ASIANS	COLOURED	TOTAL
1. opportunity afforded by the syllabus	22	29	10	61
2. proximity to school	36	8	3	47
3. guide/education officer available to instruct pupils	9	22	1	32
4. been before/tradition in the school or decision made by senior teacher	17	11	1	29
5. simple ecosystem/clearcut boundaries /restricted number of species	14	0	0	14
6. the flora and fauna in the system are easily visible	10	0	1	11
7. wide variety of habitats/can teach different sections/subjects on one trip	1	6	2	9
8. interesting/"different" ecosystem (cf "grasslands are very boring")	7	0	0	7
9. the reserve can take large groups ie in terms of space and pupil management	0	7	0	7
10. knowledge of the area (versus lack of knowledge of other areas)	1	3	2	6
11. literature/information available (versus lack of resources on other areas)	4	2	0	6
12. new area for pupils/ "good to get away"	0	5	0	5
13. accommodation available/the overnight experience is valuable	3	1	1	5
14. worksheets available	2	3	0	5
15. previous training in the use of the area	4	0	0	4

TABLE 4.7 (CONTINUED)

Reason given	Number of times reason given			
	WHITES	ASIANS	COLOUREDS	TOTAL
16. complex system/high diversity	4	0	0	4
17. presence of large mammals	2	2	0	4
18. a personal interest in the area	3	0	0	3
19. advertising brochures received from owners of the natural area	0	0	3	3
20. the area is a proclaimed nature reserve/well preserved area	2	0	1	3
21. proximity to pupils' own neighbourhood/to inspire appreciation of nature locally	2	1	0	3
22. recommended by education department (helps to reduce "red tape")	0	2	0	2
23. recommended by colleagues/ "all schools are going there"	0	1	1	2
24. low cost	1	0	0	1
25. no booking needed	1	0	0	1
26. ease of examining	1	0	0	1
27. to show effects of invader species	1	0	0	1
28. good hiking trail	0	1	0	1
29. pupils enjoy the seaside	0	0	1	1
30. "discovered that Blacks could go there"	0	0	1	1

The popularity of coastal areas such as mangrove swamps can be partly attributed to these two characteristics (Table 4.8).

Reasons 10, 11, 14 and 15 indicate reliance upon available resources, such as site-specific literature and training to provide teachers with field knowledge, and worksheets for pupil use. The fact that only 4 teachers mentioned 'previous training' (reason 15) may appear to contradict the findings of section 4.3.6 and 4.3.7 where training was shown to have a significant influence on teachers' choice of site. However, on two grounds it is argued that no necessary contradiction exists. In Table 4.7, the influence of training could be subsumed under other reasons (eg no. 4 and 10). Notwithstanding this possibility, it should be noted that the number of times a reason was stated does not necessarily indicate the importance of that reason. Not all factors affecting an individual's decision necessarily come to mind in response to an open-ended question and some factors are simply taken for granted by the respondent. The findings of section 4.3.8.2 which considered the relative importance of factors affecting choice of site lends support to the findings of sections 4.3.6 and 4.3.7.

To sum up, the first analysis of question 8A indicates that the reasons most often given by teachers for their choice of site may be arranged into four main categories. Firstly, the syllabus provides the motivation for fieldwork and the framework of possible topics from which to choose. Secondly the availability of resources, broadly defined, forms an important set of influences upon teachers' choice of site. Thirdly, the constraint of transport time and cost is operative creating a demand for nearby sites. Fourthly, there are a number of intrinsic characteristics of natural areas which teachers regard as important.

The discussion turns now to the details of the seven most popular natural areas and the factors which attracted teachers to them.

This information is presented in Table 4.8 and each of the seven sites is then discussed in turn.

Beachwood Mangroves/Dunes

This small area was used mainly by White schools, a large number of which are situated in reasonably close proximity to it. However, many of the groups using this area were travelling right across Durban to do so which suggests some appeal intrinsic to the site. Thirteen teachers mentioned that they favoured the simple nature of this ecosystem in that its boundaries are clear, inputs and exports of matter and energy are easy to understand, and the low species diversity facilitates ease of explanation of interactions between organisms. Together with the neighbouring dunes, principals such as ecological succession, adaptations to abiotic factors, competition, and predation can be conveniently demonstrated. Thus a number of syllabus topics can be taught. The plants and most of the animals in the ecosystem are usually visible so that pupil interest is maintained. In forests or grassland, by comparison, one may see very little animal life, especially when large groups of pupils are present. Other factors contributing to the popularity of the mangroves are the plentiful literature and resource material available on this well studied ecosystem. Added to this, the area has been developed for education with raised walkways and, since the completion of this survey, the addition of an interpretive centre. The role of exposure to this site in training has already been discussed under questions 4 and 6.

In summary, it is a combination of intrinsic characteristics of the site, available teaching resources, proximity, training, and tradition in schools, which together contribute to the popularity of the Beachwood Mangroves.

TABLE 4.8 REASONS FOR CHOICE OF POPULAR NATURAL AREAS

Reason given	Number of times reason given							
	Beachwood Mangroves/Dunes	Isipingo Mangroves/beach	Umgeni Valley Nature Reserve	Treasure Beach	Stainbank Nature Reserve	Oribi Gorge	Thompson's Bay	
Numbers allow cross reference to Table 4.7								
1. dictated by syllabus	6	4	18	7	2	2	3	
2. proximity to school	11	2	2	4	5	0	1	
3. guide/education officer	2	0	24	0	5	0	0	
4. been before/tradition in the school	10	0	6	1	2	0	2	
5. simple ecosystems	13	0	0	0	0	0	0	
6. flora & fauna easily visible	7	0	3	0	0	0	0	
7. wide variety of habitats	0	0	5	4	0	0	0	
8. interesting/different ecosystems	5	0	0	1	0	0	0	
9. can take large groups	0	0	6	1	0	0	0	
10. knowledge of the area	0	0	3	1	0	0	0	
11. literature/information available	3	0	1	0	0	0	0	
12. new area for pupils	0	0	3	0	0	0	0	
13. accommodation available	0	0	3	0	0	0	0	
14. worksheets available	2	0	3	0	0	0	0	
15. previous training....in the area	3	0	0	0	0	0	0	
16. complex ecosystem	0	0	0	0	2	0	0	
17. presence of large mammals	0	0	1	0	2	0	0	
19. advertising brochures	0	0	2	0	0	0	0	
22. recommended by education dept	0	0	1	1	0	0	0	
23. recommended by colleagues	0	1	1	0	0	0	0	

Isipingo Beach/ Mangroves

This is a less well preserved natural area, which is not yet proclaimed a reserve. The area's intrinsic characteristics are similar to the Beachwood Mangroves with the addition of a rocky area but its use for education has not been developed or promoted in the same way. Not many teachers in the sample had used this area. The syllabus and proximity to schools were the main reasons for choosing it.

The fact that this site is similar to the Beachwood Mangroves but is far less used can be explained largely by the fact that it had not been developed to meet the needs of education (eg walkways); it had not been used much in the training of teachers (only 3 in the sample had been there in training - Table 4.5); and it lacked site specific literature (although that which exists for Beachwood Mangroves could probably be adapted). It is suggested therefore that the great difference in popularity between the two mangrove sites is due mainly to differences in 'resource availability' and 'facilities'. Intrinsic characteristics, and proximity to schools do not appear to play a significant role in influencing the popularity of these two sites relative to one another. This site, if adequately developed, could offer a valuable alternative to the Beachwood Mangroves for schools in the Southern parts of Durban (eg those in Chatsworth).

Umgeni Valley Nature Reserve, Howick

Situated about a two hours' bus ride from Durban, this reserve has proved popular particularly amongst Asian and Coloured schools. Run by the Wildlife Society of Southern Africa, it is geared entirely for Environmental Education and its curriculum is designed to meet the requirements of Biology and Geography syllabuses. Education officers, who are mainly qualified teachers, are available if required and this is one of the main reasons for the popularity of this reserve. The problems of pupil management in the field, teachers' lack of field knowledge, and their difficulties in developing resources, are therefore

overcome. Worksheets are also available. The reserve offers a variety of habitats and land forms so that different subjects and different sections of syllabuses can be combined into one trip. In terms of its intrinsic physical and ecological characteristics, however, Umgeni Valley Nature Reserve offers little more than Silverglen Nature Reserve which is in the heart of the largest Asian population in Durban, Chatsworth. Silverglen is, however, hardly used by schools.

In relation to Asian schools at least, the above comparison between Umgeni Valley Nature Reserve and Silverglen strongly suggests that it is the availability of resources, especially trained education officers, which draw teachers to Umgeni Valley Nature Reserve despite the distance involved and despite the fact that an intrinsically similar site exists nearby.

Treasure Beach

This rocky shore area enjoys some of the same benefits for education as mangrove swamps in that at low tide the range of plants and animals is clearly visible. Adaptations, effects of abiotic factors on zonation of organisms, and feeding relationships can be clearly demonstrated. The adjacent dune vegetation grading into coastal scrub forest offers further opportunities to illustrate various ecological principles (e.g. succession) and so fulfils several syllabus requirements. Treasure Beach is also close to large concentrations of Asian and Coloured populations.

In addition to these factors, Treasure Beach ranked amongst the more popular sites used for the training of Asian and Coloured teachers (Table 4.5) so that it was better known amongst the teaching community than most other sites.

The evidence suggests that it is a combination of intrinsic qualities and the training factor which draws teachers from all over Metropolitan Durban to this site.

Stainbank Nature Reserve

This fairly large nature reserve, which comprises forest, grassland and freshwater habitats, is used mainly by White schools, apparently for reasons of proximity and the availability of an education officer to instruct pupils. The area has a number of species of large mammals which makes it suitable for teaching sections of junior secondary syllabuses. Thus the intrinsic characteristics of the site, the transport constraint and resource availability all played a role in influencing teachers in favour of this site.

Oribi Gorge

This reserve is particularly attractive to Geographers as it boasts the magnificent scenery of deeply incised river meanders and resulting rock formations. 'Text book' examples of various geological and geomorphological features are the main attractions to this site. While it also offers much for ecological studies it is apparently not exploited for this purpose. Oribi Gorge is situated several hours drive from Durban and is used mainly by Asian schools. Many features of geological and geomorphological interest are available in Metropolitan Durban (although on a less dramatic scale) so the search for 'text book' examples of such features is not sufficient to explain or justify visits so far afield. The fact that Oribi Gorge has been used as a training site, however, may also contribute to its popularity (Table 4.5).

Thompson's Bay

Thompson's Bay is situated over an hour's drive from Durban. This rocky coastal area is used by White Geographers for its 'text book' examples of coastal erosion, faults, various rock types, and weathering features. As in the case of Oribi Gorge, the popularity of this site cannot be attributed solely to intrinsic features of the site since similar features can be found in Metropolitan Durban. Habit and tradition in certain schools also helps to account for the ongoing use of Thompson's Bay (Table 4.8).

Overall, the analyses of question 8A show that reasons for the choice of natural area differ between teachers in different education departments and also according to the characteristics of the natural areas and the resources available. Lists of reasons have been presented and discussed, first in isolation and then in relation to specific sites. As the number of times a reason was stated need not necessarily indicate the importance of that reason, question 8B required teachers to rate the importance of a number of pre-determined factors which may have affected their choice of site.

4.3.8.2 Question 8B

Question 8B proposed a list of six factors (a - f) possibly affecting choice of site. Teachers were required to rate these factors on a four point scale where 1 = 'no influence', 2 = 'minor influence', 3 = 'moderate influence', and 4 = 'major influence'. A zero option was also provided for respondents who were 'unsure' of the influence of a particular factor upon them. Responses were analysed in two ways. The first analysis involved calculating the mean rating given to each of the factors (a) to (f). Mean scores were plotted as histograms giving a profile of the relative importance of each factor in affecting teachers' choice of natural area (Figures 4.2 - 4.5). These Figures are referred to as 'means profiles'.

Since means give a poor indication of the distribution of responses, a second analysis was carried out. The distribution of responses for each factor (a-f) was calculated (Appendix E). Using this data histograms (Figures 4.6 - 4.8) representing the 'frequency distributions' for certain factors are presented in the text where they are helpful in interpreting the 'means profiles' (Figures 4.2 - 4.5). It was found, for example, that 'frequency distributions' for some factors were strongly bimodal.

Figure 4.2 shows a composite 'means profile' for all three groups,

FIGURE 4.4: ASIANS

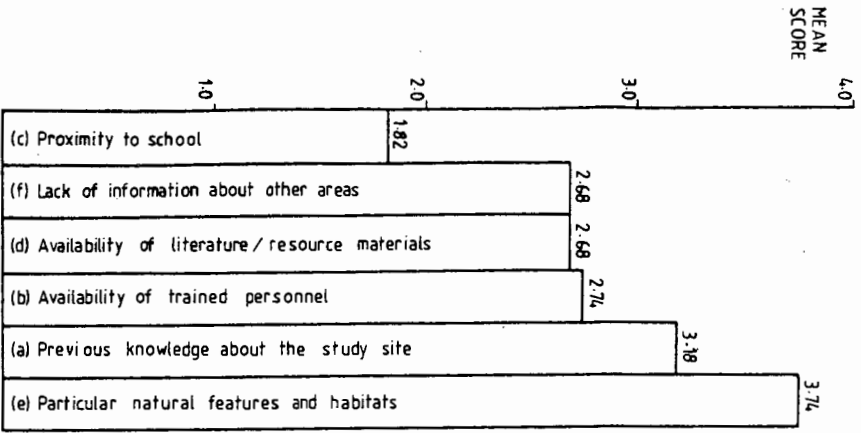


FIGURE 4.5: COLOUREDS

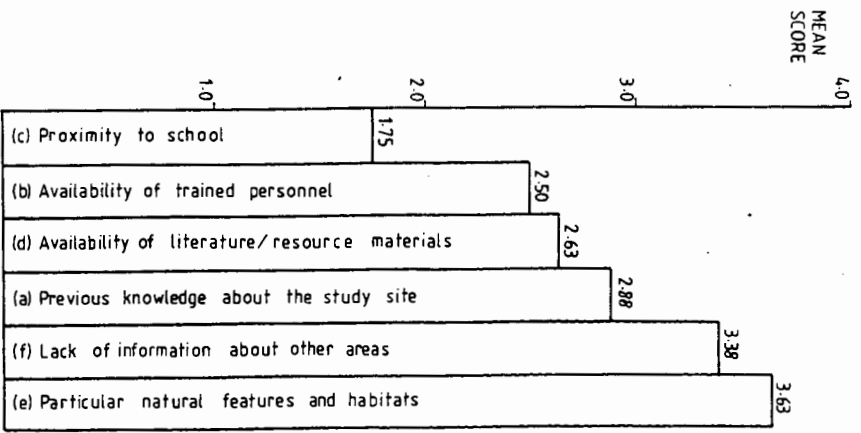


FIGURE 4.2: ALL GROUPS

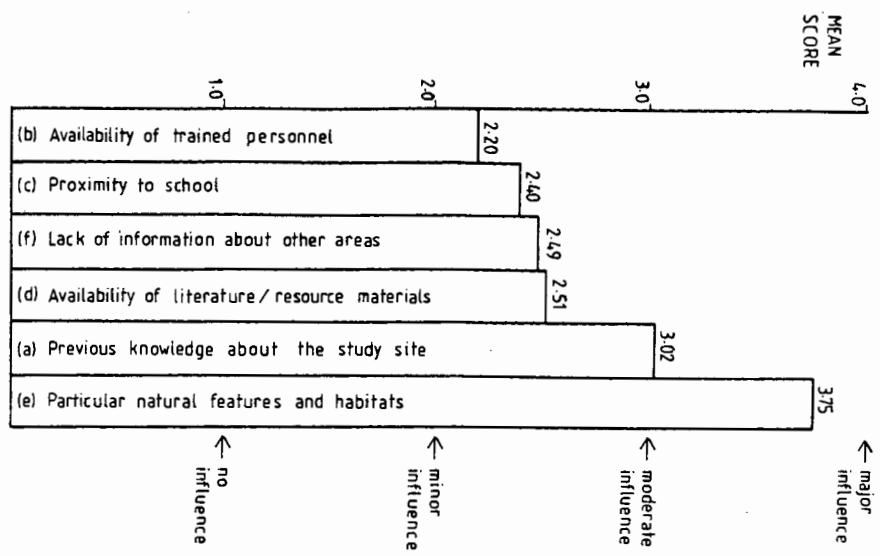
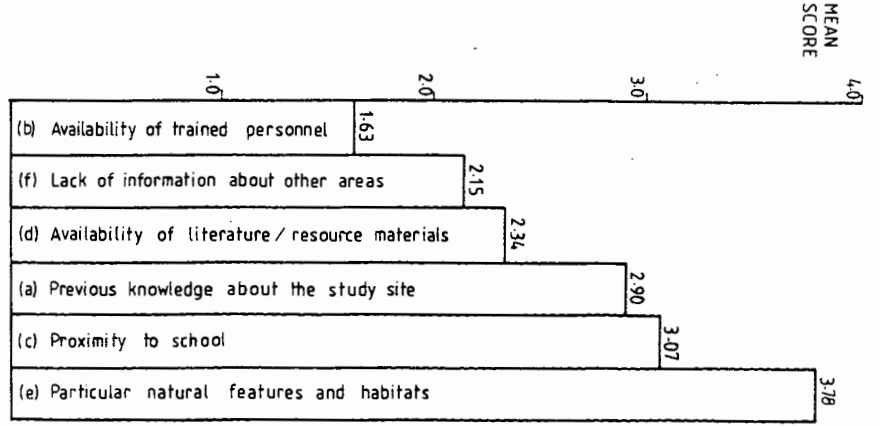


FIGURE 4.3: WHITES



Whites, Asians and Coloureds. Figures 4.3, 4.4 and 4.5 show separate means profiles for each of the three groups. These are referred to where they differ significantly from the composite profile. Factors a - f are discussed below in rank order according to Figure 4.2. Except where otherwise stated, the discussion is based on Figure 4.2.

Factor e, 'the particular natural features and habitats which the area offers', emerges as the most important factor influencing teachers' choice of site (mean = 3.75). All three groups agreed on this factor (Figures 4.3 - 4.5). This simply reflects teachers' appreciation of the potential of certain sites for use within the range of topics offered by subject syllabuses (see the first reason for choice of site in Table 4.7). However, as pointed out earlier, syllabus content does not explain the choice of sites as fieldwork could relate to one of a range of topics therein. For example, the standard 9 Geography syllabus included sections on the work of rivers, sea and ice. If the teacher had chosen to undertake fieldwork in geomorphological aspects of the syllabus, he/she could have found features resulting from each of these three agents within Metropolitan Durban. Yet some teachers still chose Thompson's Bay or Oribi Gorge. Neither does the senior Biology syllabus specify what habitats must be used for fieldwork. Forests, grasslands, fresh- or marine aquatic ecosystems could be used in terms of the syllabus but most teachers preferred mangroves. Therefore, certain intrinsic characteristics of some areas were seen to be of particular value for fieldwork. The desirability of particular intrinsic characteristics is discussed in section 4.3.11.

Factor a, 'previous knowledge about the site', was ranked second having a 'moderate influence' upon teachers' choice of site (mean = 3.02). There was close agreement between the three groups on this factor (Figures 4.3 - 4.5). Despite the fact that some teachers relied on field officers to instruct pupils, the majority had to turn to sites of which they had previous knowledge and

experience. By implication the role of training is important here. It is clear that site-specific training, by giving teachers knowledge of particular sites, will predispose them to use those sites (sections 4.3.6 and 4.3.7).

Factor d, 'availabiliy of literature/resource materials or worksheets', was ranked third with a mean rating of 2.51. There is a reasonable degree of agreement between groups when the means are considered (Figures 4.3 - 4.5). However, the frequency distribution (Figure 4.6) is bimodal indicating that resource materials and worksheets were either not available, in which case this factor had 'no influence' or they were available, in which case they tended to have a 'moderate or major influence'. This suggests that if resource materials had been available for more sites, this factor would have received a much higher mean rating.

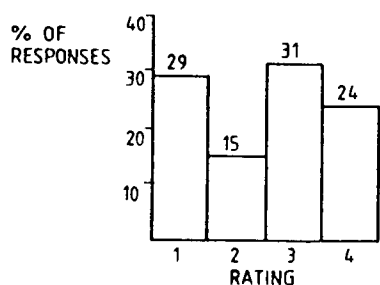


FIGURE 4.6 FACTOR (d): AVAILABILITY OF LITERATURE / RESOURCE MATERIALS: FREQUENCY DISTRIBUTION: ALL GROUPS

Factor f, 'lack of available information about other areas', ranked fourth with a mean of 2.49, i.e. between a 'minor' and a 'moderate' influence. This mean, however, masks strong differences between the White, Asian and Coloured groups with means of 2.15, 2.68 and 3.38 respectively (Figures 4.3 - 4.5). The figures for Asian and Coloured groups are surprisingly high, indicating a lack of awareness amongst many teachers of the range of potential sites available. This fact points to a need for a comprehensive resource listing of available local sites, and what they have to offer, to be produced and distributed by education departments.

Factor c, 'proximity to school', was ranked fifth overall (mean = 2.40) i.e. somewhat above a 'minor influence'. The role of this factor, however, differed greatly between the three groups of teachers. Mean ratings for the White, Asian and Coloured groups were 3.07, 1.82 and 1.75 respectively (Figures 4.3 - 4.5). These ratings reflect the fact that the majority of Whites had used local sites (e.g. Beachwood Mangroves) whereas the majority of Asians and Coloureds had used distant sites. The composite frequency distribution shown below (Figure 4.7A) reveals a bimodal tendency which can be explained by referring to the frequency distributions drawn for the three groups (Figure 4.7B - D).

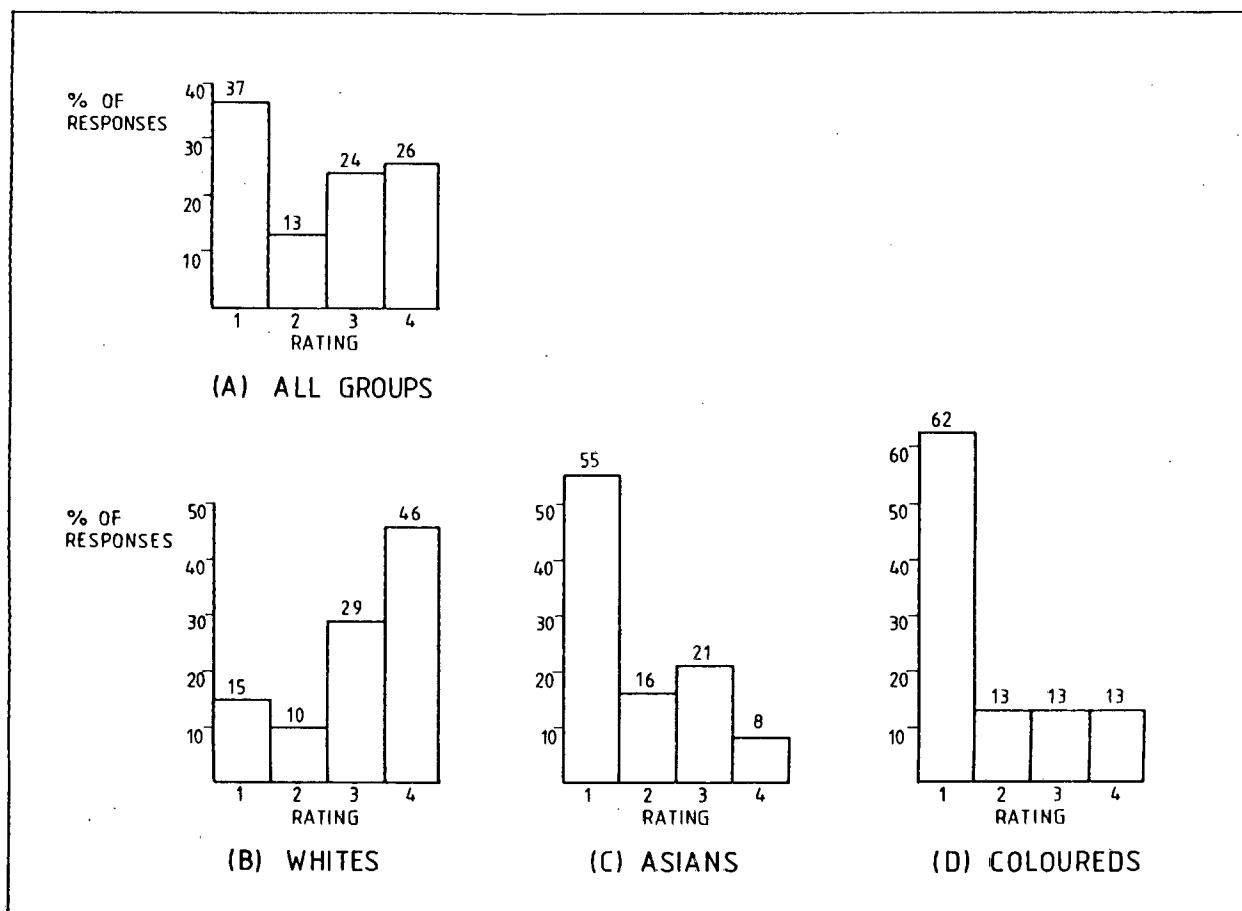


FIGURE 4.7 FACTOR (c): PROXIMITY TO SCHOOL: FREQUENCY DISTRIBUTIONS

White teachers tended to rate this factor as a 'moderate' to 'major' influence whereas the distributions for Asians and

Coloureds showed strong modes indicating 'no influence'.

In an attempt to explain the differences between groups on this factor, the way in which fieldwork was funded by different education departments was investigated. The Natal Education Department (Whites) traditionally granted schools a small subsidy per pupil per annum for fieldwork. Asian and Coloured schools received no such subsidy so that fieldwork was funded entirely by school funds and pupil contributions (Naidoo, 1988 pers comm). The fact that 'proximity to school' was of little importance to Asian and Coloured teachers can therefore only be explained by their relatively greater reliance upon available resources, including field officers, for which they were prepared to travel some distance. Figures 4.4 and 4.5 show that various resource factors ranked much higher in the means profiles than 'proximity to school'.

Factor b, 'availability of trained personnel' was ranked sixth with a mean of 2.20 i.e. a 'minor influence'. On this factor there was the strongest disagreement between groups. Mean ratings for White, Asian and Coloured groups were 1.63, 2.74 and 2.50 respectively (Figures 4.3 - 4.5). The composite frequency distribution for the three groups (Figure 4.8) is strongly bimodal. This reflects the fact that field officers either were available (e.g. at Umgeni Valley Nature Reserve where they represented a strong attraction to the site) or they were not available (as in most cases) or not required (as in the case of the Beachwood Mangroves where there is adequate knowledge amongst teachers and resource materials are in circulation).

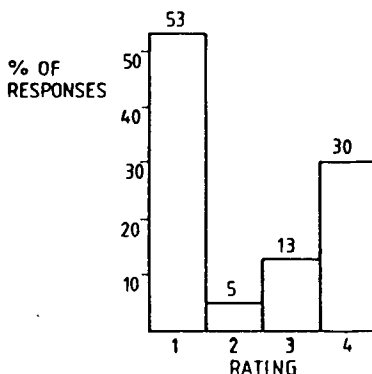


FIGURE 4.8 FACTOR (b): AVAILABILITY OF TRAINED PERSONNEL: FREQUENCY DISTRIBUTION: ALL GROUPS

In summarising the results of question 8B, the six factors (a-f) are arranged into three groups.

Firstly, teachers perceive that certain intrinsic characteristics of sites (factor e) lend themselves to teaching particular sections of syllabuses. This factor constitutes a major influence upon teachers' choice of fieldwork site.

Secondly, 'resource availability', (factors a, b, d, f) including site-specific training and its influence upon the field knowledge of teachers, is shown to have a minor to moderate influence on the teachers' choice of site. It was suggested earlier that this set of factors would emerge with a much higher rating if resources were available for a wider range of sites distributed throughout Metropolitan Durban. As it is, in many instances, resources are simply not available so that teachers are forced to generate their own, and consequently resource availability factors were rated by many as having 'no influence' upon choice of site. This argument is born out by the results of question 11.

Thirdly, there were considerable differences between groups with respect to the importance placed upon 'proximity to school' (factor c) so that this factor was rated either very low or very high. Current trends are rendering this factor more and more important due to economic pressures so that local sites are likely to be used more in future.

4.3.9 Question 9: Teacher Awareness of Local Natural Areas

The possibility that teachers did not use natural areas close to the school simply because they were unaware of them is tested by this question. The extent to which teachers had recognised the educational potential of nearby sites, other than those in popular use, and endeavoured to exploit that potential, is also assessed in conjunction with question 10.

Question 9 was scored in two ways as detailed in the following paragraphs. The first scoring provides a crude measure of teachers' level of awareness of nearby natural areas. The second scoring repeated the same procedure after deleting responses pertaining to sites which the teacher had used for fieldwork. The second score was then deducted from the first score. This provided a measure of how 'resourceful' teachers had been in utilising the sites closest to their school. A large difference between the first and second score would indicate that teachers were 'resourceful' in developing and exploiting the potential of sites close to their schools. No difference in score would indicate that they were travelling to sites further away rather than developing the potential of nearer sites.

The following scoring procedure was adopted for question 9.

- 9(a) One mark was allocated for each natural area named, provided that these areas were among the four natural areas closest to the school (ie some margin was allowed for errors in the perception of distances). Maximum: 3 marks.
- 9(b) Another mark was allocated for each area correctly indicated in (a) if the interviewee had been into that natural area. Maximum: 3 marks.
- 9(c) Whereas any interested member of the public could have scored full marks on (a) and (b), part (c) probes whether teachers were viewing their local natural areas with an 'eye open' for their potential educational value. One or two marks were given per natural area named depending on the level of detail of biological and physical features observed therein, eg habitat types and landforms. Maximum: 6 marks. A greater number of marks is allocated for this part-question because teachers would need to have recognised the intrinsic characteristics of an area as a minimum requirement before they could begin to consider using the area.

9(d) One mark per natural area was allocated if interviewees were aware of the facilities offered, eg guides, trail booklets, picnic spots, toilets etc. A mark was also given if the interviewee correctly answered that there were no facilities. Maximum: 3 marks.

The maximum total was therefore 15 marks.

The results are shown in Table 4.9 which gives percentage scores for each part-question and aggregate scores (i.e. raw scores summed and then converted to percentages). The differences between first and second aggregate scores are also shown. Although the scale of measurement used may be criticised as being a rather arbitrary measure of teacher awareness, it is justified on the grounds that the information required of teachers by question 9 is the minimum level of information they would need in order to recognise the educational potential of a natural area before they could begin to take steps to utilise it.

A number of inferences can be drawn from Table 4.9.

- Considering that most of question 9 required no specialised knowledge, in fact any observant member of the public should have been capable of answering most parts, the level of teacher awareness of their local natural areas is not high (50% for all three groups of teachers combined). This lack of awareness must therefore be an important reason for teachers not using the sites closest to their school.
- Differences in the levels of awareness between the three racial groups are apparent; aggregate first scores were 62% for White teachers, 41% for Asians, and 25% for Coloureds. Three reasons are suggested for these differences. Firstly, they probably reflect cultural values. One Asian teacher remarked that his people were less inclined to explore 'wild areas' than White folk. Secondly, different levels of

TABLE 4.9 TEACHER AWARENESS OF LOCAL NATURAL AREAS

Question	WHITES*(43)		ASIANS*(39)		COLOUREDS*(8)	
	First Score%	Second Score%	First Score%	Second Score%	First Score%	Second Score%
9a	78	53	61	58	42	33
9b	65	40	44	40	29	25
9c	53	31	34	29	19	19
9d	59	37	34	30	17	17
Aggretate of a, b, c, d	62	38	41	37	25	23
Difference between first and second score		24		4		2
					ALL GROUPS*(90)	
					First Score%	Second Score%
			Aggregate total	50	37	
			Difference		13	

Note: - *Figures in brackets indicate sample size.
 - All other figures are percentage scores rounded to the nearest whole number

awareness reflect different levels of exposure to natural areas in training (question 6). Thirdly, given South Africa's situation of racial segregation, members of the Asian, Coloured and Black groups do not always know where they will be welcome. This unfortunate problem was brought to the author's attention by a Coloured and an Asian teacher who indicated, in answer to question 10, that "they did not know they could go to the Beachwood Mangroves". However, this factor probably affected teacher awareness of natural areas to a very limited degree, as natural areas are fairly well distributed throughout the various racially

defined group areas. Furthermore very few natural areas are in fact segregated (section 3.3).

- Comparing the scores for the parts a, b, c and d of question 9 shows that although there was a fairly high level of awareness of the existence of nearby natural areas (part a), there was little effort to explore these areas (part b) except, perhaps, for recreational purposes, and little consideration had been given to what the areas offered as fieldwork resources (parts c, d).
- Comparing the first and second scores in Table 4.9 shows an overall reduction of only 13% between the first score (50%) and the second score (37%). This implies that the majority of teachers who are aware of their nearby natural areas have not endeavoured to develop resources for the use of these sites. However, differences between the three groups were again apparent. While the differences between first and second scores for the Asian and Coloured groups were minimal (4% and 2% respectively), the White group showed a large reduction in score suggesting that many White teachers had recognised the potential of nearby sites, and had developed the necessary teaching resources to use them.

The reasons for many local sites not being used are investigated in question 10.

4.3.10 Question 10: Reasons for Not Using Sites Close to School

Where natural areas were known to teachers but not used the reasons given by teachers are listed (Table 4.10)

The eleven reasons most commonly given for not using sites close to the school may be arranged into four main groups, each of which is shown to have been important in inhibiting the use of

TABLE 4.10 REASONS FOR NON-USE OF NATURAL AREAS CLOSE TO SCHOOL

Reason given*	Number of times reason given			
	WHITES	ASIANS	COLOURED	TOTAL
1. No reason given/not sure (usually implied that the area in question had not really been considered)	17	17	2	36
2. Not yet considered but the area has potential	3	2	1	6
3. Have not got around to it/ needs exploring first	8	4	0	12
4. Lack of information about area	3	8	0	11
5. Require field guides to instruct and help manage pupils in field/ don't know who to approach about organising a trip there	0	11	1	12
6. Inexperience of teaching or new to a particular school/area	2	1	0	3
7. The area offers too little for geography but may be suitable under the new syllabus (which includes ecology)	11	2	1	14
8. The area is undeveloped/ still being developed (but its educational potential was recognised)	1	9	0	10
9. Concern for pupils' safety	1	1	0	2
10. Travelling cost and lack of time (usually implied that if only one field trip can be carried out each year, the area already used is preferred - if only due to habit and familiarity)	14	8	3	25
11. "Did not know we could go there" (i.e. racial segregation was assumed)	0	1	1	2

*Note: Only reasons which were mentioned by more than one interviewee are shown.

nearby sites.

Reasons 1, 2 and 3 relate to teacher initiative, interest and available time. Notably, the most common reason for not using nearby sites was that teachers simply had not thought about it. In a few cases teachers recognised the potential of sites but had not explored further.

Reasons 4, 5 and 6 relate to a lack of available information or resource material, the perceived need for field guides (especially by Asian teachers) and lack of experience.

Reasons 7, 8 and 9 relate to the intrinsic characteristics of sites. Notably, White Geography teachers wanted interesting geological/geomorphological features which are lacking in many of the smaller natural areas. However, these teachers acknowledged that with the inclusion of ecology into the Geography syllabus more use could be made of local sites. Teachers also wanted sites to be developed in some way (e.g. safe paths provided) and preferably proclaimed nature reserves so that they could be policed against vagrants.

Reason 10 pertains to logistic constraints such as the cost of transport and lack of time available. Since most teachers were using sites further away than those nearest to their school, offering this reason could only mean that they had time for only one or two field trips per year and, by implication they preferred sites which they were already using. This was the second most commonly stated reason.

Reason 11 stands apart from the above four groupings. The fact that some Asian and Coloured teachers did not know whether certain sites were open to all races posed a small constraint upon the use of some sites.

In summary the main reasons for teachers not using sites closest

to their schools are:

- a lack of time, initiative and possibly interest. It has simply not occurred to many teachers to use such sites;
- a lack of available resource materials and field officers;
- unsuitability of certain sites for teaching particular syllabus content - notably geomorphology. This is a minor constraint which could be largely removed by the inclusion of ecology into the Geography syllabus;
- a lack of time and funds to undertake more than one or two fieldtrips per class per annum. Given this constraint teachers choose the well known, proven sites rather than expend time and energy on exploring new possibilities. This point has important implications for the educational development of fieldwork sites. It suggests that a few high potential sites, distributed throughout Metropolitan Durban, should be identified where resources can be concentrated.

Question 11 contributes towards investigating criteria which could be applied in establishing which natural areas have high educational potential.

4.3.11 Question 11: Characteristics Required of Natural Areas

In order to establish what characteristics of natural areas are regarded as important for environmentally orientated fieldwork, teachers were asked to rate the desirability of a list of 'intrinsic characteristics' (A) and 'facilities' or 'developable' aspects (B) of natural areas. The list was drawn up in the manner outlined in section 4.2.2 and can be found in Appendix D. Rating was done on a five point scale, ranging through 'very undesirable' (1), 'undesirable' (2), 'unnecessary' (3), 'desirable' (4), and 'very desirable' (5). A 'no opinion' (0) option was also given.

Two types of analysis were carried out on the ratings produced.

Firstly, mean scores were calculated for each characteristic and histograms plotted giving profiles of the relative desirability of various characteristics. These are referred to as 'means profiles'. A composite profile, Figure 4.9, gives the results for all three groups of teachers combined, while Figures 4.10, 4.11 and 4.12 give separate profiles for the White, Asian and Coloured groups respectively.

Secondly, since mean ratings give a poor indication of the distribution of responses, 'frequency distribution' data was calculated for each characteristic and presented in Table 4.11. This data is referred to, where necessary in discussion of the 'means profiles'.

The following discussion of the results focusses on Figure 4.9, the composite 'means profile'. Figures 4.10 - 4.12 representing the three racial groups separately, are referred to only where the ratings of certain factors differ markedly from the composite 'means profile'. The ten 'intrinsic characteristics' are discussed individually in rank order according to Figure 4.9A, followed by the nine 'facilities', also in rank order (Figure 4.9B). Thereafter some general conclusions are discussed.

No respondent gave a rating of 1 to any of the characteristics while only a few gave a rating of 2 to certain characteristics. Thus in general all nineteen characteristics were rated somewhere between 'unnecessary' and 'very desirable'.

4.3.11.1 Intrinsic Characteristics

- There is general agreement between groups that the most desirable intrinsic aspect of a natural area is that it should be a simple ecosystem (a) - ie one that is easy to understand and qualitatively model. (Figures 4.9 - 4.12)

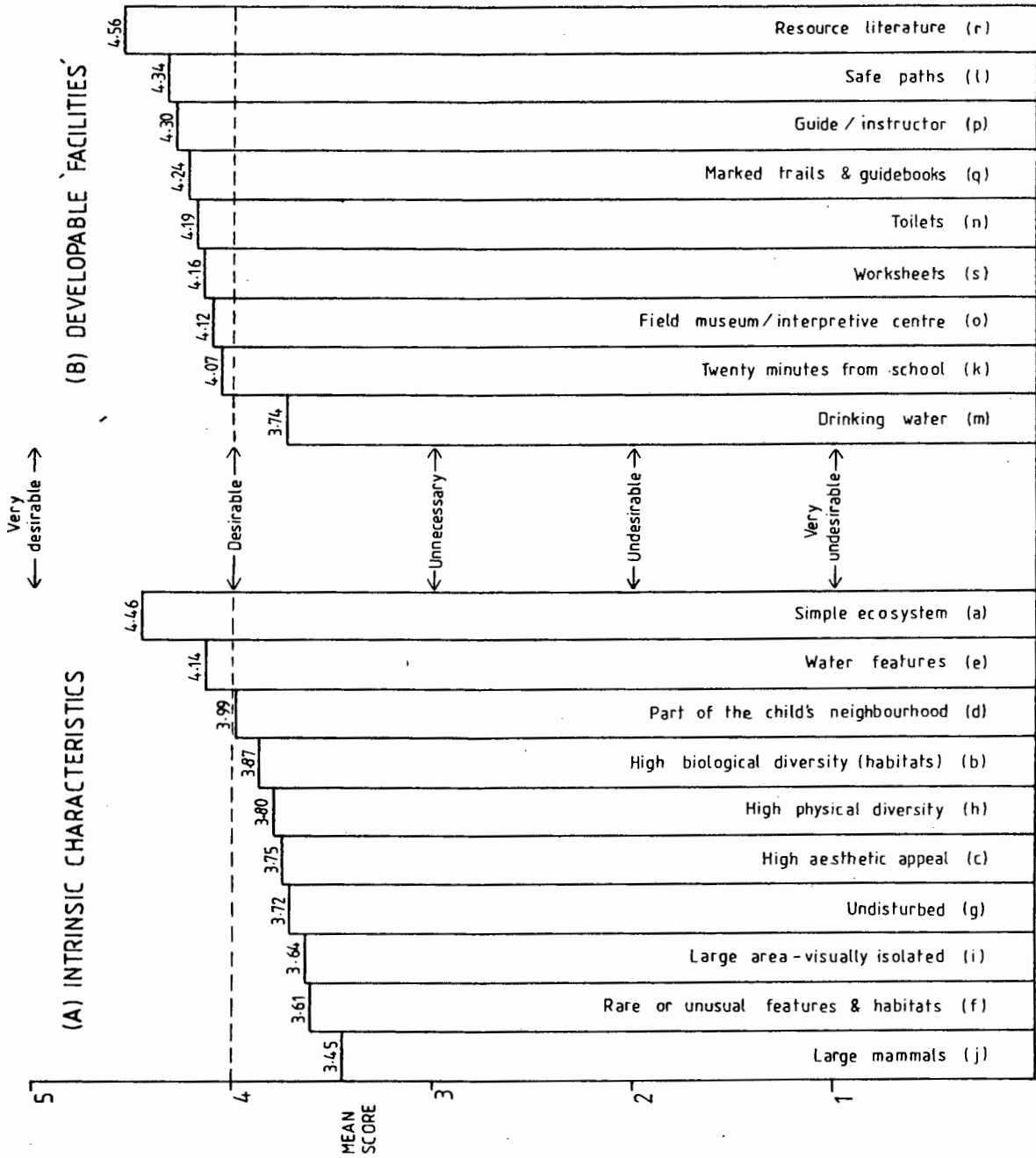


FIGURE 4.9 CHARACTERISTICS REQUIRED OF NATURAL AREAS: MEANS PROFILE ALL GROUPS

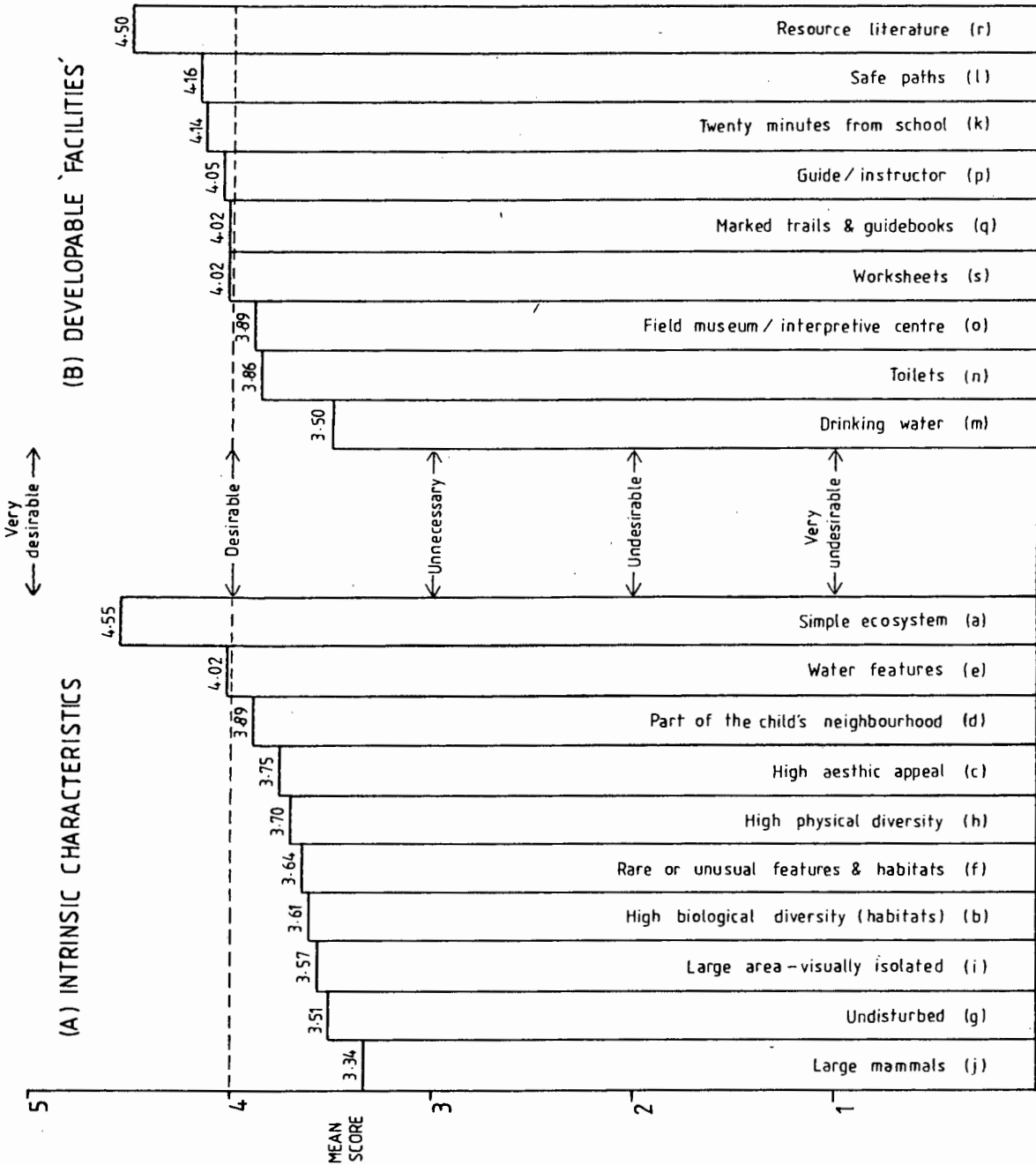


FIGURE 4.10 CHARACTERISTICS REQUIRED OF NATURAL AREAS: MEANS PROFILE WHITES

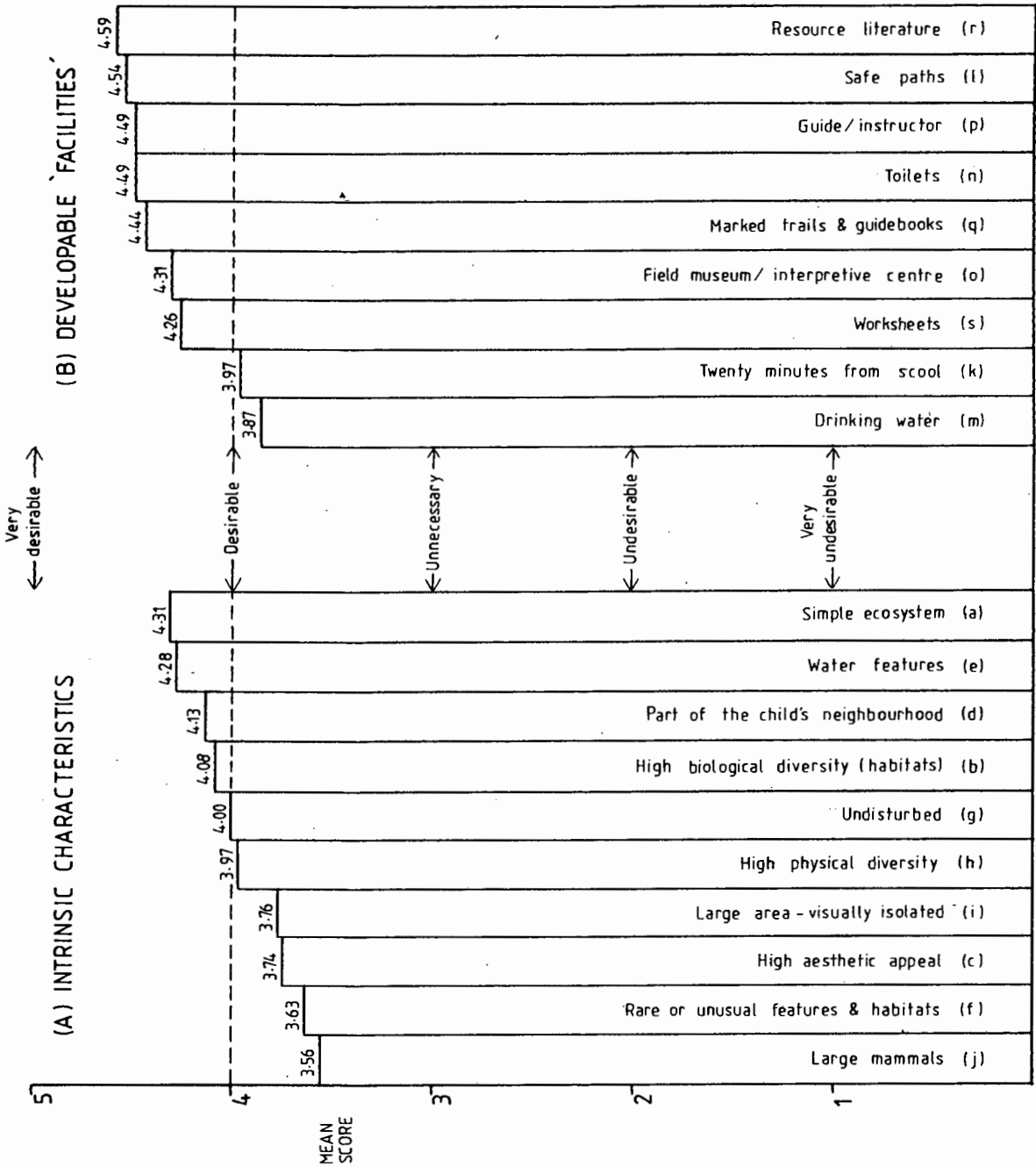


FIGURE 4.11 CHARACTERISTICS REQUIRED OF NATURAL AREAS: MEANS PROFILE ASIANS

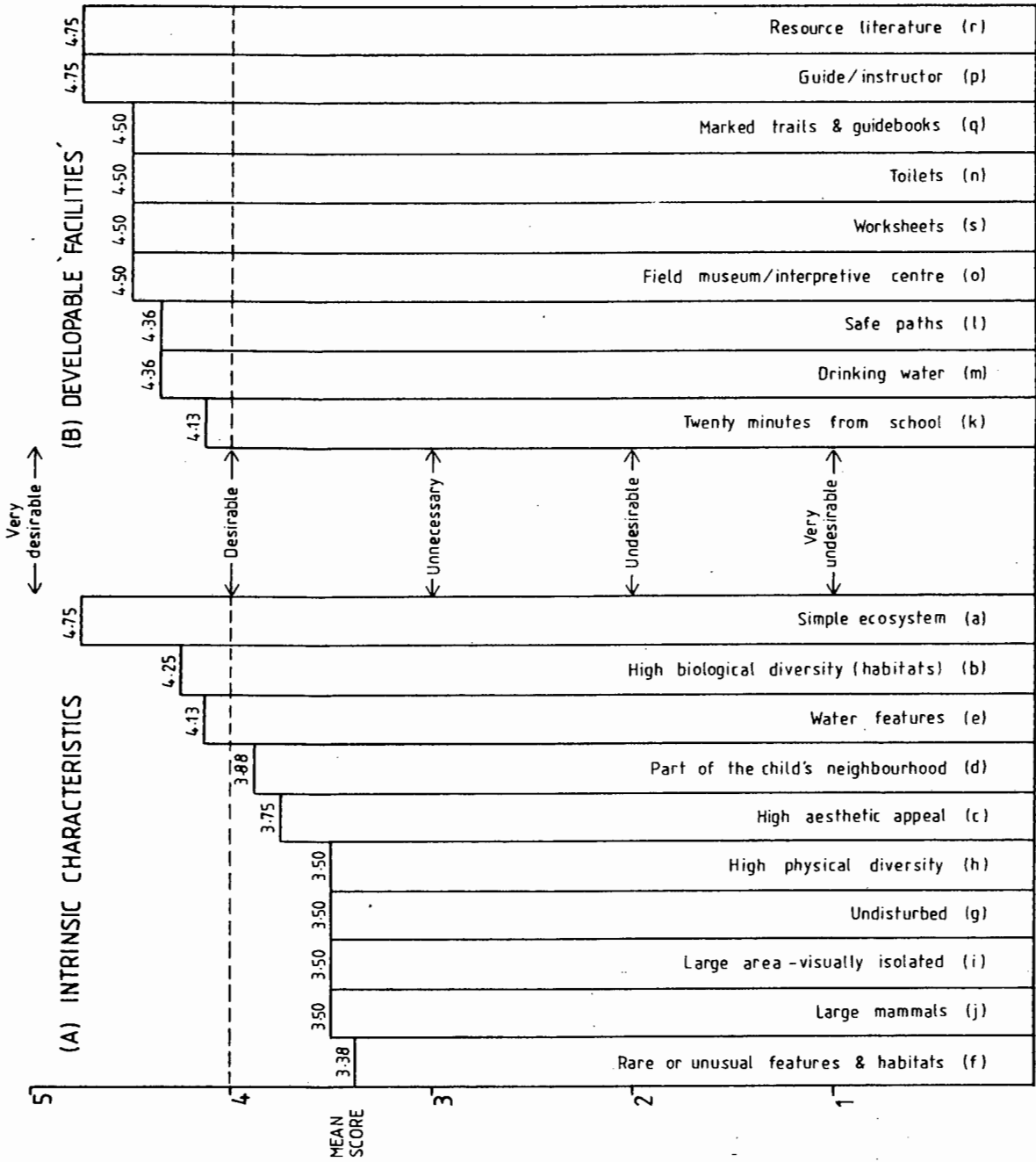


FIGURE 4.12 CHARACTERISTICS REQUIRED OF NATURAL AREAS: MEANS PROFILE COLOURED

TABLE 4.11: FREQUENCY DISTRIBUTION DATA: CHARACTERISTICS REQUIRED OF NATURAL AREAS

(A) 'INTRINSIC CHARACTERISTICS'	Percentage response for each rating number*															
	ALL GROUPS				WHITES				ASIANS				COLOUREDS			
	2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
(a) Simple ecosystem	0	4	45	51	0	0	45	55	0	10	49	41	0	0	25	75
(b) High biological diversity	7	19	56	19	11	27	50	11	3	13	59	26	0	0	75	25
(c) Aesthetic appeal	0	36	53	11	0	39	48	14	0	33	59	8	0	38	50	13
(d) Local neighbourhood	3	26	40	31	5	30	39	27	3	21	37	39	0	25	63	13
(e) Water features	0	13	59	27	0	18	61	20	0	10	51	38	0	0	88	13
(f) Rare & unusual features	0	44	50	6	0	43	50	7	0	42	53	5	0	63	38	0
(g) Undisturbed	6	35	42	18	12	42	30	16	0	24	53	24	0	50	50	0
(h) High physical diversity	0	40	41	20	0	45	39	16	0	28	46	26	0	63	25	13
(i) Large area, visually isol.	0	51	33	16	0	59	25	16	0	42	39	18	0	50	50	0
(j) Large mammals	0	59	36	4	0	70	25	5	0	49	46	5	0	50	50	0
(B) 'FACILITIES'																
(k) 20 Minutes from school	0	24	44	31	0	23	40	37	0	26	51	23	0	25	38	38
(l) Paths	0	3	59	37	0	7	70	23	0	0	46	54	0	0	63	38
(m) Drinking water	1	41	42	16	2	59	25	14	0	28	56	15	0	0	63	38
(n) Toilets	0	18	46	36	0	32	50	18	0	5	41	54	0	0	50	50
(o) Field museums	0	19	51	31	0	30	52	18	0	10	49	41	0	0	50	50
(p) Qualified guides	0	19	33	48	0	27	41	32	0	13	26	62	0	0	25	75
(q) Marked trails/guidebooks	2	11	47	40	5	20	43	32	0	3	51	46	0	0	50	50
(r) Resource literature	0	1	42	57	0	2	45	52	0	0	41	59	0	0	25	75
(s) Worksheets	0	14	55	31	0	20	57	23	0	10	54	36	0	0	50	50

* Note: - No respondents gave a rating of 1 to any characteristic.
- Each percentage was calculated after excluding non-respondents.
- Percentages were rounded to the nearest whole number.

This need explains the popularity of mangrove swamps which are simple in that they have low species diversity and inter-relationships between organisms are relatively clear. Vegetation communities on primary coastal dunes are likewise fairly simple to study. However, it must be acknowledged that no ecosystem is really simple and perhaps what is needed are simple methodologies for dealing with complex systems. The Action Ecology resources developed by the Natal Parks Board (O'Donogue, 1987) are helpful in this regard as they provide a simple model which can be applied to any ecosystem.

- Water features (e) are regarded as 'desirable' for various reasons (Figures 4.9 - 4.12). They add to the aesthetic qualities of an area, add an alternative habitat to study (provided water quality is acceptable), and, from a geographical point of view, the presence of water is frequently associated with features of geomorphological interest.

- Teachers consider it 'desirable' that natural areas should be part of the childrens' neighbourhoods (d) (Figures 4.9-4.12). The reason for this is not merely one of logistics but to teach children the importance of ecology and of conservation in their own local environment. This should help to overcome the notion prevalent in our society that conservation is the responsibility of government and provincial bodies, and should encourage community involvement in local conservation matters. Only 3% of interviewees regarded this characteristic as 'undesirable' because they felt that children preferred to travel to new and unfamiliar places (Table 4.11).

- The desirability of 'high biological diversity' (b) creates an apparent contradiction with the desire for simple ecosystems. The relatively high rating of this factor is attributed largely to Asian and Coloured group responses

(Figures 4.11 - 4.12) with means of 4.08 and 4.25 respectively. White teachers, however, gave it a mean rating of 3.61 (Figure 4.10). Although the means differed between these three groups, the modal rating in each case was the same, ie 4 (Table 4.11). When teachers were asked to explain their answers the following qualifications came to light. Firstly, a few teachers were influenced by their conservation ideals which valued high diversity in ecosystems. This was apparent from their comments despite the fact that the question asked teachers to consider the characteristics on educational criteria only. Secondly, and more importantly, it is diversity of habitat rather than a high number of species which is considered valuable for education. A variety of habitats is felt to offer opportunities to teach a range of different topics. Furthermore, a variety of habitats in an area implies the presence of a range of abiotic factors, the effects of which can be demonstrated by contrasting habitats within an area. However, 7% of interviewees actually rated high biological diversity as 'undesirable' because it confused pupils, while 19% rated it as 'unnecessary' (Table 4.11).

- A high diversity of physical landscape (h) was given a mean rating of 3.80 (Figure 4.9). In general, Geography teachers, wishing to teach geomorphology, valued this factor more highly than Biology teachers. Some Biology teachers also rated this factor highly as they recognised that high physical diversity results in high diversity of habitats. High physical diversity is also associated with a range of abiotic factors, the effects of which can, for example, be demonstrated in relation to the distribution of organisms.
- High aesthetic appeal (c) was given a mean rating of 3.75 overall (Figure 4.9). Of all interviewees 36% regarded it as 'unnecessary' while 64% rated it 'desirable' or 'very desirable' (Table 4.11). Most teachers felt that it enhanced

the appeal of an area and therefore contributed towards affective learning.

- The desirability of an area being undisturbed by invader plants and human activities (g) was an issue on which there was no strong agreement (Figures 4.10 - 4.12 and Table 4.11). The conservation ideals of teachers possibly influenced their thinking on this point. While, 60% of teachers felt it to be 'desirable' or 'very desirable' that a natural area be mainly free of exotic weeds, 35% considered this 'unnecessary', and 6% regarded it as 'undesirable'. The latter group argued that the presence of invader plant species offers an ideal opportunity to teach about the effects of this problem and to explain how a competitive advantage accrues to exotic species where they exist in the absence of their natural pests and enemies.
- On the question of whether natural areas should be large and visually isolated, opinion was divided between the 51% who regarded this as 'unnecessary', and 49% who regarded it as 'desirable' or 'very desirable' (Table 4.11). Although many teachers felt that a sense of wilderness and adventure would enhance affective learning, they did not feel that this was an important attribute of a natural area.
- Features and habitats which were rare or unusual (f) were rated 4 or 5 by 50% and 6% of interviewees respectively as having some value in adding to the interest generated in pupils by fieldwork. However, 44% believed such attributes were 'unnecessary' (Table 4.11).
- The presence of large mammals (j) was regarded as 'unnecessary' by 59% of interviewees, with only 4% regarding this as 'very desirable' (Table 4.11). It was considered more important that there be a range of animal life which is easily seen on most trips to an area (eg the crabs, snails

and fish in mangroves, or the animal life in pools on rocky shores).

4.3.11.2 Facilities and Logistic Aspects

Characteristics (k) - (s) refer to those aspects of natural areas which can be developed as opposed to aspects which are intrinsic to an area. These are discussed individually in rank order according to Figure 4.9B.. Notably the 'facilities' (except drinking water) are rated somewhere between 'desirable' and 'very desirable'.

- Resource literature about an area (r) stands out clearly as the most important requirement of teachers (Figures 4.9-4.12), 57% rating this 'very desirable' and 42% rating it 'desirable'. Only 1% regarded this as 'unnecessary' (Table 4.11). This requirement reflects a lack of teacher field knowledge and highlights the importance of developing site-specific resource material if the educational potential of natural areas is to be more fully utilised.
- The need for good, safe paths (l) is obvious from Figures 4.9 - 4.12 and local authorities concerned need to be persuaded to cut and maintain trails. School groups can assist in this sort of project, but in the researcher's experience, unless the relevant local authority takes responsibility for such a project on an ongoing basis paths rapidly become impassible in Durban's warm and humid climate.
- The need for qualified guides and instructors (p) is strongly apparent (Figures 4.9 - 4.12). Only 19% of interviewees felt these were unnecessary, while 33% felt they were 'desirable' and 48% rated them 'very desirable' (Table 4.11). This need points to a lack of teacher field knowledge, and the difficulty of managing large groups of pupils in the field. To some extent the former problem can be overcome through

site-specific in-service training. Some difference in opinion was apparent between the three groups of teachers. Frequency distributions for the Asian and Coloured groups displayed modal ratings of 5, whereas for the White group the mode was 4 (Table 4.11). These differences reflect differences in fieldwork training (question 5).

- Marked trails with interpretive guidebooks (q) are also in demand (Figures 4.9 - 4.12). This method of instruction, although less flexible than field officers, could serve as a valuable and inexpensive alternative. Self-guided trails exist in a number of local natural areas but guide books tend to be of a general interest nature aimed at the public rather than geared towards school syllabuses.
- Toilets (n) were regarded as 'desirable' by most teachers, only 18% considering these 'unnecessary' (Table 4.11). It is worth noting, however, that one of the most popular fieldwork sites, the Beachwood Mangroves, had no such facilities prior to the survey, which did not deter school groups from using the site. The provision of this facility would represent a maintenance problem for local authorities. Where toilets are provided, drinking water (m) will also be made available although this latter requirement was considered the least important of facilities.
- Most teachers agreed that the provision of worksheets (s) was desirable (Figures 4.9 - 4.12) although 14% felt they were unnecessary (Table 4.11). Of the latter group, a number felt that worksheets could actually inhibit the acquisition of a holistic understanding of ecosystems by narrowing the field of a pupil's enquiry. Worksheets, therefore, need to be carefully designed to encourage broad open-ended observation and conceptual development. Worksheets which deal mainly with details of a factual nature, rather than developing understanding of principles and relationships, will fail to

achieve the objectives of Environmental Education.

- Field museums or interpretive centres (o) were considered 'unnecessary' by 19% of teachers while the rest regarded them as 'desirable' or 'very desirable' (Table 4.11). Some, however, suggested that these should not distract from the primary purpose of obtaining a first hand experience of ecology in the field. The researcher is in agreement with this view. The desire for field centres may reflect the fact that they make the teacher's task easier by providing a classroom-like situation, but such centres should not be used for more than just an initial orientation talk. The cost effectiveness of such centres for school use should be seriously considered before they are developed.
- The desirability of natural areas being within 20 minutes travelling time from school (k) was agreed on by all three groups although this characteristic ranked higher in the 'means profile' for the White group (Figure 4.10) than for other groups (Figures 4.11 - 4.12). This was true despite the similar mean ratings from the three groups (Whites: 4.14, Asians 3.97 and Coloureds 4.13). Overall, 75% considered it 'desirable' or 'very desirable' for the area to be within 20 minutes from school, while the rest considered it 'unnecessary' (Table 4.11).

The following general conclusions can be drawn from the results of question 11.

- Figure 4.9 (A and B) shows that those 'facilities' which could be developed were rated much more highly than the 'intrinsic characteristics' of natural areas. This was true for all three groups of teachers (Figures 4.10 - 4.12). Figure 4.9 shows that the 'facilities' were, with one exception, rated between 'desirable' and 'very desirable'. Intrinsic characteristics, on the other hand, were mostly

rated between 'unnecessary' and 'desirable', only the top two receiving ratings above 'desirable'. These results suggest that, providing a natural area meets certain minimum requirements in terms of its intrinsic characteristics, the extent to which the area has been developed for education is more important, in determining the amount of use it enjoys, than its intrinsic characteristics.

- Figure 4.9B shows that educational resources, particularly site-specific resource literature, guides/educational field officers, marked trails with guidebooks and worksheets, are very much in demand. This fact indicates the difficulty teachers have in developing their own fieldwork resources due to lack of time, knowledge and confidence. This in turn reflects upon inadequate fieldwork training. ↩
- The above is borne out by the fact that White teachers, the group which had received the most training in fieldwork (question 5) rated resource factors significantly lower than did their Asian and Coloured colleagues who had received less training in the field. White teachers nevertheless rated resource factors as more important than most intrinsic characteristics (Figure 4.10).
- Paths are seen to be the most important physical amenity in fieldwork sites. Other physical amenities such as toilets and interpretive centres, while rated 'desirable', are not essential. This is evidenced by the fact that very few of the sites in popular use at the time of the survey had such amenities yet this lack has not detracted from their popularity.
- All three groups of teachers consider it 'desirable' that natural areas be located within 20 minutes travelling time from school (Figures 4.10 - 4.12). The White and Coloured groups rated this 'facility' higher than most 'intrinsic

characteristics'. The Asian group by contrast rated this facility below most 'intrinsic characteristics'. Comparing the need for proximity with the need for teaching resources shows that only in the case of the White group was the proximity factor considered more important than the availability of teaching resource materials. It was noted earlier, however, that transport costs are becoming a more important issue for Asian and Coloured schools (section 4.3.8.2).

- Notwithstanding the above points, certain intrinsic characteristics of natural areas are shown to be desirable, notably a 'simple ecosystem', the presence of 'water features', and a 'variety of habitats and physical features'. Sites should ideally also be part of the pupils' local neighbourhood. This means that suitable natural areas should be developed for education close to all major concentrations of population throughout the metropolitan region.

4.3.12 Question 12: Reasons for Not Using Natural Areas Extra-curricularly

The survey of school principals showed that local natural areas had been effectively used by small groups of pupils on an extra-curricular basis, especially amongst White schools. It was suggested in section 3.4 that many local natural areas may have greater potential for extra-curricular work than distant sites; a wider range of natural areas could be used, and due to smaller group size, more in-depth studies could be undertaken. Question 12 explores reasons why teachers do not make more use of their local natural areas on an extra-curricular basis.

When asked whether they had considered using any natural areas extra-curricularly, the majority of teachers said they had not ie 55% of White, 74% of Asian and 100% of Coloured teachers. A

number of other teachers had considered doing so but had not yet achieved this for various reasons. Table 4.12 gives the reasons offered by teachers for not using natural areas extra-curricularly. The more frequently given reasons are discussed briefly below.

TABLE 4.12 REASONS FOR NON-USE OF NATURAL AREAS EXTRA-CURRICULARLY

Reason given	Number of times reason given			
	WHITES	ASIANS	COLOUREDS	TOTAL
1. No reason given/have not thought about it	12	7	0	19
2. Teachers and pupils are too busy	6	9	2	17
3. Involvement in other extra-curricular activities	10	0	0	10
4. Restrictive regulations ("red tape")	0	9	1	10
5. Not interested/lack of initiative/another teacher is in charge	3	3	2	8
6. Pupils aren't interested/haven't time after school when some work to earn money	0	4	2	6
7. No natural areas close by	0	3	0	3
8. Lack of knowledge/experience	0	1	1	2
9. Preference for more exciting areas further afield	2	0	0	2
10. Only recently formed an environmental society	0	2	0	2

A number of teachers had simply not given serious consideration to using natural areas extra-curricularly. This was the most common reason given. Secondly, the pressures of academic work and other duties upon pupils and especially upon teachers, inhibited extra activities. Amongst White teachers afternoons and weekends were often taken up by other school commitments. Amongst Asian and Coloured schools there appears to be far less emphasis on sport and other extra-curricular pursuits with the

main focus placed on academics, so the potential for these groups to embark on environmental projects is greater. However, a few Asian and Coloured teachers reported that many of their pupils are not interested in extra-curricular involvement or that they engage in some form of part-time employment in the afternoons to earn some money. Parents of Asian children were reported to be less encouraging of involvement in extra-curricular activities than White parents. Departmental regulations, requiring the completion of indemnity forms by parents for each excursion, were also considered to inhibit extra-curricular use of natural areas amongst Asian and Coloured schools. Three Asian teachers from the Phoenix area said they would use natural areas if there were some close by.

4.3.13 Question 13: Characteristics of Natural Areas Required for Extra-curricular Use

Teachers were asked whether they would require the same characteristics of natural areas which were to be used extra-curricularly as for areas used for formal fieldwork. While it was apparent that most teachers had not given much thought to this issue there was broad agreement that the same characteristics would be desirable. However, the following qualifications were made.

Ten teachers said that working with small groups of pupils allowed far greater flexibility regarding the choice of area to be used. Small groups could engage in a wider range of activities, and travel further or more frequently. Thus almost any natural area could be used. One teacher mentioned specifically that there was more scope for self study by pupils extra-curricularly.

Fourteen teachers said they would prefer larger, more pristine areas further afield where more specialised interests could be

pursued. They said that pupils enjoyed the opportunity to travel to more exciting places.

Another group of five teachers argued that proximity to school would be particularly important, facilitating regular use of an area - especially for serious research such as that engaged in for conservation symposia.

The survey of school principals showed that a much wider range of areas was in fact used extra-curricularly than within the curriculum. Whether teachers prefer local or distant natural areas depends largely on the type of activity to be carried out and the depth of the studies to be undertaken. Local natural areas offer greater scope for in-depth study than distant areas.

In summary, extra curricular activities vary widely in the nature of the activity and in the type of natural area sought. The type of activity, in turn, depends largely on the interests of the teacher in charge.

4.4 CONCLUSION

Having presented the results of the teacher survey question by question, the discussion now turns to the implications of those results in terms of the second, third and fourth aims of the study (section 1.2).

4.4.1 Testing the Hypotheses

The second aim of the study is 'to investigate the factors which influence teachers' choices of natural areas for fieldwork (section 1.2). The three hypotheses formulated in this regard (section 3.4) are tested below.

Notwithstanding certain differences between the three racial groups of teachers, the results of the teacher survey provide considerable evidence in support of the three hypotheses. These are to be discussed in turn.

Hypothesis 1: 'Resource availability' is an important factor predisposing teachers towards the choice of particular natural areas for fieldwork.

Evidence in support of this hypothesis is found in sections 4.3.5 - 4.3.11.

Sections 4.3.5 - 4.3.7 dealt with the influence of training and other kinds of introductions to sites upon teachers' choices of fieldwork sites. It was shown that site-specific training could account for a substantial number of site choices, particularly amongst the White group. Since site-specific training can be regarded as a resource which increases teachers' fieldwork knowledge and ideas regarding methods, this finding supports hypothesis 1. In all three groups of teachers the majority relied on recommendations from colleagues/tradition in the school for their introductions to sites. Since this will often have involved exchanges of resource materials, it provides implicit support for the first hypothesis. The fact that relatively few teachers undertook their own exploration of potential sites gives further support to this argument.

Section 4.3.8, particularly 4.3.8.2 provides qualified evidence in support of hypothesis 1. Teachers' ratings of the importance of various factors affecting their choice of site showed that a number of resource availability factors were rated between a 'minor' and a 'moderate influence'. It was argued, however, that since certain resources e.g. trained personnel and literature/worksheets were not available for most sites used, the importance of this factor was underrated by the results of question 8. This argument is supported by the results of

question 11(section 4.3.11) in which teaching resource factors were shown to be in greater demand than most intrinsic characteristics of natural areas.

Section 4.3.10 investigated the reasons why natural areas closest to schools were mostly not used. A lack of teacher time, knowledge and initiative in developing teaching resources were the reasons most often given to explain this. A lack of field guides to instruct pupils was also frequently mentioned by Asian teachers. By implication, if the necessary resources had been available, many more of the local natural areas would have been used. These results, therefore, give indirect evidence that 'resource availability' is an important influence upon the teacher's choice of site.

In general the availability of teaching resources including field officers was more important to the Asian and Coloured groups than to Whites. This difference can be attributed mainly to the greater training in fieldwork received by White teachers (section 4.3.5).

Hypothesis 2: Certain 'intrinsic characteristics' make some natural areas more suitable for environmental fieldwork than other areas.

Evidence in support of the second hypothesis is found in sections 4.3.8 and 4.3.11. Figures 4.2 - 4.5, which show the results of question 8B, indicate that teachers rated 'particular natural features and habitats' as the most important influence upon their choice of site. Table 4.7, which presents the results of question 8A, contains a large number of entries pertaining to various intrinsic characteristics of natural areas. Many teachers chose sites with simple ecosystems, a low number of species, a clearly visible range of fauna and flora, and a wide variety of habitats. In question 11, most of the 'intrinsic characteristics' were rated close to 4 (ie 'desirable'), although

they were less important than certain teaching resources and facilities (Figures 4.9 - 4.12).

Hypothesis 3: While 'transport costs' may limit the number of fieldwork trips undertaken, this is only a secondary consideration influencing teachers' choices of natural area.

Sections 4.3.8 and 4.3.11 provide evidence in support of the third hypothesis. Question 11 assessed the importance of this factor as perceived by teachers, while question 8 assessed its influence upon their choices of sites in practise. Whereas question 11 showed that it was considered 'desirable' for natural areas to be within 20 minutes travelling time from school, the popular use of sites requiring 90 minutes to 2 hours travelling time showed that other factors often had a greater influence upon the choice of site. Although 'proximity to school' was frequently given as a reason for choice of site in response to question 8A, when the importance of this factor was rated in question 8B it's mean rating was midway between 'minor influence' and 'moderate influence'. This placed it low in the rankings shown in Figures 4.2, 4.4 and 4.5.

The acceptance of the third hypothesis is however subject to qualification. A marked difference was evident in this regard between White teachers on the one hand and Asian and Coloured teachers on the other. White teachers considered that 'proximity to school' was a 'moderate influence' upon their choice of site, while for the other groups it had been only a 'minor influence'. Thus the third hypothesis can be accepted without qualification in relation to the Asian and Coloured groups but it is qualified in relation to the White group. While the cost of transport tends to limit White schools to sites in Metropolitan Durban, within that limitation it appears to be a secondary consideration in the choice of site. A site such as the Beachwood Mangroves which has suitable 'intrinsic characteristics' and 'available resources' remains popular even with schools at distant locations

within the metropolitan area.

4.4.2 Criteria for the Selection of Natural Areas for Environmental/Ecological Fieldwork

Since teachers feel that intrinsic characteristics have an important influence upon their choice of natural area, this issue must be given adequate consideration before sites are chosen to be developed for fieldwork.

The following discussion synthesises the findings of sections 4.3.8.1 and 4.3.11 with the review of literature presented in section 2.3.4 to produce a set of criteria for the selection of natural areas that would make good fieldwork sites. These criteria are important to ensure that resources expended on developing environmental/ecological fieldwork are directed towards the best sites. Five major and five minor criteria are identified.

- i) The ecosystems within a natural area should be as simple as possible, with relatively low species diversity and clearcut natural boundaries.

This criterion is based on Figures 4.9A - 4.12A in which 'simple ecosystems' are shown to be the most desirable intrinsic characteristic. The existence of 'simple ecosystems' was the reason most often given by teachers for using the most popular site - the Beachwood Mangroves Table 4.8.

The requirement of low species diversity contrasts with that of Usher (1973) and Mantle and Heath (1986) whose research applied to conditions in the United Kingdom where species diversity is very much lower than in South Africa. The whole of the U.K. with its post glacial pioneer communities contains approximately 2 200 plant species

(Clapham et al, 1952), whereas Metropolitan Durban alone has an estimated 1 500 - 2 000 indigenous plants (Nichols, 1988 pers comm), including approximately 400 species of trees (Palgrave, 1977). This difference in natural diversity explains the difference between requirements of local teachers and those in the United Kingdom. A forest in Durban containing hundreds of tree species could be totally confusing for children.

The problem of dealing with some of Durban's more diverse systems could, however, be overcome if teachers and syllabuses move away from a pre-occupation with factual content towards a more conceptual approach. Furthermore, it has been suggested by Moss and Theobald(1979) that species identification is unnecessary beyond "grass 1"... etc. In addition, the need for simple methodologies and conceptual models for dealing with complex ecosystems has already been mentioned (section 4.3.11.1).

- ii) Although ecosystems chosen should be simple, they should contain a range of both plants and animal species which are clearly visible, and which display obvious interrelationships with each other and with the abiotic elements in their environment (Mantle and Heath, 1986). Such characteristics were mentioned by a number of teachers, particularly in relation to mangrove swamps (Tables 4.7 and 4.8). Tidal pools also meet this criterion fairly well. By contrast, very few animal species may be encountered during a visit to forest or grassland ecosystems.

- iii) A diversity of habitats within a natural area would be a strong recommendation, and related to this, a diversity of physical features is desirable (section 4.3.11.1 and Tables 4.7 and 4.8). A varied physical landscape is associated with a range of abiotic factors, the effects of

which on biotic communities can be demonstrated. Diversity of landscape and habitats will give rise to distinct distribution patterns and gradients (or 'ecotones'). Usher (1973) considered diversity of habitats to be an important requirement, while Mantle and Heath (1986) drew attention to the value of distinct patterns and gradients in demonstrating ecological principles. Coastal sites in the Durban area are usually suitable in this regard as clear distribution patterns can be observed in small areas. The valleys and interfluves of inland systems, however, are also useful. The effects of aspect, for example, on microclimate and on vegetation communities can be demonstrated, and pupils can test simple hypotheses regarding factors such as effects of light, water, temperature and soil moisture on the height and composition of plant communities.

- iv) Natural areas selected should contain water features of some sort. Figure 4.9A indicates that teachers consider this an important requirement. Water features not only add aesthetic qualities to an area and create interest, but they also allow for a number of topics to be taught.

In its simplest form, a large pond introduces a new ecosystem with a range of plants and animals, possibly including waterfowl. A range of abiotic factors can be demonstrated together with feeding relationships, adaptations of organisms, zonation of plant species etc. Streams and rivers offer the additional opportunity for geological and geomorphological processes to be taught. Durban's deeply incised valleys illustrate the effects of palaeoclimates on current physical and social systems. The engineering implications, such as the need for driving piles into the sediments of the Umgeni River to construct bridges are an example of these effects (Christian and Maud, 1987).

Streams and rivers also create linkages between ecosystems. They can be used to illustrate the effects of human impact such as increased runoff from an urban catchment and its effect on flood peaks and riverine communities. Pollution studies can also be undertaken.

- v) Teachers consider it 'desirable' that a natural area should be situated close to concentrations of population and schools, ie 'part of the local neighbourhood' (Figures 4.9A - 4.12A). This principle is supported by Mantle and Heath (1986) and Usher (1973) for reasons of logistics and costs, but more importantly because learning has been shown to be optimum in situations which are neither too strange nor too familiar (Falk, 1983). Few children venture into local natural areas often so that neighbouring natural areas are unlikely to be too familiar but may be familiar enough by virtue of being part of the neighbourhood. Other reasons for using local sites were given in section 2.3.3. Figure 2.1 (section 2.3.3) shows that natural areas are fairly well distributed throughout the metropolitan area so that suitable sites can be found near each concentration of population.

The above five criteria are considered to be the most important for the selection of fieldwork sites. The remaining five criteria are less important but Figures 4.9A - 4.12A indicate that they are considered to enhance the educational appeal of natural areas.

- vi) High aesthetic qualities may help to create interest in pupils and promote affective learning (Disinger, 1986). Due to the very subjective nature of aesthetic appreciation, no attempt is made here to define what constitutes high aesthetic appeal. However, the search for variety and contrast within an harmonious whole may be a suitable starting place from which to consider the

aesthetic qualities of an area.

- vii) The area should be largely undisturbed by human activities i.e. as natural as possible. The presence of some invasive plant species is of educational benefit, since their destructive effects due to competitive advantages can be demonstrated. However teachers agreed that such exotic species should not dominate a natural area.
- viii) The area should be as large as possible and visually isolated, at least in part, from areas dominated by human activity. This will give pupils a sense of adventure and aesthetic enjoyment and so enhance affective learning. The area should certainly be large enough to cope with large groups of pupils without doing damage to the ecosystem (Usher, 1973).
- ix) Rare and unusual habitats, species and landforms are a desirable feature. However, if rare species and habitats are likely to be endangered by pupil use of the area such sites should not be used for education.
- x) The presence of large mammals presents some attraction to school groups but only the largest metropolitan nature reserves such as Stainbank and Silverglen will be able to stock significant populations of large animals. Even in these reserves there is no guarantee that a range of these animals will be seen during any one visit.

4.4.3 Priorities for the Development of Local Natural Areas as Fieldwork Sites

The criteria presented in section 4.4.2 can be used to identify sites with high potential for environmental/ecological fieldwork. Thereafter it will be necessary to consider the manner in which such sites can be developed in accordance with the needs of

education. The following priorities for such development are suggested by the findings of section 4.3.

- i) Teaching resource materials need to be produced which meet the needs of subject syllabuses and which are specific to particular sites. These resources should include detailed literature about the site from which teachers can draw their information, guidebooks and brochures relating to marked trails, and worksheets and activities for pupils. These requirements are apparent from Figures 4.9 - 4.12.
- ii) The areas should ideally be proclaimed as nature reserves and properly managed so that:
 - paths are created and maintained (section 4.3.11.2).
 - the area is patrolled to discourage vagrants or other elements which may represent a threat to the safety of pupils (section 4.3.10);
 - exotic invasive plants are controlled (section 4.3.11.1).

Such protective measures are necessary to ensure that sites are available for school use on a permanent basis. The fact that teachers often chose sites out of habit or tradition (Tables 4.7 and 4.8) is indicative of the need for permanence in fieldwork sites.

- iii) In-service courses for teachers should be held at a range of good sites to supply teachers with the necessary field knowledge and familiarity with teaching methodologies which can be used at those sites. Evidence from section 4.3.6 and 4.3.7 strongly suggests that site-specific training is important in introducing teachers to natural areas and equipping them for effective teaching in the field. Teacher training institutions also have the potential to play an important role in site-specific fieldwork training (sections 4.3.4 - 4.3.5).

- iv) The need for a comprehensive inventory of suitable local fieldwork sites and relevant teaching resources is apparent from sections 4.3.9 and 4.3.10. These sections showed that many teachers were simply unaware of local opportunities or were slow to explore new possibilities.

It is suggested on the basis of the teacher survey results that the above four requirements represent the minimum development necessary to encourage teachers to use new fieldwork sites. The following additional developments, are also desirable (Figures 4.9B - 4.12B), but they are less likely to be cost-effective in achieving the objectives of Environmental Education.

- v) Field guides/instructors, who should be trained teachers could be seconded by education departments to natural areas to assist teachers in gaining field knowledge, developing teaching resources and methods, and in actually conducting fieldwork when required. This need was expressed particularly strongly by Asian and Coloured teachers (section 4.3.10 and 4.3.11.2). Such secondment of teachers could be limited to a fixed period (e.g. 5 years) to upgrade the quality of fieldwork teaching. Such personnel could also be responsible for the development of teaching materials.
- vi) Field museums/interpretive centres may be useful at some of the best fieldwork sites but these are likely to be expensive to construct and maintain relative to the benefits derived from them.
- vii) Toilets and shelter are similarly desirable but should not receive a high priority.

CHAPTER FIVE

CONCLUSION

This research report began by placing the study within the context of the growth of Environmental Education at national and international levels. Brief discussion of the aims of Environmental Education, and the value of fieldwork in achieving those aims, has highlighted the integral role of fieldwork within Environmental Education.

The benefits of using local rather than distant sites have been argued on educational as well as logistic grounds. While many potential fieldwork sites exist in built environments, this research has focussed on the use of natural areas. The creation of the Durban Metropolitan Open Space System provides an extensive (though not exclusive) set of opportunities for environmental/ecological fieldwork in the research region.

This study investigated the current use of MOSS for fieldwork and has shown that, although the number of secondary schools using these sites is substantial, relatively few sites have been used intensively. Teachers' choices of sites are influenced by combinations of several factors which can be arranged into three groups. These relate to:

- i) resource availability, ie teachers' dependence on available teaching resource materials, site-specific training, and education officers in the field;
- ii) intrinsic characteristics of natural areas, ie teachers perceive that certain characteristics of natural areas lend themselves to teaching certain syllabus content; and

- iii) the cost of transport - which is taken into account by many teachers, although often only as a secondary consideration so that numerous teachers still choose sites beyond Metropolitan Durban.

While many sites within MOSS are already used for formal fieldwork and/or extra-curricular activities, a number of current trends are likely to increase the demand for local natural areas. Firstly, the inclusion of ecology into the Senior Geography Core Syllabus and a growing emphasis on ecology in the Biology Core Syllabus will probably stimulate an increase in the use of natural areas. Secondly, increasing transport costs are likely to render local sites more popular than distant sites. Thirdly, as Environmental Education is incorporated more and more into teacher training, a trend which has begun in colleges of education, so the level of interest, knowledge and skills in Environmental Education are likely to increase within the teaching community. Fourthly, the need for teaching resources in Environmental Education has been recognised for a few years. As resources become available teachers may be encouraged to explore new areas. Considering the current use of MOSS together with these trends it is concluded that MOSS has considerable potential for environmental/ecological fieldwork.

In order to realise this potential a number of steps must be taken.

Firstly, a range of good teaching sites should be identified throughout Metropolitan Durban. Towards this end, this study has investigated the characteristics of natural areas required by secondary schools and a set of criteria has been established to assist planners and educationalists in choosing the best sites. Most importantly, natural areas chosen for fieldwork should:

- contain simple ecosystems;
- contain a limited range of both plants and animals which are

- clearly visible and which display obvious inter-relationships;
- contain a diversity of habitats and physical features so that distinct patterns and ecological gradients are apparent;
 - contain water features;
 - be located close to concentrations of schools for easy access.

Secondly, since many schools have no regular fieldwork programme, various constraints need to be addressed. The most important of these are the training, confidence, and interest of teachers in Environmental Education and fieldwork, and the cost of transport. The findings of this study suggest that the major constraints can be alleviated by developing local natural areas for education in conjunction with the upgrading of fieldwork teaching. Thus the following set of priorities was established for developing the fieldwork potential of those natural areas which are identified using the above criteria:

- suitable sites should be proclaimed and managed as nature reserves;
- site-specific resource materials which meet the needs of syllabuses must be developed and made available to teachers;
- site-specific training through in-service courses must be provided for teachers;
- resource inventories of suitable local sites should be distributed; and,
- if possible, suitably qualified teaching personnel should be seconded to train and assist teachers in the use of a number of local sites.

The set of criteria for selection of sites and the list of priorities for developing them are the end points towards which this study has been directed. The findings herein are of value both to educationalists and planners. To the planners of MOSS

and educational planners, this study has confirmed that MOSS has considerable educational potential, while also identifying priorities for the development of that potential. The list of criteria should facilitate that resources expended for this purpose be directed towards the best sites. This should avoid the risk of educational developments becoming 'white elephants'. The findings of the study are also of value to teachers, particularly in view of the increasing emphasis on ecology already mentioned, as they provide guidelines for the selection of appropriate fieldwork sites. This should be especially helpful to those who are inexperienced in fieldwork, or to Geography teachers - most of whom are untrained in the field of ecology.

Three extensions of this study would further enhance its value.

Firstly, although certain high potential sites have been named in previous chapters, no systematic application of the selection criteria has been attempted and no comprehensive list of high potential sites produced. Systematic application of the selection criteria is therefore recommended as a sequel to this study as a list of good teaching sites is important for the co-ordinated planning and development of fieldwork in Metropolitan Durban. The list of sites already in use (Chapter 3) could serve as a useful starting point to achieve this task.

Secondly, while the relative importance of constraints inhibiting fieldwork was established, the detailed fieldwork requirements of Black teachers were not investigated. This study therefore needs to be extended to include the views of Black teachers.

Thirdly, the study should also be extended to primary schools so that a complete picture of the relationship between fieldwork requirements and MOSS can be established.

In conclusion, the educational value of MOSS lies in the numerous

opportunities it provides for learning which can fulfill not only cognitive objectives of Environmental Education but also affective and behavioral objectives. This study has provided an assessment of the current use of MOSS for fieldwork, an evaluation of constraints which limit its use, and an appreciation of the factors which influence teachers' choices of natural areas in practice. This information was used to develop guidelines for the selection and appropriate fieldwork development of suitable natural areas. In this regard, the research findings should help to facilitate the development of environmental fieldwork so that students may indeed become "participants in a valued environment" (Lutts 1985, p40).

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APPENDIX AA BACKGROUND TO THE DURBAN METROPOLITAN OPEN SPACE SYSTEM (MOSS)

The concept of urban open space planning has received much attention in South Africa in recent years, especially in the larger centres of Cape Town, Johannesburg and Durban. Poynton and Roberts (1985) have reviewed this trend with respect to these three centres and discussed the benefits of an open space planning approach.

The development of the Durban Metropolitan Open Space System has come about through the co-operation of the Natal branch of the Wildlife Society of Southern Africa (WLSSA) with its primary concern for nature conservation, and the Natal Town and Regional Planning Commission (NTRPC) whose aim is to achieve the harmonious development of urban environments in Natal (Nicholson, 1986).

Early research projects funded by NTRPC were carried out by Wynn (1979) and Cawood (1980). These studies, together with work done by WLSSA over a period of several years, identified a large number of open spaces and recommended the proclamation of some of these as nature reserves.

The efforts of WLSSA and NTRPC led to a jointly organised seminar held in 1983. At this seminar, some of the open space potential in the metropolitan region was identified, policy proposals were considered, and problems which would have to be overcome were discussed (NTRPC, 1984). Resolutions were passed urging co-operation between local authorities and other bodies concerned.

A MOSS Steering Committee was subsequently formed to co-ordinate and give policy direction to the various planning authorities involved. This committee is chaired by a representative of NTRPC

and includes representatives of the kwaZulu Government, Natal Parks Board, local municipalities, WLSSA and the Department of Development Aid. NTRPC serves as the co-ordinating agency.

Another committee, the MOSS Action Committee chaired by a representative of WLSSA has also been established to enable the policy proposals to be worked out in practise. This committee identifies open spaces, draws up plans, negotiates with local authorities and land owners, and organises the cutting of trails.

The MOSS Steering Committee defined their overall aim as follows:

"To establish and maintain the most efficient open space/trail system which will link established and potential conservation areas within Metropolitan Durban." (Cooper, 1986, p 3)

Subsumed beneath this broad aim are six specific objectives to be achieved.

1. BIOLOGICAL CONSERVATION - To protect those species which are of conservation interest ... by acquiring or otherwise safeguarding examples of their habitat.
2. TRAIL SYSTEM - To maximise the biological conservation, recreational and educational functions of MOSS by planning for the maximum degree of connectivity between otherwise isolated open spaces.
3. RECREATION - To meet the demand for passive and active nature-orientated recreational activities by providing the necessary space and facilities.
4. EDUCATION - To enhance environmental awareness and adequate facilities for the interpretation of environmental patterns and processes.
5. VISUAL AMENITY - To improve the aesthetic quality of urban and suburban areas by providing for scenic variety and a green relief of the built environment.

6. RIVER PROTECTION - To prevent the deterioration of water quality and flow by protecting the structure and functioning of the Metropolitan river systems (Cooper 1986, p 3).

In 1985 WLSSA and NTRPC drew up an agreement in which NTRPC was to sponsor a research project to investigate the establishment of the most efficient open space system which would link established and potential conservation areas within Metropolitan Durban. The research involved drawing up a plan for the system and proposals for its implementation and management. This research was undertaken by Nicolson (1988).

A second joint NTRPC/WLSSA seminar was held in February 1987 in which progress on various aspects of the development of MOSS was reported (NTRPC, 1987). Amongst other speakers three school groups presented papers on their contributions to the development of MOSS. The author of this study also presented a paper on aspects of this research (Christian, 1987).

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APPENDIX BLIST OF EDUCATION DEPARTMENTS HAVING CONTROL OF SCHOOLS IN THE 'STUDY AREA'

Permission was obtained from the following education departments to carry out surveys among secondary schools in the 'study area'.

WHITE SCHOOLS	The Natal Education Dept. Private Bag 9044 Pietermaritzburg 3200
ASIAN SCHOOLS	Administration House of Delegates Dept. of Education and Culture Private Bag X54323 Durban 4000
COLOURED SCHOOLS	Administration House of Representatives Dept. of Education and Culture Private Bag 9008 Cape Town 8000
BLACK SCHOOLS (in areas not to be included in kwaZulu)	Dept. of Education and Training Private Bag X9026 Pietermaritzburg 3200
BLACK SCHOOLS (kwaZulu)	Dept. of Education and Culture Private Bag X04 Ulundi 3838

APPENDIX CQUESTIONNAIRE

FOR COMPLETION BY PRINCIPALS OF SECONDARY SCHOOLS
IN METROPOLITAN DURBAN

Before completing the questions, please take note of the following definitions of terms as used in this survey.

A "NATURAL AREA" is defined as any open-space containing predominantly natural vegetation. This includes small areas of forest, bush or grassland, sections of river courses, estuaries, rocky or sandy shores. The areas need not be proclaimed as nature reserves but must not be built up nor dominated by human activity: ie. formal parks are excluded.

As a rough guide, areas smaller than one hectare (ie. approximately one full-sized rugby field) are not relevant to this study.

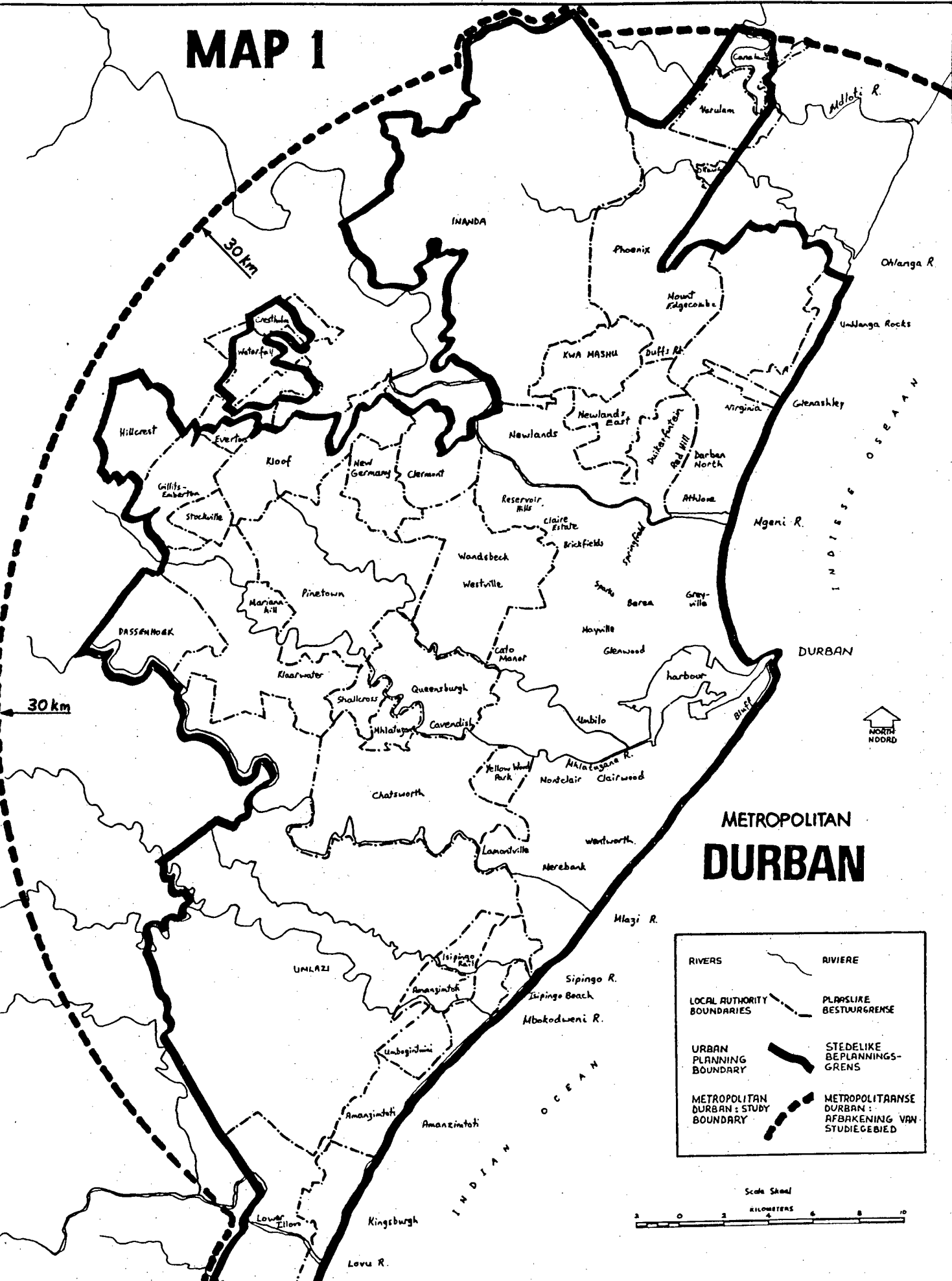
"ENVIRONMENTAL EDUCATION" (E.E.) is any educational activity which aims to increase the pupils' awareness, knowledge, concern for, and responsible action towards his/her environment.

E.E. does NOT refer to a separate subject, and it need not be confined to the subjects of Biology, Geography, or Agriculture. (A language teacher, for example, using a natural area as a stimulus to creative writing is also considered to be involved in environmental education.)

"METROPOLITAN DURBAN", for the purpose of this questionnaire, is the area enclosed by the heavy broken line on Map 1, ie. the area within approximately 30 km from the centre of Durban.

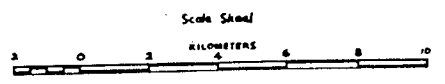
Note: In the case of schools which have primary and secondary sections, please consider only standards 6-10.

MAP 1



METROPOLITAN DURBAN

RIVERS	RIVIERE
LOCAL AUTHORITY BOUNDARIES	PLAASLIKE BESTUURSGRENS
URBAN PLANNING BOUNDARY	STEDELIKE BEPLANNINGS-GRENS
METROPOLITAN DURBAN: STUDY BOUNDARY	METROPOLITAANSE DURBAN: AFBAKENING VAN STUDIEGEBIED



N.B. If in doubt about the location of a natural area, or about whether an activity should be regarded as environmental education, please be inclusive rather than exclusive.

QUESTIONNAIRE CONTENT

SECTION A: Environmental Education and the use of natural areas - WITHIN THE CURRICULUM.

SECTION B: E.E. and the use of natural areas - AS AN EXTRA-CURRICULAR ACTIVITY.

SECTION C: The role of E.E. in the school and constraints upon the use of natural areas.

SECTION D: General information.

SECTION A: ENVIRONMENTAL EDUCATION AND THE USE OF NATURAL AREAS - WITHIN THE CURRICULUM

Q1. During 1984-1985, have any of your teachers used outings to natural areas WITHIN METROPOLITAN DURBAN as part of the teaching of their subject syllabus ?

YES	NO
-----	----

please circle the appropriate response

◀ If "YES" please answer Q2.	If "NO" go to Q3. ▶
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Q2. Complete the table below giving details of the outings referred to in Q1. (during 1984-85). [Please supply information in each column corresponding to each teacher listed in column one]

NAMES OF TEACHERS who have led class outings to natural areas in Metropolitan Durban	MAIN SUBJECTS TAUGHT by teachers listed	NAMES OF NATURAL AREAS USED (or description of their location)	STANDARD OF PUPILS involved	HOW OFTEN has each area been used ?	WERE THESE VISITS DURING SCHOOL HOURS ?
Teacher 1:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 2:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 3:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 4:		i ii iii	i ii iii	i ii iii	i ii iii

Q3. During 1984-85, have any of your teachers conducted field trips to natural areas BEYOND METROPOLITAN DURBAN as part of the teaching of their subject syllabus ?

YES NO

please circle the appropriate response

◀ If "YES" please answer Q4.

If "NO" go to Q5. ▶

Q4. Complete the table giving details of the trips referred to in Q3. (during 1984-85). [Please supply information in each column corresponding to each teacher listed in column one.]

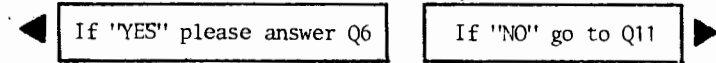
NAMES OF TEACHERS who have led class outings to natural areas beyond Metropolitan Durban	MAIN SUBJECTS TAUGHT by teachers listed	NAMES OF NATURAL AREAS USED	STANDARD OF PUPILS involved	HOW OFTEN has each area been used ?	WERE THESE VISITS DURING SCHOOL HOURS ?
Teacher 1:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 2:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 3:		i ii iii	i ii iii	i ii iii	i ii iii
Teacher 4:		i ii iii	i ii iii	i ii iii	i ii iii

SECTION B: ENVIRONMENTAL EDUCATION AND THE USE OF NATURAL AREAS - AS AN EXTRA-CURRICULAR
ACTIVITY

Q5. Does your school have an Environmental Society, Wildlife Club or any other environmental/nature-orientated group which functions on an extra-curricular basis ?

YES	NO
-----	----

please circle the appropriate response



Q6(a) Name of this society/club?

Q6(b) Main subjects taught by the teacher/s in charge.

Teacher 1 _____

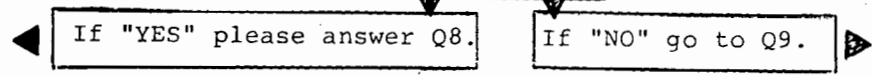
Teacher 2 _____

Q7. Has this society/club visited any natural areas

WITHIN METROPOLITAN DURBAN during 1984-85 ?

YES	NO
-----	----

please circle
the appropriate
response



Q8. Please give details of these visits as follows: -

NAMES OF NATURAL AREAS VISITED (or description of its location if name is not known).	FREQUENCY OF USE	BRIEF DESCRIPTION OF ACTIVITIES IN EACH NATURAL AREA LISTED.
Natural area 1:		
Natural area 2:		
Natural area 3:		
Natural area 4:		
Natural area 5:		

Q9. Has the environmental society/ wildlife club visited
 natural areas BEYOND METROPOLITAN DURBAN during 1984-85 ?

YES	NO
-----	----

please circle
 the appropriate
 response

◀ If "YES" answer Q10.	If "NO" go to Q11. ▶
------------------------	----------------------

Q10. Please provide details of these visits as follows: -

NAMES OF NATURAL AREAS USED	FREQUENCY OF USE	BRIEF DESCRIPTION OF ACTIVITIES IN EACH NATURAL AREA LISTED
Natural area 1:		
Natural area 2:		
Natural area 3:		
Natural area 4:		
Natural area 5:		

SECTION C: THE ROLE OF NATURAL AREAS & ENVIRONMENTAL EDUCATION IN THE SCHOOL AND
CONSTRAINTS UPON THE USE OF NATURAL AREAS

Q11(a) In your opinion, does the educational use of natural areas
make a positive contribution to the "image" (or reputation)
of the school in the eyes of:-

(i) the pupils of the school	YES	NO	please circle the appropriate response
(ii) the staff of the school	YES	NO	
(iii) other schools	YES	NO	
(iv) parents of pupils	YES	NO	
(v) the public in general	YES	NO	

Q11(b) If you answered "YES" to any of the above, please outline in what ways these
activities contribute to the "image" of your school _____

Q12. Does your school have any small area set aside within the school grounds for the
purpose of Environmental Education? YES NO

If "YES", how is this area used ?

Q13. The following is a list of possible constraints which may be limiting the (formal) educational use of natural areas in Metropolitan Durban. Please give your opinion of the importance of each factor by rating it on a scale of 0 - 5. [eg. If you feel the factor is important, circle 4. If you feel it is insignificant, circle 1. If you have no opinion on a particular factor, circle 0.]

	No opinion	Insignificant	Of marginal significance	Significant	Important	Extremely important
(a) Teachers have little interest in Environmental Education.	0	1	2	3	4	5
(b) Class outings are too disruptive to the school timetable.	0	1	2	3	4	5
(c) The educational value of fieldwork is difficult to assess in exams	0	1	2	3	4	5
(d) Teachers have had little training in running fieldwork programmes	0	1	2	3	4	5
(e) Subject syllabuses do not insist upon fieldwork	0	1	2	3	4	5
(f) The cost of travelling to local natural areas is too great.	0	1	2	3	4	5
(g) Teachers have little confidence regarding their environmental knowledge in the field	0	1	2	3	4	5
(h) Your Department does not readily give support to classes spending time out of the school .	0	1	2	3	4	5
(i) Teachers are very involved in sport and lack time for fieldwork	0	1	2	3	4	5
(j) The natural areas close to my school are in some way unsuitable.	0	1	2	3	4	5
<u>ANY OTHER FACTORS</u> [please specify, and rate as above.]						
(k) _____	0	1	2	3	4	5
(l) _____	0	1	2	3	4	5
(m) _____	0	1	2	3	4	5

SECTION D: GENERAL INFORMATION

[The information requested in this section is for the purpose
of planning the second phase of the study]

Q14. Name of School: _____ please indicate boys/girls/both.

Q15. Street Address of School _____

APPENDIX D

TEACHER INTERVIEW QUESTIONNAIRE

NAME OF SCHOOL _____

TEACHER'S NAME _____

TEACHER TRAINING AND EXPERIENCE

1. Subject: _____

2. Subject Training: ... As above / Other: _____

3. Number of Years Teaching Experience: _____

4. Training Institution attended: _____

5. Have you at any stage received any specific training in conducting fieldwork?

i) Pre-service Yes No

ii) In-service Training Yes No

iii) Informal Training (eg. through organisations such as the Wildlife Society) .. Yes No

6. Which natural areas were visited as part of this training?

Now I see from my first survey which I sent to your principal, that you have taken pupils to:-

i) _____

ii) _____

iii) _____

7. How were you introduced to this area - ie. how did you discover its educational potential?

i) Through training Pre- / In-service / Informal:.....

ii) Recommendation from colleagues, or tradition in your school

iii) Published material _____

iv) Own exploration _____

REASONS FOR CHOICE OF SITE

8A Why did you choose these particular natural areas which you have used for fieldwork?

Area 1.	Area 2.	Area 3.
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

8B Please rate the extent to which the following factors influenced your choice in favour of the area(s) which you used.

	unsure	no influence	minor influence	moderate influence	major influence
a) Previous personal knowledge about the study site ..	0	1	2	3	4
b) The availability of trained personnel in the study area to instruct pupils.	0	1	2	3	4
c) Proximity to school (as compared with other natural areas)	0	1	2	3	4
d) Availability of literature/resource materials and/or worksheets.	0	1	2	3	4
e) The particular natural features & habitats which the area offers	0	1	2	3	4
f) Lack of available information about other areas and what they have to offer.	0	1	2	3	4

CHARACTERISTICS REQUIRED OF NATURAL AREAS FOR ENVIRONMENTAL EDUCATION

11. Please rate the desirability of the following characteristics for the purpose of Environmental Education - consider both cognitive and affective objectives.

	no opinion	very undesirable	undesirable	unnecessary	desirable	very desirable
<u>(A) INTRINSIC CHARACTERISTICS</u>						
a) Simple ecosystem(easy to understand and model)..	0	1	2	3	4	5
b) High biological diversity (of habitats & species)	0	1	2	3	4	5
c) Great aesthetic appeal	0	1	2	3	4	5
d) Part of the local neighbourhood (ie. somewhat familiar to pupils)	0	1	2	3	4	5
e) Water features	0	1	2	3	4	5
f) Contain rare or unusual features, habitats, or species	0	1	2	3	4	5
g) Be undisturbed by human activities or invader plants	0	1	2	3	4	5
h) High diversity of physical landscape	0	1	2	3	4	5
i) Large area - visually isolated to create a sense of wilderness and adventure.....	0	1	2	3	4	5
j) Contain large mammals - likely to be seen	0	1	2	3	4	5
<u>(B) FACILITIES AND LOGISTIC ASPECTS</u>						
k) Within 20 minutes travelling time from school ..	0	1	2	3	4	5
l) Paths for rapid safe movement	0	1	2	3	4	5
m) Drinking water	0	1	2	3	4	5
n) Toilets	0	1	2	3	4	5
o) Field museum or interpretive center	0	1	2	3	4	5
p) Qualified warden as guide and instructor	0	1	2	3	4	5
q) Marked trails with interpretive guidebooks	0	1	2	3	4	5
r) Resource literature about the area	0	1	2	3	4	5
s) Pre-worked exercises and worksheets for pupil use	0	1	2	3	4	5

EXTRA-CURRICULAR USE OF NATURAL AREAS

12. Have you considered using any natural areas as part of an extra-curricular programme? YES / NO

IF no, is there any particular reason why you have not used them?

13. If you were selecting a natural area for extra-curricular purposes, would the same criteria apply as in question 11? YES / NO
Please explain

APPENDIX E

FREQUENCY DISTRIBUTION DATA FOR QUESTION 8B: FACTORS AFFECTING TEACHERS' CHOICE OF SITE

FACTOR	Percentage response to each rating number*															
	ALL GROUPS				WHITES				ASIANS				COLOUREDS			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(a) Previous knowledge about the site	15	11	30	44	17	17	24	41	13	5	32	50	13	13	50	25
(b) Availability of trained personnel	53	5	13	30	71	7	10	12	34	3	18	45	50	0	0	50
(c) Proximity to school	37	13	24	26	15	10	29	46	55	16	21	8	62	13	13	13
(d) Availability of literature/resource materials	29	15	31	24	37	12	32	20	19	22	32	27	38	0	25	38
(e) Particular natural features and habitats	1	1	20	78	2	0	15	83	0	0	26	74	0	13	13	75
(f) Lack of information about other areas	30	16	29	25	39	20	29	12	24	16	29	32	13	0	25	63

*NOTE: - Each percentage was calculated after excluding non-respondents.
- Percentages were rounded to the nearest whole number.

APPENDIX FSUGGESTIONS FOR ENVIRONMENTAL ACTION BY PUPILS ARISING FROM
FIELDWORK

- writing letters to city councillors regarding matters affecting environmental quality;
- promoting the use of indigenous plants amongst the local community;
- litter clean up operations as part of a public awareness campaign regarding solid waste;
- drawing public attention to sources of industrial or other pollution in the environment;
- practical conservation activities in small nature reserves, eg. eradication of exotics or trail making;
- tree planting; or
- lobbying with city councillors and the public for the preservation of historic buildings.