Author A'BEAR D R LITTLE A M PHELAN A J TAYLOR R H

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REPORT FOR
DEPARTMENT OF FORESTRY/NATAL PARKS BOARD LIAISON COMMITTEE

ST. LUCIA EASTERN SHORES
AN EVALUATION OF NATURAL RESOURCES

by

D.R. A'BEAR A.M. LITTLE A.J. PHELAN R.H. TAYLOR

TOWN AND REGIONAL PLANNING COMMISSION, NATAL 1977

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1. INTRODUCTION

In November 1975 the Natal Town and Regional Planning Commission completed a study of St. Lucia Estuary in which the land capability for urban and conservation uses was assessed from the natural resources of the area. The study was well received by the Natal Parks Board/Department of Forestry Liaison Committee who then approached the Natal Town and Regional Planning Commission with the request for a similar study to be conducted on the St. Lucia Eastern Shores. A multi-disciplinary team of biologists and planners was established to conduct the study which was commenced in May 1976.

2. OBJECTIVES

The first objective on the Eastern Shores of the St. Lucia Lake System was to determine the potential for three land uses, namely afforestation, conservation and recreation. For the purpose of this study these are defined as follows:

Afforestation is the use of land for the commercial production of timber and whatever supporting services that go with that use.

Conservation is the maintenance of land in a state which is relatively unaffected by human activity.

Recreation means, in its widest sense, the use of land for leisure time activities that people engage in from choice. On the Eastern Shores the emphasis is on a low intensity of use with a choice of activities restricted to those which are based on undeveloped natural resources and requiring unsophisticated facilities, e.g. camping, hutted camps, fishing and hiking.

A second objective was to provide a land capability data base at a scale of 1:20 000 suitable for management purposes. (Air photography see reference to Trig. Survey).

This report describes a method of evaluating selected natural resources to establish the potential for afforestation, conservation and recreation on the Eastern Shores. The technique used was a map-based data recording system which also provides a data base suitable for management purposes.

3. THE STUDY AREA (Figure 1 and Map 1)

(i) LOCATION

The study area lies on the Zululand coast between St. Lucia Park in the south and Sodwana Bay in the north (Figure 1 and Map 1). The western boundary follows the eastern shore of Lake St. Lucia and then continues northwards along the eastern edge of the Mkuzi Swamps to the plantations of Mbazwane. The northern boundary follows the southern edge of the

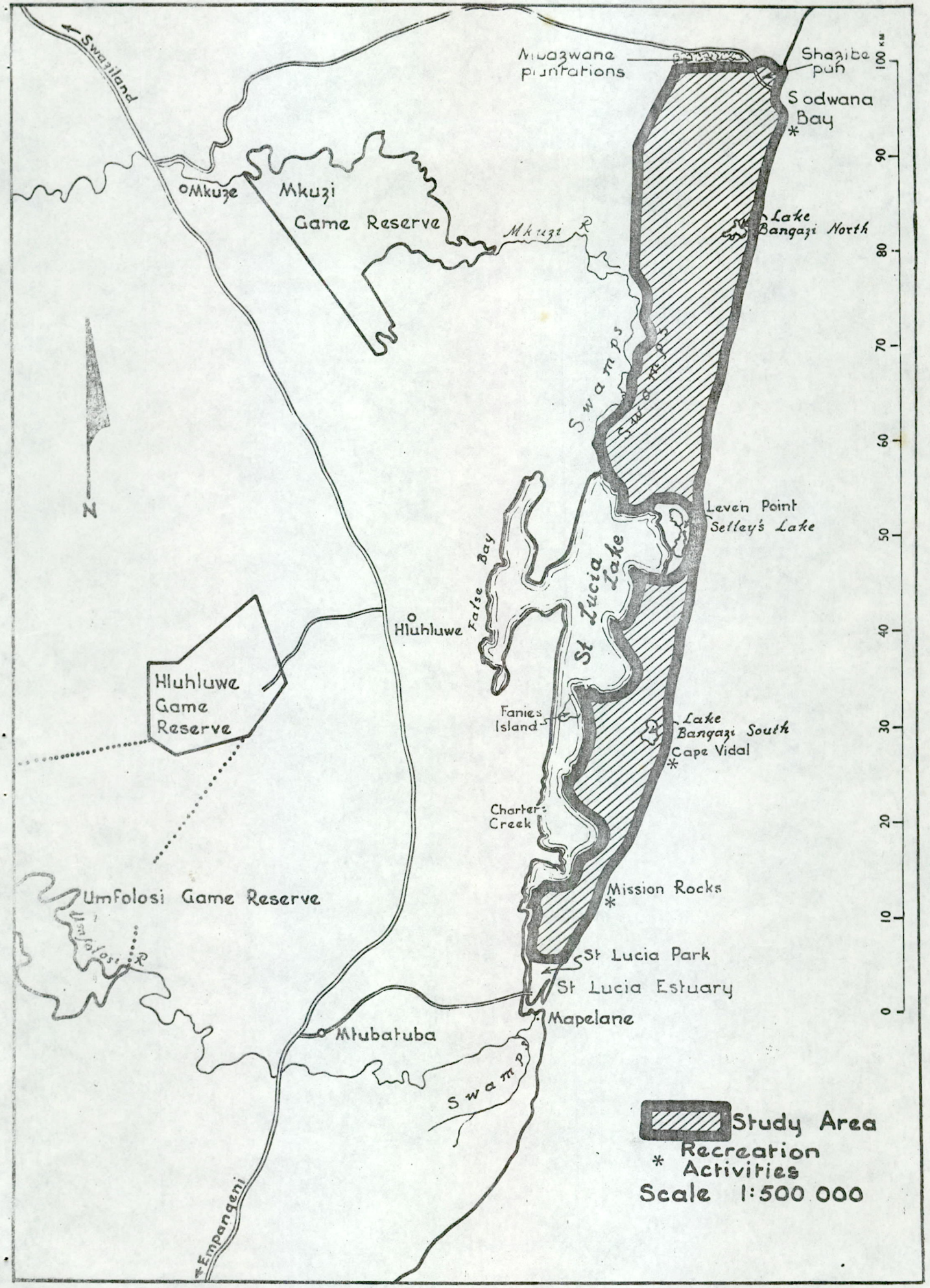
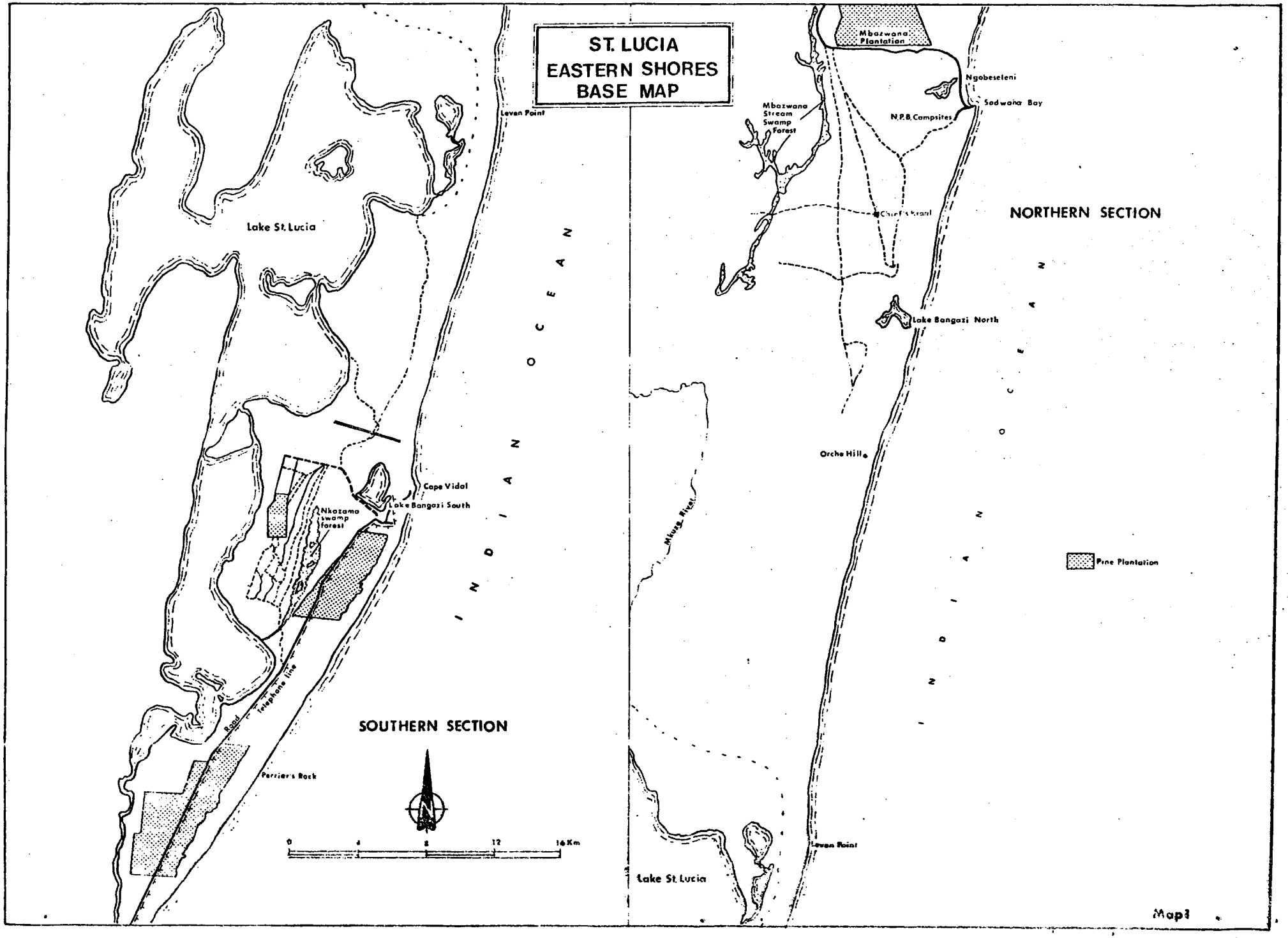


Fig 1. ST LUCIA : EASTERN SHORES STUDY AREA


ST. LUCIA
EASTERN SHORES
BASE MAP
Leven Point
Lake St. Lucia
INDIAN OCEAN
Cape Vidal
Lake Bangazi South
Nkazana swamp forest
Road
Telephone line
Perriers Rock
SOUTHERN SECTION
0
4
8
12
16 Km
Mbazwana Plantation
Ngobeseleni
Sodwana Bay
Mbazwana Stream Swamp Forest
N.P.B. Campsites
Chief's Kraal
NORTHERN SECTION
Lake Bangazi North
Orche Hill
Mkuze River
Pine Plantation
Leven Point
Lake St. Lucia
Map3

Mbazwane plantations and continues to the coast with a loop northwards to include Shazibe Pan. The beach was not included in the terms of reference for this study because it would have been necessary to study a range of marine resources beyond the scope of the work team.

(ii) NATURAL ENVIRONMENT

The Eastern Shores forms the most southerly portion of the Mozambique Plain. It has a great diversity of plant and animal species partly as a result of the merging tropical and temperate biomes. Characteristic features are the high forest covered coastal dunes, dry and hygrophilous grassland areas, reed and papyrus swamps, swamp forest and fresh water coastal lakes and pans.

(iii) HUMAN ACTIVITIES

The most obvious human activity in the area is afforestation and an area of 3 100 hectares is under pine trees. Cape Vidal and Sodwana Bay are well known fishing and camping resorts where thousands of visitors converge each year to participate in surf and ski-boat fishing. In the area between Selley's Lakes and Sodwana Bay there are still a number of Africans ekeing out a living based on subsistence agriculture.

There are two other activities that have only recently been imposed on the region. The first is a missile testing range and training area used by the South African Defence Force to the north of Cape Vidal, and the second, an extensive area leased for prospecting by various mining groups to the south of Cape Vidal.

4. METHODOLOGY

(i) EVALUATION OF NATURAL RESOURCES

Early in the seventies it was realised that advancing technology and demands for higher standards of living by ever-increasing populations threaten our limited resources in Natal.

Fortunately, by that time the Town and Regional Planning Commission had already established the philosophy that regional planning involved the wise allocation of a region's human and natural resources. A comprehensive assessment of a wide range of resources was required in order to arrive at an optimum land-use strategy. Over the previous 18 years surveys, many of a pioneering nature, had been undertaken of various key resources — soils, vegetation, water quality and quantity, land most suitable for industry were assessed; and these studies were matched by surveys of population resources, labour resources, industrial needs and the like. Professor Phillips' study in 1972 into the agricultural potential of Natal highlighted the 'holistic' interpretation of resources by the skilled ecologist. (Phillips, 1973)

However, the planner also had to interpret and evaluate resources and needs in order to resolve the conflicting demands for each piece of land. During an overseas study tour in 1972, senior planning officials had the chance of seeing the value of the Canada Land inventory as a broad scale mapping base; the manipulative usefulness of computer-based mapping systems used at the University of North Carolina, Harvard University; and the system of interpreting values of resources applied by Professor I. McHarg at the University of Pennsylvania. (McHarg, 1969)

Spurred on by these excellent examples, the following technique of resources evaluation was evolved. In essence its purpose was to determine the relative values of key resources, and to plot the results on maps which can be related to one another so as to indicate either the most appropriate land use or the effect which any land use would have on the environment. Since the maps are readily interpreted, non-technical politicans and decision makers are able to identify with the problems of rationalising development and resources and to understand the effects of policy decisions.

(ii) DESCRIPTION

The primary objective in this study was to produce a map of the study area showing a rational allocation of land to afforestation, conservation and recreation. Afforestation and conservation were identified as primary uses because they have very large land requirements. Recreation is a secondary use because it has relatively smaller land requirements and may be fitted into the mosaic of primary uses.

Thus the natural resources selected for evaluation were those that would yield a land capability map for the two primary uses. However, the selection of natural resources was also constrained by the data which could be obtained in the limited time allowed. Further, because of a limitation on funds available for the study it was decided to aim at a reconnaissance level of detail and accuracy.

Figure 2 illustrates in schematic form how the rationalised land use map was obtained. The four natural resources selected for evaluation were

A	Water table level	C	Conservation value of the vegetation
B	Erosion susceptibility	D	Conservation value for animal life

Water table level and erosion susceptibility were chosen for evaluation because they would determine the land capability for afforestation and recreation. The conservation value of the vegetation and animal life would indicate the suitability of the area for conservation purposes.

Each of the four factors was mapped on overlays on rectified 1:20 000 aerial photographs and subdivided into four classes. Each will be discussed in turn.

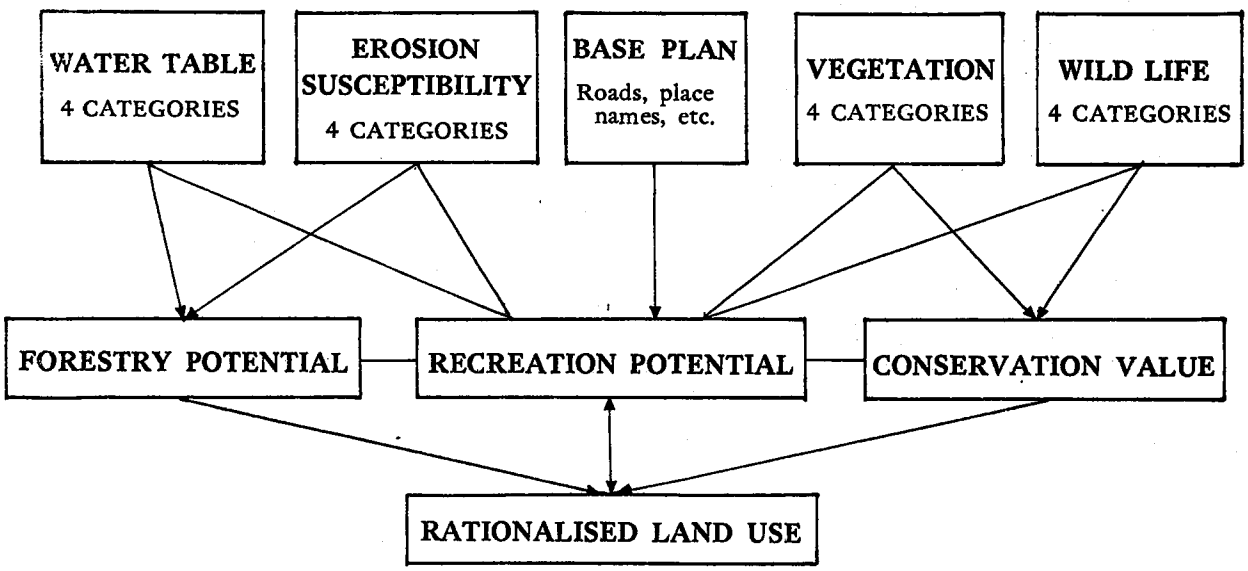


FIG. 2: FLOW DIAGRAM

A. *WATER TABLE* (Map 2)

The level of the water table is regarded as the single most important environmental factor influencing the vegetation in the study area. A high water table restricts the growth of trees in much of the area and supports large areas of hygrophilous grassland. Where the water table is exposed in depressions it forms pans which are characteristic of the study area.

The area was subdivided into four classes ranging from dry land to permanent water.

CLASS	DESCRIPTION
1	Areas of permanently dry land. These areas are never flooded and there is no noticeable influence of a high water table on the vegetation. Vegetation is usually indigenous forest, or fire-maintained secondary grassland.
2	Areas where the water table is near the soil surface and may have an inhibitary effect on indigenous tree growth. These areas are usually dry but may be flooded occasionally for a few weeks or months at a time.
3	Areas which are usually flooded during the wet season but dry during winter. This is often indicated by the number of sedges in the vegetation.
4	Areas with permanent water in years of average rainfall. Plants which indicate permanent water include *Nymphaea* spp. *Nymphoides indica, Barringtonia racemosa, Typha latifolia, Cyperus papyrus* and *Phragmites* spp.

B. *EROSION SUSCEPTIBILITY* (Map 3)

Erosion susceptibility was regarded as an important indicator of the suitability of land for afforestation because any careless disturbance of the indigenous vegetation could lead to windblown erosion. In assessing the erodability of an area a number of variables were considered. The slope of land is important especially in the dune areas where in places the slope is greater than the normal angle of repose for sand, due to the binding function of the vegetation. On the Eastern Shores aspect is important because the strongest winds are from the south-west or from the north-east. The latter blow off the sea and carry salt spray which restricts vegetation growth. Finally, water table and soil consolidation are

important because the drier and less compact the soil the greater the erosion susceptibility. The protective value of the vegetation was not considered.

The following four classes were recognised.

CLASS	DESCRIPTION
1	Areas with no erosion hazard. These are usually damp areas with little or no slope, well consolidated soils and a high peat or clay content.
2	Areas with a slight erosion hazard having little or no slope. If erosion occurs it is of a small scale and is not likely to spread easily.
3	Areas with moderate erosion susceptibility. The slope is usually moderate with no exposure to salt spray, or, a gentle slope exposed to either salt spray or the strong south-westerly winds. The soil is usually loosely consolidated sand and large scale erosion can occur.
4	Areas very susceptible to large scale erosion. These areas have moderate slopes exposed to salt spray and/or to the strong south-westerly winds. Alternatively they may just have very steep slopes. Soil is very loosely consolidated.

C. *CONSERVATION VALUE OF THE VEGETATION* (Map 4)

Vegetation communities were considered. In evaluating vegetation for inclusion in four classes the conservation status and extent of the community in the Republic of South Africa and the extent of the community in the St. Lucia area were considered.

The vegetation was then given a value of one to four where one indicated the lowest and four the highest conservation value.

CLASS	DESCRIPTION
1	Exotic communities; pine plantations, casuarinas and blue gums.
2	Natural communities abundant on the Eastern Shores and common elsewhere in South Africa.
3	Communities not endangered but uncommon in South Africa.
4	Communities rare in South Africa, or rare on the Eastern Shores.

D. *THE CONSERVATION RATING OF THE LAND FOR ANIMAL LIFE* (Map 5)

At a reconaissance level of detail and accuracy and with the present state of knowledge it was only possible to give ratings for waterfowl, crocodiles, reedbuck and hippopotamus. In the area south of Selley's Lakes the *existing* animal life was assessed, while in the northern part of the study area where human activities have reduced the animal life the *potential* value of the area for the grassland inhabiting species was taken into account. To compile a map of rated animal life areas, separate maps for the assessment of hippopotamus, reedbuck, and a combined map of crocodile and waterfowl were drawn on transparent overlays. For each of these the study area was subjectively rated between one and four with four indicating those areas that were most important for a particular animal. These maps were then overlayed and a composite map was drawn and evaluated as follows.

CLASS	DESCRIPTION
1	All areas that have three 1 ratings.
2	All areas with one or two 2 ratings.
3	All areas with three 2 or one 3 rating.
4	All areas with at least one 4 rating or, two 3 ratings or, one 3 rating plus two 2 ratings

The four natural resource maps (Maps 2, 3, 4 and 5) provide the data for assessing forestry potential and conservation value which are the two primary uses identified for the Eastern Shores. Recreation potential was discussed after the rationalised land use map for afforestation and conservation had been drawn because the latter was an important input into the recreation potential map (see Figure 2).

5. DATA ANALYSIS

(i) AFFORESTATION POTENTIAL (Map 6)

Figure 3 shows how the water table and erosion susceptibility were combined to produce a forestry potential map showing land highly suitable, and moderately suitable to afforestation and a third category, the remainder, which is totally unsuited to afforestation.

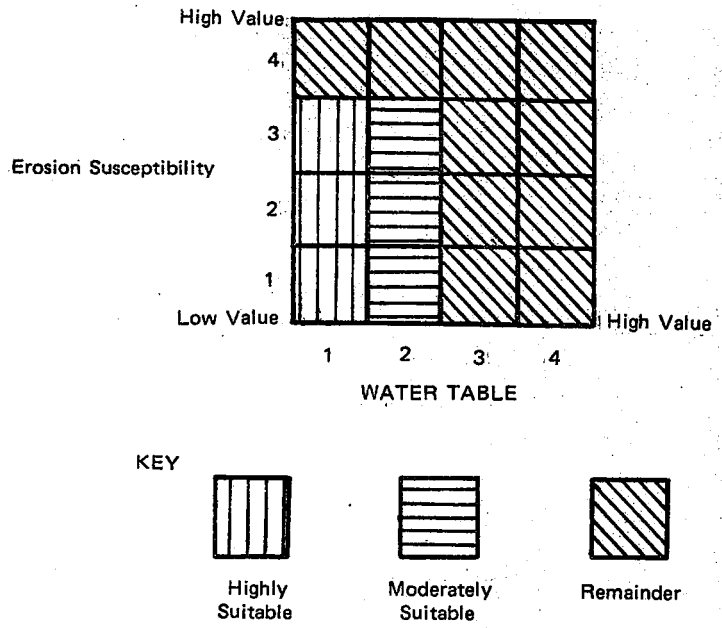


FIG. 3: LAND USE POTENTIAL FOR AFFORESTATION

The Afforestation Potential map (Map 6) showed a large area immediately west of the coastal dune from Sodwana Bay to St. Lucia Park that was highly suitable for afforestation. South of Cape Vidal the area is 25 000 hectares of which 12 per cent is already afforested with pines. North of Selley's Lakes the area is 35 000 hectares of which none is afforested.

South of Selley's Lakes the forestry potential is mainly divided into highly suitable land and remaining land but further north where the study area is wider extending northwards to the Mkuzi swamps there is a mosaic of moderately suitable land interspersed with remaining land.

(ii) CONSERVATION VALUE (Map 7)

Figure 4 shows how the vegetation and animal life maps were combined to produce a conservation value map showing land highly suitable and moderately suitable for conservation and a third category, the remainder, which is not suitable for conservation.

The conservation value map (Map 7) is distinctive because all existing pine plantations are relegated to the remainder category. In the area south of Cape Vidal the division of land is approximately between land highly valuable for conservation and remaining land. The only substantial portion of moderately valuable land is east of Catalina Bay.

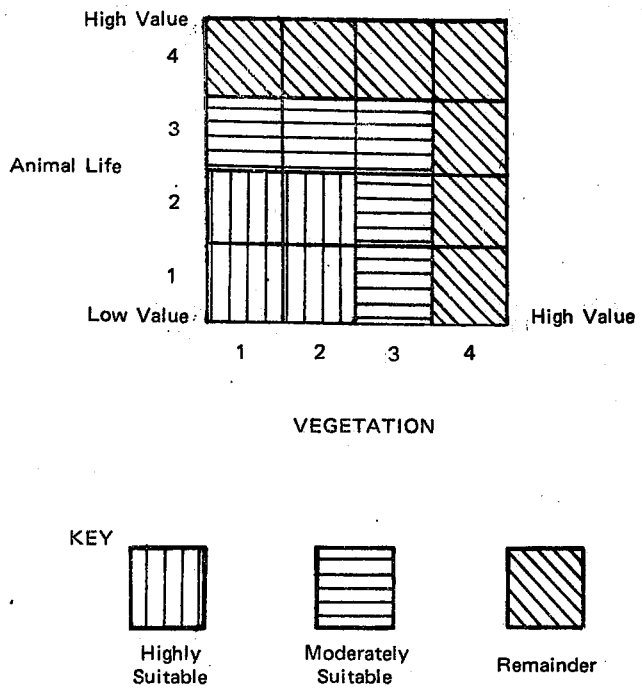


FIG. 4: LAND USE VALUE FOR CONSERVATION

Between Cape Vidal and Selley's Lakes the land is predominantly highly valuable for conservation. However, north of Selley's Lakes the balance changes in favour of land moderately valuable for conservation. Highly valuable conservation land is concentrated along the coast, along the western edge of the study area bounded by the Mkuzi swamp and around Lake Bangazi north. North-west of Lake Bangazi north is a substantial area of land with a low conservation value.

(iii) RATIONALISED LAND USE MAP FOR CONSERVATION AND AFFORESTATION (Map 8)

A rationalised land use map is necessary to clarify exactly where afforestation and conservation should occur since neither are viable in very small blocks of land.

The procedure for drawing the rationalised land use map for conservation and afforestation (Map 8) was as follows:

(a) All areas highly and moderately suitable for afforestation on the afforestation potential map (Map 6) were marked.

(b) The conservation value map (Map 7) was overlayed and all those areas were hatched where highly valuable conservation land clashed with land suitable for afforestation.

Thus the rationalised land use map (Map 8) depicts four land types which are summarised in Table 1.

Table 1: Land for Conservation and Afforestation on the St. Lucia Eastern Shores

LAND USE	AREA IN HECTARES
Highly suited for Afforestation	10 000
Moderately suited for Afforestation	12 000
Conservation clashes with Afforestation	8 000
Land remaining for Conservation	30 000
TOTAL LAND AREA	60 000 hectares

It is important to understand that the rationalised land use map should be used with discretion. It does not purport to be a blueprint for afforestation and conservation land uses on the Eastern Shores because it does not take policy or economic decisions into account. It requires verification in the field in the light of policy and economic influences.

(iv) RECREATION POTENTIAL

(a) **Background:** The St. Lucia Lake and the Eastern Shores are important areas because they are the southern limit for the distribution of hippopotamus in Africa. In addition the largest concentrations of reedbuck in South Africa are found there.

Within this context there are a few spots which have potential for fishing and ski-boating which have attracted concentrations of human activity.

The purpose is to continue this pattern. This means the principal land uses will remain conservation and afforestation. The area should be used for the enjoyment of countryside and animal life with the accent being on unsophisticated recreation development.

Human activities will be concentreated in areas which have developed as recreation nodes such as St. Lucia Estuary, Sodwana Bay and Cape Vidal. A few more developments may be located in a way that does not deviate from the provision of unsophisticated facilities.

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(b) **Existing Development:** At present the only recreational development in the area is Sodwana Bay in the north with 600 camp sites, Cape Vidal with 32 camp sites and Mission Rocks with day visitor facilities.

(c) **Recreation Plan** (see Map 9): In order to achieve a low intensity of recreation development on the Eastern Shores the town of St. Lucia Estuary is being planned to provide a variety of recreation and accommodation types. It will act as a filter to the Eastern Shores so that the desired low intensity of use may be achieved.

Figure 2 illustrates schematically which data maps were combined to produce a map of the recreation potential. Water table (Map 2) was obviously a constraint on the siting of development and likewise the erosion susceptibility (Map 3). The forestry potential (Map 6), conservation value map (Map 7) and the base plan (Map 1), the animal life map (Map 5) and the vegetation map (Map 4) were all used in assessing the recreational potential.

The base plan shows that all public access to the beach is concentrated in three places, Sodwana Bay, Cape Vidal and Mission Rocks. Because the demand for access to the area has mainly been from fishermen and people from inland all roads lead to the beach with the consequent development of only beach related activities. Since large areas of the Eastern Shores have high value for conservation the development of self-guided hiking trails, walks and guided wilderness trails are envisaged as walking is compatible with conservation in this area. The Natal Parks Board is already planning a two-day self-guided hiking trail from St. Lucia Estuary to Cape Vidal. This should be the beginning of a network of trails and walks which could utilise the whole area south of Cape Vidal. North of Cape Vidal guided wilderness trails would be provided.

Another new development could be the provision of several game and bird viewing hides on the shores of Lake St. Lucia, Lake Bangazi south and some of the more interesting pans. Access to them would be by prior arrangement with the ranger or forester in charge of the area so that tight control could be exercised over their use.

It seems that within the framework of unsophisticated development there is room for a 'walk in' camping facility for a limited number of people at Perriers Rocks. (See Map 9). Fishermen, birdwatchers and hikers could make use of this facility with little impact on the beautiful surroundings. The possibility of establishing hutted camps on the Eastern Shores should not be considered until both the Eastern and Western Shores of the lake are studied. In addition it would be premature to discuss new locations until mining activities in the adjacent concession areas have begun so that their noise and visual impact may be assessed.

Map 9 shows the recreation plan for the St. Lucia Eastern Shores. It is divided into two phases of development.

The *first phase,* indicated in solid black lines, would be scheduled for immediate implementation. This includes the following:(Map 9):

(i) Sodwana Bay should be left at its present level of development.

(ii) Cape Vidal camp site should be upgraded and access roads improved.

(iii) The ski-boat club houses at Cape Vidal should be removed at the earliest possible time and a Parks Board amenity provided such as that envisaged for Mapelane.

(iv) Mission Rocks should be retained for day-visitors. It requires an improved access road and picnic/parking area. Simple toilet and fish-cleaning facilities are required.

(v) The St. Lucia Estuary to Cape Vidal hiking trail should be implemented and the possibility of other walks in the hiking zone should be investigated.

(vi) A game or bird viewing hide should be constructed at a suitable place on the shoreline of Lake St. Lucia.

(vii) A "walk in" rustic camp site should be provided at Perrier's Rocks to cater for fishermen, birdwatchers and hikers.

The *second phase of development* is indicated in dashed lines and would be scheduled for implementation in the next 5—10 years once the full impact of mining activities has been assessed. All sites indicated in dashed lines are only suggestions and their implementation would depend on detailed investigations of alternative sites and the selection of the one most suitable.

Future proposals include: (Map 9)

(i) A hutted camp on the eastern shoreline of Lake St. Lucia, if, when studied in conjunction with the Western shores of the lake, it is considered appropriate.

(ii) The development of game or bird viewing hides.

The potential for recreation on the St. Lucia Eastern Shores is constrained by the desire to retain its wild character by only encouraging activities requiring unsophisticated development. However, at this point in time there is also a need to proceed cautiously because the full impact of mining is not known or understood and it would be very easy to provide foolishly.

6. CONCLUSIONS

(i) OBJECTIVES

The objectives for this study were, firstly, to evaluate the land capability for afforestation, conservation and recreation, and secondly, to provide a data base for future research, planning and management.

Map 10 showing the proposed Land Use on the St. Lucia Eastern Shores summarises the results of the evaluation of land capability. This plan is a combination of Map 8, showing the Rationalised Land Use for Afforestation and Conservation, and Map 9 showing proposed Recreation Development. The total study area was 60 000 hectares and Table 2 summarises the percentage allocation of land to the three uses.

Table 2: Percentage Allocation of Land to Conservation, Afforestation and Recreation

LAND USE	AREA IN HA.	PERCENTAGE
Land for Afforestation	22 000	37
Land for Conservation	30 000	50
Land where Conservation clashes with Afforestation	8 000	13
Estimate of Land for Recreation Use	30 000	50 *
TOTAL AREA	60 000	

** In many instances recreation use combines with one of the other uses, therefore the percentages will total more than 100 per cent.*

A map based data recording system was used so maps of the natural resources used in the study are available as a data base. It is envisaged that this information will ultimately be stored in a computer which will facilitate data manipulation in the future.

(iii) USE OF THE DATA

As the data is studied by potential users there is no doubt that many uses for it will come to mind. The list of uses in Table 3 is not meant to be an exhaustive one, it should serve only as a guide.

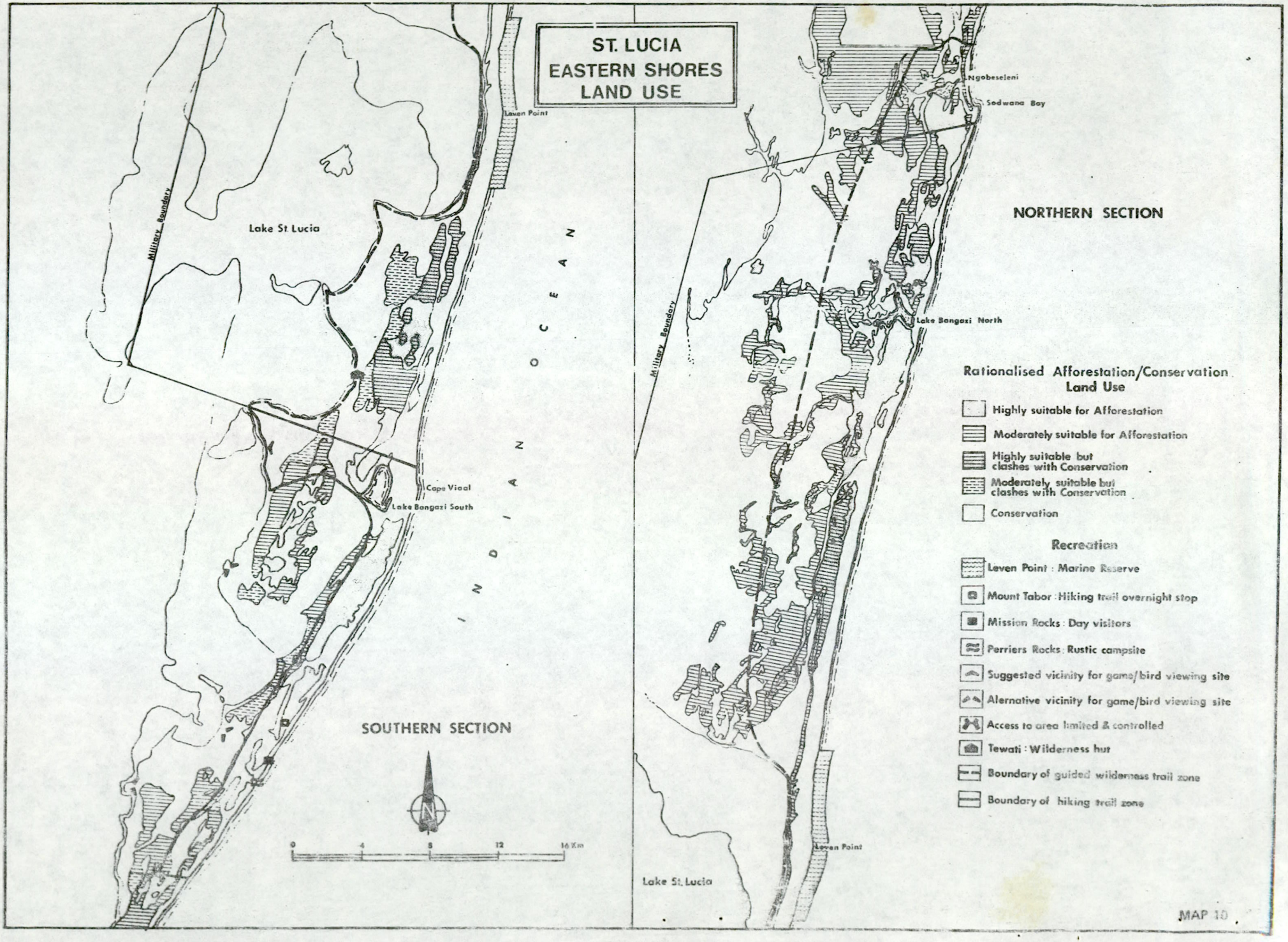
ST. LUCIA
EASTERN SHORES
LAND USE
Leven Point
Lake St Lucia
Military Boundary
INDIAN OCEAN
Cape Vidal
Lake Bangazi South
SOUTHERN SECTION
0
4
8
12
16 Km
Ngobeseleni
Sodwana Bay
NORTHERN SECTION
Lake Bangazi North
Military Boundary
Leven Point
Lake St Lucia
Rationalised Afforestation/Conservation Land Use
Highly suitable for Afforestation
Moderately suitable for Afforestation
Highly suitable but clashes with Conservation
Moderately suitable but clashes with Conservation
Conservation
Recreation
Leven Point : Marine Reserve
Mount Tabor : Hiking trail overnight stop
Mission Rocks : Day visitors
Perriers Rocks : Rustic campsite
Suggested vicinity for game/bird viewing site
Alternative vicinity for game/bird viewing site
Access to area limited & controlled
Tewati : Wilderness hut
Boundary of guided wilderness trail zone
Boundary of hiking trail zone
MAP 10

Table 3: Uses of the Data

MAP TITLE	USE
Natural Resource Base Maps: watertable, erosion susceptibility, vegetation, animal life map no's 2, 3, 4, 5, 6, 7.	Designing veld management programs: carrying capacities, veld burning, selection of management blocks. Monitoring of changes in water table and vegetation Selection of suitable sites for buildings, campsites, game viewing hides Ground truth for comparison with satellite information on the same area
Derived Land Use Maps: Conservation and Afforestation Potential map no's 8, 9 & 10	Management decisions on allocation of land to different uses
Base Map	Recording of all names, new roads, building developments, etc.

All maps are a base for the recording of further scientific data

(iii) PROBLEMS AND LIMITATIONS OF THE STUDY

One of the major problems was the lack of recent rectified 1:20 000 aerial photographs. This meant that it was not always possible to identify exact present changes in data and it also resulted in a long time being spent in the production of a reasonably accurate 1:20 000 map.

Another problem was that the study was heavily weighted in favour of natural resources. This means that the proposals for afforestation may change when economic considerations are superimposed such as the minimum area that can be economically planted. Furthermore since most of the existing recreation pressure in the area is directed at coastal fishing a study should have been undertaken of the beach to ascertain (i) the impact of vehicles and people on the beach; (ii) possible ski-boat launching sites and (iii) good surf fishing spots.

It is important to realise that the boundaries drawn on the natural resource and derived maps (see Figure 2) are points on a continuum of temporal and spatial change and that subjective judgement was involved in dividing the land into classes. However, it is believed that the logic in the technique used for the evaluation of land use classes was consistent and suitable for use in other similar studies.

While this study of the afforestation, recreation and conservation potential on the St. Lucia Eastern Shores has been of value in the allocation of land to the several uses the most important feature is the data base. It exists as an holistic appraisal of the area for wildlife management. Existing data can be changed and modified but it is always there on which to build.

Finally, it is appropriate that the approach used in this study should have been used on the St. Lucia Eastern Shores because more than any of South Africa's other reserves it standards as a separate ecological unit.

7. RECOMMENDATIONS

It is recommended by the Town and Regional Planning Commission that:

1. All the maps (Maps 1—10) should be presented to the Natal Parks Board/ Department of Forestry Liaison Committee Meeting for study.

2. The Parks Board/Forestry Liaison Committee's attention should be drawn to Map 10, Proposed Land Use on the St. Lucia Eastern Shores.

3. If the Parks Board/Forestry Liaison Committee considers it necessary and appropriate a similar natural resource capability study should be carried out on the western shores of the lake and in the catchments of the major rivers feeding the lake to determine appropriate land uses and/or rehabilitation measures consistent with the conservation of the lake system.

4. The Parks Board/Forestry Liaison Committee considers requesting the Town and Regional Planning Commission to assist in setting up a computerised data bank for storing all existing and future information collected concerning the Study Area.

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