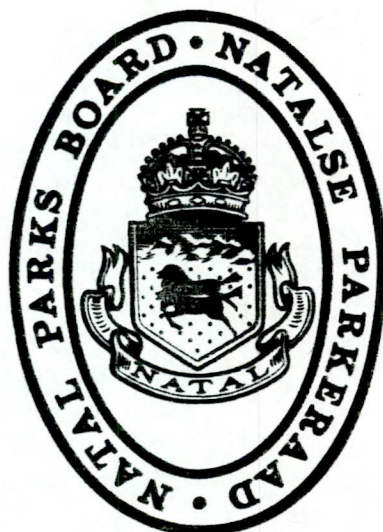


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LAND USE IN THE ST LUCIA CATCHMENT

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INTRODUCTION

Information was collected from many sources to prepare the report of the Commission of Inquiry into the alleged threat to animal and plant life in St Lucia Lake (Kriel et al, 1964-66). Data on land use in the catchment of Lake St Lucia were, however, meagre. More is known now, fifteen years later, but knowledge is still far from adequate. Reasonably accurate quantitative information on water yield and use, erosion, productivity, potential and other aspects is necessary for efficient management of the St Lucia system. In the absence of facts, informed estimates are being used. Hutchison (1976) foresees "Land use studies at say decade intervals in the catchments of all rivers feeding the Lake. (With the aid of aerial photographs and agricultural censuses it should be possible to compile an inventory of all activities that affect runoff and silt yield, e.g. number and size of all dams and extent of cultivation, irrigation and afforestation)".

No full land use studies have yet been undertaken although satellite imagery has been used to study the surround of St Lucia. Quantitative information on land use in adequate detail has not yet been obtained by this technique for the St Lucia catchment, but prospects for the future are bright.

The Mfolosi River will provide a small part of its runoff to supplement St Lucia's freshwater needs. It therefore becomes part of St Lucia's catchment. No water will be contributed by the Pongola River in the foreseeable future but its use as a source of water for St Lucia is often mooted. It is therefore included in this report on land use in the St Lucia catchment.

ST LUCIA CATCHMENT

Land ownership

The ownership or control of the land comprising the catchment of St Lucia is summarized in Table 1. Direct inflow into the Lake is derived from an area of about 8 700 km² controlled mainly by white farmers (54 per cent), by KwaZulu (39 per cent) and by Natal Parks Board (7 per cent).

18: CATCHMENTS

TABLE 1 :

AREA OF ST. LUCIA CATCHMENT (km²)

	R.S.A.	KWAZULU	N.P.B.	TOTAL
Pongolo (W4R01)	5 381	2 084	260	7 725
Mkuze (W3M11)	2 833	1 668	238	4 739
Mzinene	599	301	8	908
Hiuhluwe	63	528	291	882
Nyalazi	169	455	78	703
N. shores	485	444	-	929
W. shores	266	-	-	266
E. shores	236	-	-	236
White Umfolosi (W2M03)	2 589	2 308	180	5 077
Black Umfolosi (W2M02)	1 101	2 116	236	3 453
Lower Umfolosi (diversion)	214	499	173	886
	13 936	10 404	1 464	25 804

N.P.B. areas include Itala, Hiuhluwe, the Corridor and Umfolosi. The surround of St. Lucia has been included in R.S.A. N, W and E shores are those remaining areas which do not fall in the listed catchments. The boundary between N and E shores is just south of Selley's Lakes.

Bioclimates

The bioclimates of Natal as established by Phillips (1973) have been found useful in assessing resources, conducting surveys, planning improved land use, and for other purposes. The bioclimates for the St Lucia catchment are superimposed on the catchment boundaries in Fig. 1. Bioclimates are also a good indication of the type of land use likely to be practised in various sectors of St Lucia's catchment.

Land use

The latest land use information in the St Lucia catchment, but excluding KwaZulu, has been derived from the agricultural survey, code-named Agriquest, conducted in 1979 by the Natal Region of the Department of Agriculture & Fisheries. It is the most ambitious and successful voluntary agricultural survey yet conducted in South Africa. Processing the large volume of data has taken much computer and personnel time and the demand for land use information has been so great that the request for more details on St Lucia's catchment could not be met before the symposium date. The computer printout in Figure 2 is therefore the best information available on land use in the St Lucia catchment.

Superimposed on this printout are the St Lucia catchment's boundaries. KwaZulu, Swaziland and a Transvaal Bantu Reserve are delineated with a dashed line, while the main Natal Parks Board reserves are defined with a dotted line.

Each symbol in the figure indicates the main income-earning primary production line in an area of 375 hectares - determined by the space assigned to a single character on the computer printer.

It was not possible to present both bioclimatic and Agriquest information on one map. The two maps are of the same scale and location of towns has been indicated on both to aid orientation.

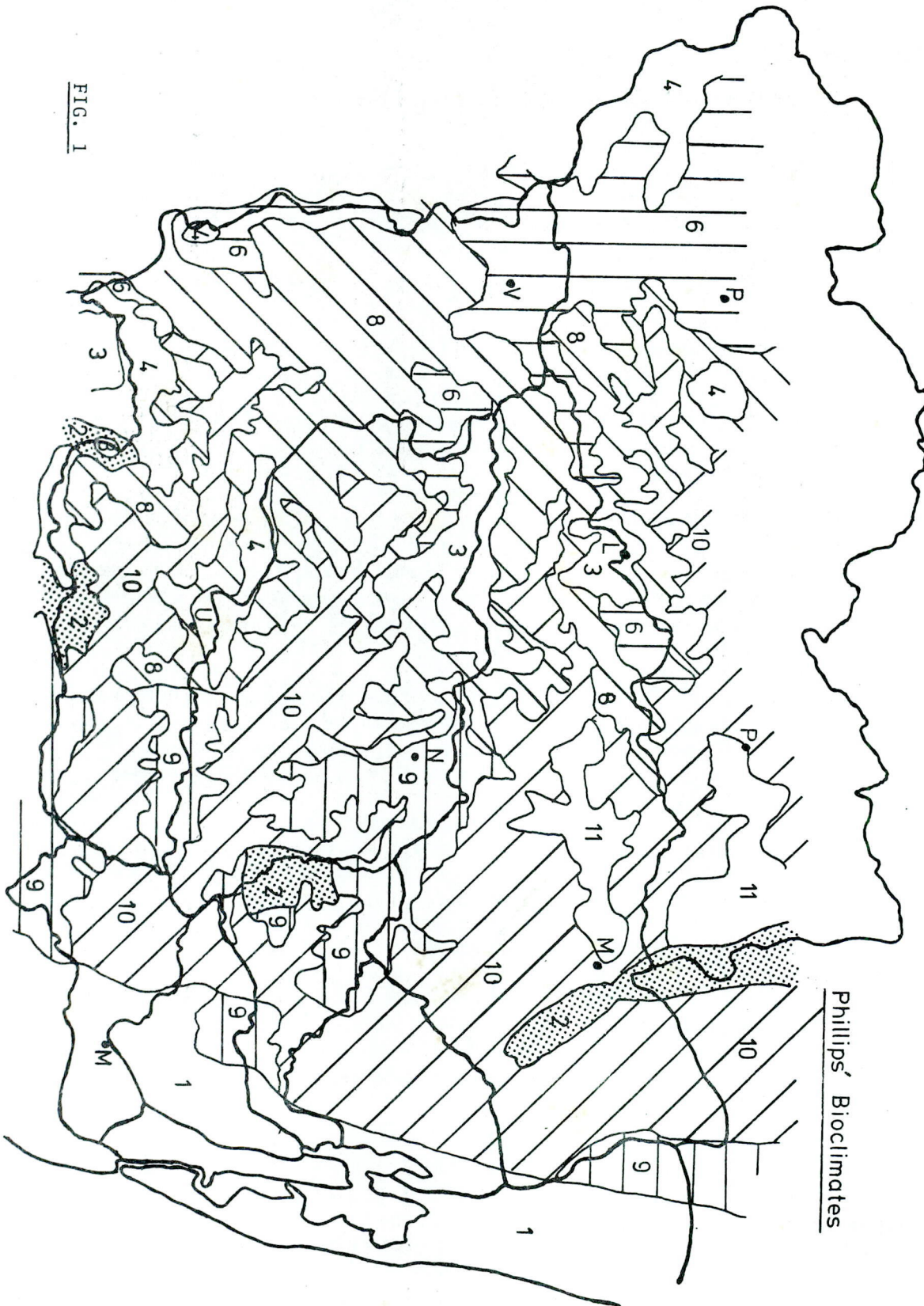
The main uses made of the land within St Lucia's catchment are described below:

KwaZulu

McKay described land use in the KwaZulu areas of St Lucia catchment in 1965. His description is still apt for the greater part of KwaZulu in 1982 is therefore repeated here:

"Each Tribe has a defined ward, which is subdivided into a number of subwards. Control of the tribe and its land, is exercised by a Hereditary Chief, with

FIG. 1



Phillips' Bioclimates

the assistance of a Traditional Tribal Council, and each subward is under the control of an Induna, placed in authority by the Chief.

Married tribesmen are entitled to arable land, if such is available, and the allocation of arable and residential allotments, is carried out by the Chief, through his Indunas.

All other land is communally used for the exploitation of the vegetation. Grassland is used for grazing, with no restriction on the number of stock kept by each individual, and it is obvious that as the population increases, overstocking must result. The Tribal system has so far not taken any steps to counter this danger. In the summer the stock is allowed to graze the veld most conveniently situated to each subward. In winter, after the crops have been harvested, the stock is permitted by the Chief to graze on the crop residues in the arable lands, returning to the veld in the spring, when ploughing starts. There is no rotational grazing practised, and it is difficult for the individual to grow supplementary stock feeding crops, as all the lands are used by the stock of the whole community.

Forest and bush is used for the requirements of the tribe, for hut building timber, fuel, tools, implements etc., under limited control by the Chief, and no attempts are made to extend forests or plantations.

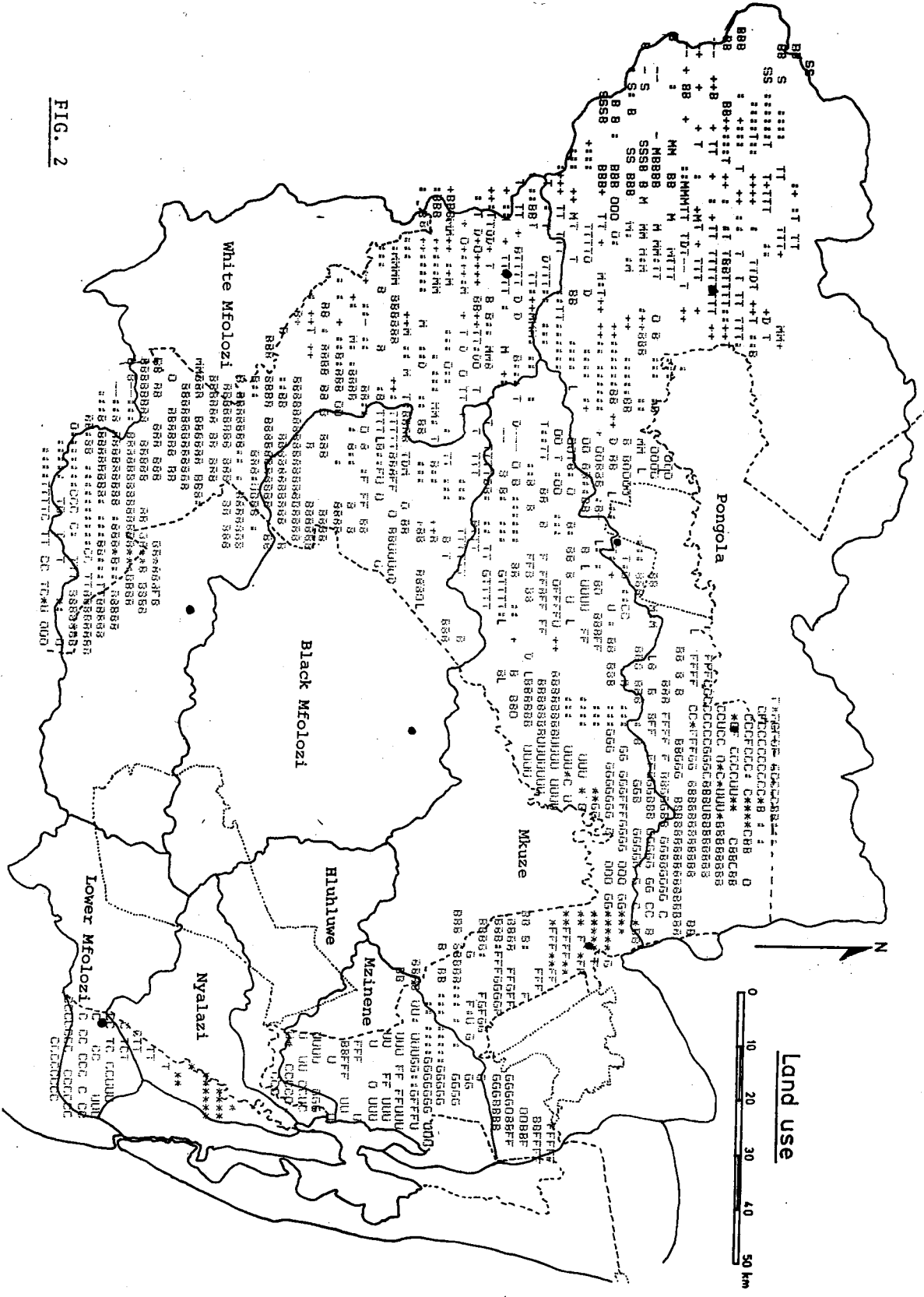
Sections of the commonage or of the arable lands, are often closed by the Chief for the provision of thatch grass for roofing material, and cutting may not take place until his authority has been granted".

Degradation has accelerated in many areas since 1965 but there has been an improvement in others. Large areas have been planned in recent years and improved management practices are being applied where the tribe has accepted a

Fig. 1 LEGEND

1	Coast Lowlands	8	Dry Tall Grassveld
2	Coast Hinterland	9	Zululand Bush and Lowveld
3	Midlands Mistbelt	10	Interior and Valley Thornveld
4	Highland Sourveld	11	Arid Lowveld
6	Moist Tall Grassveld		

FIG. 2



plan. Chief Minister Buthelezi has accepted such a plan for his own ward of about 50 000ha administered by about 30 indunas. Dams are being built, contours constructed and camps are being fenced at great cost. The example set by the Chief Minister is sure to be followed by others.

Rehabilitation is only just starting and the overall picture is still one of no change since 1965.

Beef

The number of beef cattle in Natal has increased by about 40% in the last decade. Agriquest data suggest that many beef farms are overstocked. The low calving percentages reflect the generally poor state of herd management and by implication, poor veld management. Experience suggests that herd management is generally poorer in drier areas such as Bioclimates 9, 10, and 11, which form a large part of St Lucia's catchment.

Game ranching

There has been a marked increase in the area of game ranches in the lower white-owned land of the St Lucia catchment during the last 15 years. Unfortunately the standard of veld management on even some well-known ranches is well below that recommended by the Department of Agriculture & Fisheries. The Umfolozi and Hluhluwe Game Reserves also have areas of severe degradation. Grazing has deteriorated, bush has encroached extensively and erosion is active on many properties devoted to game.

Labour farms

It was common practice, especially in northern Natal, for landowners to buy farms on which Bantu were permitted to

Fig. 2 LEGEND

C	cane	)	0	other
M	maize	)	L	labour farms
B	beef	)	*	cane/mixed, cane major
D	dairy	)	+	maize mixed, maize major
S	sheep	)	-	beef/sheep, more than 85%
T	timber	)	"	stock mixed, D, B or S major
G	game	)	---	Kwazulu
F	fibre	)	...	Natal Parks Board
U	sub.trop. fruit	)	—	watershed
		)		earned
		)		more than 67%
		)		of income
		)		earned
		)		more than 50%
		)		of income
		)		earned

settle provided they supplied labour for the owner's other properties. There has been a notable decrease in this practice but there are nevertheless still a number of labour farms in the catchment of St Lucia.

Control of human and animal populations on these labour farms is minimal and veld management non-existent. Erosion is usually active and sometimes worse than in neighbouring KwaZulu.

Irrigation

Extensive irrigation is practised on the riparian land of several tributaries to Lake St Lucia and neighbouring catchments. The rivers most used are the Pongola, Mkuze, Hluhluwe and lower Umfolosi. The geological formations of these catchments and, in some cases mining activities, is responsible for a relatively high salt content of their waters. The concentration increased during the season of low flow when water demand is high. This poor quality water, in combination with soils which are very susceptible to brak, is causing the Department of Agriculture & Fisheries grave concern. Salts are being concentrated in the soils and the ability of the irrigated land to produce crops is diminishing. The nature of the soils is such that the possibility of leaching their salts, as is practised elsewhere, is remote.

Forestry

There is now sufficient evidence to permit reasonable estimates to be made of water use by forest plantations relative to grassland. Plantations in the catchment are contributing to decreased flow into Lake St Lucia, but claims of their detrimental effects were frequently exaggerated.

A few thousand hectares of forest plantations in the upper Pongola, Mkuze and Mfolozi catchments probably reduce dry season flow in the upper catchments measurably but their effect would no longer be measurable in the augmented flow of the lower reaches. Their effect on the annual flow of these rivers is negligible.

The plantations on the Eastern Shores, however, could have a markedly detrimental effect on small sources of perennial fresh water. These may be the only sources of fresh water available to animals during drought and high Lake salinities.

Forest plantations would have to be several times larger than they are at present to influence Lake salinities materially but even small plantations strategically situated

could cause serious desiccation of small but vital water resources.

Poor forest management can be responsible for erosion but there is little erosion from the plantations in St Lucia's catchment.

Mining

A number of mines are extracting coal from large deposits in the upper catchments of St Lucia tributaries - especially the Mkuze and Black Mfolozi. The highly acid water seeping from these mines and their waste dumps, or pumped from deeper levels, dissolves bases from rock strata and can be particularly detrimental to stock and irrigated land. Irrigation with mine effluent causes profound detrimental changes to the chemical, physical and biological properties of certain problematic soils. Some of these changes are irreversible and the soils can never be brought back to production with known economic techniques. Use of degraded water reduces the capability of the soils to produce crops by increasing salinity and sodicity and decreasing internation drainage.

Waters, high in dissolved salts, contribute to the salinity of Lake St Lucia but are not inherently toxic to the saltwater biota of the Lake.

Efforts are being made to render mine waste water less harmful but progress is limited.

Erosion

The Development Programme for Natal Region (Department of Agriculture & Fisheries, 1972,1974,1981) and Scotney (1978) have reported on erosion according to Phillips' bioclimates.

Both cane and timber, the two most important crops in Bioclimate 1, have a high demand for water. They are responsible for reduced inflow into Lake St Lucia, but when even only reasonably well managed, they cause little erosion once they are established.

Bioclimates 2,3 and 4 have a relatively high rainfall. The main form of land use in these areas is for growing timber and mixed farming. Danger of erosion is not as severe here as in the drier bioclimates but there are nevertheless examples of poor land management and associated land degradation.

There are extensive arable lands in Bioclimate 6 and soil erosion is moderate on both cultivated land and natural

veld. Conservation practice in this important mealies growing area is generally poor. The natural veld is in fair condition but overstocking and mismanagement in local areas have led to serious erosion, encroachment of undesirable plants, and accentuation of termite damage.

Bioclimate 8 is generally drier than 6 and only the moister areas are suitable for dryland cropping. Many of the soils are susceptible to erosion. Incorrect land use and poor cropping practice and veld management have caused severe erosion. Sheet erosion is common to most upland soils but many of the extensive bottomlands are severely gully-eroded. Bush encroachment is a feature of this bioclimate and is associated with poor grass cover and high rates of soil loss. Wind erosion is serious locally on sandy soils. Large areas have been withdrawn from cultivation owing to past erosion.

Most of the thornveld in Natal is in Bioclimates 9, 10 and 11. The soils here are highly erodible and the vegetation sensitive to mismanagement. These bioclimates are the most eroded in Natal. Much of the erosion is in the form of deep gullies or areas totally denuded of soil. There are, however, definite signs of better management and improved grass cover. in many areas.

The state of veld management in Natal as a whole, as inferred from Agriquest data, is that 15% of the veld is well managed, 25% is under some form of rotational grazing system, while 60% is in poor condition with much loss of cover and soil. However, most of this poor veld is in the drier areas so that St Lucia's catchment would have a much higher percentage of poor veld condition than the Natal average.

Scotney (1978) has prepared a table showing overall degree of erosion in Natal on a scale where 1 is very slight and 5 is very severe. The assessments are subjective but based on information supplied by informed people. The relevant information for St Lucia catchment is given in Table 2.

The dismal record of degradation of vegetation and of soil loss in the catchment of St Lucia is obvious to all. The areas, in both KwaZulu and on white farms, where the course of degradation has been halted and even reversed, are so small that they do not materially influence the gravity of the situation. They are, however, encouraging signs of what can be done to reverse the trend.

Scotney (1978) writes that "despite much publicity and persuasive extension, there remains an apathetic attitude among the public at large. There is urgent need to create public awareness and to encourage farmers and others to view

erosion in a serious light".

TABLE 2: Degree of Erosion

Bioclimate	Overall assessment	Cultivated land	Natural veld	Wind erosion
1	2	2	1	2
2	2	2	2	-
3	1	2	1	-
4	1	1	1	1
6	3	3	3	-
8	5	4	4/5	3
9	4	3	4	-
10	5	4	5	-
11	4	4	4	-

Severity of erosion is therefore least in Bioclimates 1, 2, 3, and 4, moderate in 6, and worst in 8, 9, 10, and 11.

Water resources and irrigation

The main tributaries to the Lake will continue to provide most of St Lucia's freshwater needs.

The average annual contribution to St Lucia's freshwater, before development started withholding significant quantities, and at present, is recorded below:

Table 3: Volume of runoff into St Lucia

	10 ⁶ m ³ VIRGIN per cent		10 ⁶ m ³ TODAY per cent	
Mkuze	211	36	178	39
Mzinene	24	4	22	5
Hluhluwe	49	8	28	6
Nyalazi	32	6	24	5
N.E. and W. Shores	263	46	206	45
	579	100	458	100

The Mfolozi's mean annual runoff is about 750 million cubic metres while that of the Pongola is just over 1 000.

The average annual inflow of freshwater into Lake St Lucia has been just under 570 million cubic metres and a diversion of about 60 million cubic metres into the Lake from neighbouring sources could re-establish near-virgin conditions. Direct rainfall contributes about as much fresh

water as that yielded by the main tributary rivers.

About 7 500 ha can be readily irrigated in the Mkuze catchment. The volume which would be used for this purpose would be about 98 million cubic metres. The present area under irrigation is not known. There are only relatively small farm dams and barrages in this catchment.

The Hluhluwe Dam with a capacity of 29 million cubic metres is the only large storage work in St Lucia's main catchment. It has reduced the freshwater for the Lake from this river by half. The area under irrigation in this catchment is not known.

Jozini Dam on the Pongola can store 2 500 million cubic metres. Nearly 12 000ha are at present being irrigated with 156 million cubic metres in the Pongola's catchment.

The Klipfontein Dam under construction in the upper White Mfolozi River will have a capacity of 20 million cubic metres. A small dam to provide Vryheid with water and small farms storages are the only other dams in the whole Mfolozi catchment.

About 1 700 ha on white-owned land and 70 ha in KwaZulu are irrigated with about 23 million cubic metres annually in the White Mfolozi catchment. The Black Mfolozi has 1 100 ha of white-owned land and 400 ha of KwaZulu under irrigation and water use is 20 million cubic metres a year. Nearly 8 000 ha of the Mfolozi flats in the lower reaches of the catchment use about 80 million cubic metres of irrigation water annually.

INDIVIDUAL CATCHMENTS

Mkuze

The upper catchment of the Mkuze River is mostly Dry Tall Grassveld and Thornveld with a little Midlands Mistbelt. Land use is varied and includes some timber on the elevated and moist watershed with some dryland crops, while beef is farmed in the drier areas. The middle reaches produce beef, and near the rivers, cotton, citrus, and vegetables under irrigation. The lower reaches grow mostly cane under irrigation and dryland sisal, while beef and game are the main livestock. The middle and lower reaches are mostly Interior and Valley Thoreveld and Arid Lowveld.

Mzinene

Almost the entire Mzinene catchment is Interior and Valley Thornveld (Bioclimate 10). The uppermost or western

extremity and the north-eastern corner are in ZwaZulu. These areas are in a moderate to poor state of preservation and signs of erosion can be found anywhere.

The nearly flat lower areas of this catchment are white owned and well suited to pineapple production. Substantial areas of bush and forest have been cleared for this crop and about 4 500 ha are planted here. Just under half of this lower area has sandy soils which are particularly susceptible to wind erosion. The heavier textured soils at higher levels are most resistant to erosion but many drainage ways in bottomlands show signs of active donga erosion.

Ranching, game farming, small areas of sisal, cotton and irrigated cane are some other enterprises in this catchment.

There is a need for improved cultural practices, farm layouts and erosion control in this area.

Hluhluwe

Thirty three per cent of the Hluhluwe catchment is controlled by Natal Parks Board while 60% is KwaZulu. Most of this catchment is in a poor state of preservation with widespread erosion.

Nyalazi

The upper 11% of the Nyalazi catchment is controlled by the Natal Parks Board. Two thirds is KwaZulu and only one quarter is white-owned and mostly under cane and timber. Again, the worst erosion is in KwaZulu although its incidence decreases towards the more humid eastern part of the catchment.

Pongola

Much of the Pongola catchment lies in the Transvaal and Swaziland, and there is no ready access to information on these areas.

In Natal, land use in the upper half of the catchment is, from west to east, sheep farming in the most elevated parts, mixed stock, beef, timber and labour farms. East of Itala Game Reserve beef is the main dryland produce, while cane is grown extensively under irrigation especially at Pongola.

Mfolozi

Just over half of the White Mfolozi is white-owned. Timber near Vryheid, maize and mixed livestock are the main lines

of farming in the upper parts of this tributary, while the middle reaches are almost exclusively devoted to beef.

Only the upper third of the black Mfolozi catchment is white-owned. Timber and some tea is grown at the highest elevations, mixed stock is farmed at middle elevations while beef is the main enterprise at the lowest elevations of white farms.

The lowest quarter of that part which lies below the confluence of the White and Black Mfolozi Rivers and above the permanent swamp of the estuary is the white-owned Mfolozi Flats on which high-yielding cane is grown under irrigation. The only other enterprise is sub-tropical fruit at elevations above the alluvial flats.

CONCLUSION

Some of the most abused land in Natal is in St Lucia's catchment. Relatively small areas are in ideal condition or are managed as the Department of Agriculture & Fisheries would have it. Indeed, included in the main changes in the St. Lucia System effected by man are the diminution of freshwater supply to the Lake through development of agriculture and forestry, and the increased rate of silting in the Mkuze/Mosi swamp and Lake through pressures on the land in the catchment. Alteration of the estuaries of the Lake and Mfolozi River is also important.

It is futile to accuse agriculture, forestry, and mining, or any other activity of responsibility for the jeopardy in which St Lucia has been placed. All have contributed to the problem and all will aggravate it further in the future. The St Lucia system has always been delicately balanced and small changes in one factor can have profound effects on the system as a whole.

There is, however, scope for some optimism. The increasing tempo of development will probably result in improved land management. This, and future dam construction will result in less silt reaching the Lake. The diminution of freshwater inflow is already of such a magnitude that the principle of importing water has been accepted and is being put into effect. The volume of imported water will have to increase as more is withheld in the main catchment, but it would appear that enough is available from neighbouring sources for many years.

It is most necessary to instil appreciation of St Lucia's value to a greater number of people because it is only with public support that St Lucia will be able to sustain its claim for water against competing users.

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