

70248

FOR-DEA 314

X(u1/D)zh

Rec 70248

FOR-DEA no : 314

**To: DEPARTMENT OF WATER AFFAIRS AND
FORESTRY**

Contract : 1991/92

Project no : 900-91570

Project title : Wildlife Society of Southern Africa

Deliverable no : 5

Deliverable title : The swamp forests of lake St Lucia

Contact person : Mr G H von dem Bussche

The Swamp Forests of Lake St. Lucia

N G Wessels

George, South Africa

July, 1991

**DIVISION OF FOREST SCIENCE AND TECHNOLOGY
FORESTEK PUBLICATIONS**

1. Typist please complete a and b:

a. Title of report

The Swamp Forests of Lake St. Lucia

b. Author:

N G Wessels

2. Author please complete a to d:

a. This is a	- Research report	:	(For)
	- Contract report	:	(For-C)
	- Manual	:	(For-M)
	- Internal report	:	(For-I)
	- Article(**)	:	(For-R)	...X...

b. Price of report (if it may be distributed) R.....

c. Number of copies you need

d. Distribution list (names and complete addresses):

.....

.....

.....

3. To be completed by Information Centre

a. Report no. ISBN no.

b. Editing: yes/no

c. Number of copies to be made

4. Author, please check corrections if report has been edited.

5. Copying/printing/binding

Copy
Bind
Staple

6. Copies and master document to library.

(**) Journal to which article will be submitted
African Wildlife

(All liaison with journals for the publication of articles should be undertaken by the author).

DELIVERABLE REPORT

ECOSYSTEMS MANAGEMENT

Contract : Wildlife Society of Southern Africa

Project no : 91570

Project title : Ad Hoc Utilrural Projects

Deliverable no : 5

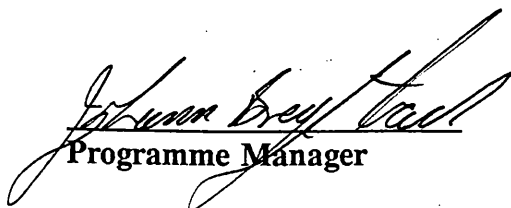
Deliverable title : The Swamp Forests of Lake St. Lucia

Project leader : C J Geldenhuys

Project researcher : N G Wessels

Date : July 1991

Notes : The paper has been submitted to and accepted by the Editor of the African Wildlife magazine


Programme Manager

The Swamp Forests of Lake St. Lucia

N G Wessels

CLASSIFICATION PAGE

TITLE: The Swamp Forests of Lake St. Lucia

AUTHOR: N G Wessels

REPORT NO:
ISBN No:

DATE:

PAGES:

KEYWORDS: Classification, Conservation, St. Lucia, Swamp forests

PROJECT NO: 91570

SPONSOR: Wildlife Society of Southern Africa

COPIES OF THIS REPORT ARE AVAILABLE FROM:

The Information Centre
Division of Forest Science and Technology
CSIR Box 395
Pretoria 0001
South Africa

PRICE:

PUBLISHED BY:

The Division of Forest
Science and Technology
CSIR
P.O. Box 395
Pretoria 0001
South Africa

TEL: (National) (012) 841 2617
(Internat) +27 12 841 2617
Telex: 3-21312 SA
Telefax: (Nat) (012) 841 2689
(Int) +27 12 841 2689

**COPYRIGHT OF THIS REPORT VESTS IN THE CSIR
KOPIEREG VAN HIERDIE VERSLAG BERUS BY DIE WNNR**

The Swamp Forests of Lake St. Lucia

Although swamp forest is the second rarest forest type in South Africa, many of the remaining patches are threatened by agricultural and forestry developments. Swamp forests are of considerable scientific interest as they are uncommon outside the tropical regions. Many of the swamp forest tree species have morphological modifications to cope with the oxygen deficiency of waterlogged soils.

Text by Nigel Wessels

Photos by Coert Geldenhuys and Nigel Wessels

After riverine forest, swamp forest is the second rarest forest type in Natal (and indeed South Africa), having a total area of only 4843 hectares. Swamp forests are of considerable scientific interest as they are rare in extra-tropical regions and are the habitat of a number of unusual birds, fish, frogs and insects. Despite this, in the recent past large areas of swamp forest have been cleared for commercial afforestation, sugar cane-growing and subsistence agriculture.

The largest and least disturbed examples of swamp forest in South Africa, occur in the coastal regions of Maputaland and on the eastern shores of Lake St. Lucia, Zululand. The largest individual swamp forest occurs just west of Cape Vidal (adjacent to the Mfabeni swamp), and covers an area of only 352 ha. Small remnants may still be found along the Natal south coast, the southern limit of distribution being just south of the Msikaba River in the Transkei.

Very little is known about South African swamp forests and most of the available literature is only descriptive in nature. Few studies have concentrated on swamp forests dynamics. It is thought that local swamp forests perform an important sediment filtering role, and that the clearing of swamp forests has contributed greatly to the silting up of estuaries in Zululand and Natal. Studies in American bottomland hardwood forests (similar to South African swamp forests) however, have shown that these forests support a high density and diversity of flora and fauna, protect the

quality of water and habitat in downstream systems, and serve as flood water storage areas. In the United States, the timber crop from bottomland hardwood forests has an estimated annual value of \$3 billion. In Florida, cypress swamps have even been used as tertiary treatment centres for domestic waste waters since 1973, and are 60% more cost effective than conventional physical treatment plants II

My study was undertaken in the swamp forests between Sodwana Bay and the Msunduze river near Lake St. Lucia. There are 3095 ha of swamp forest in this area. I aimed to provide much needed baseline data on the distribution, composition and dynamics of South African swamp forests. The distribution of the swamp forests was mapped and selected forests were classified according to their floristic composition. It is my intention to relate species composition to site factors such as soil and water quality.

The swamp forests of the Lake St. Lucia area occur typically in hypo-saline (fresh water) drainage lines and in the marshy areas around freshwater lakes. They are not to be confused with mangrove swamps, which are associated with salt water. The swamp forests are inundated with slow flowing water after heavy rains. The flood waters drain in a haphazard, braid-like fashion across the swamp forest floodplains. In intervals between flooding, the forest floor is a mosaic of stagnant pools, sluggish streamlets and small islands. Fallen trees, stilt roots, and pneumatophores (pencil-like roots which stick up out of

the ground) enhance sedimentation and create permanent islands even during times of flooding. Stagnant, foul-smelling surface water is present for most of the year.

The appearance of the Lake St. Lucia swamp forests is distinctly tropical. The undergrowth (comprised mainly of ferns) is luxuriant, and epiphytes, orchids and lianes are prominent. Tropical affinities are further indicated by the floristic composition. Many of the tree species belong to the same genera of those species found in the swamp forests of tropical Africa. The following tree species are common: *Voacanga thouarsii* (Wild frangipani), *Ficus trichopoda* (Swamp fig), *Syzygium cordatum* (Umdoni), *Barringtonia racemosa* (Powder-puff), *Phoenix reclinata* (Wild date palm), *Macaranga capensis* (Wild poplar) and *Bridelia micrantha* (Mitzeerie).

Although the swamp forests of the study area show considerable variation in floristic composition, there are numerous species which are widely distributed. The most common tree species is *Voacanga thouarsii* which is abundant in almost all the forests sampled. It flourishes across the entire floodplain, from the dry peripheries to the permanently inundated zones. *Syzygium cordatum* and *Ficus trichopoda* also occur in most of the forests, but are less abundant. *Ficus trichopoda* tends to grow along the main drainage channels, spreading outwards on horizontal branches supported by stilt roots. These stilt roots may eventually develop into

separate trees, and it becomes impossible to identify the parent tree. *Macaranga capensis*, *Rapanea melanophloeos* (Boekenhout or Cape beech) and *Myrica serrata* (Lance-leaf waxberry) are generally peripheral species, but individuals may occur sporadically throughout the floodplain.

The most commonly occurring shrubs are *Psychotria capensis* (Cream psychotria) and *Tarena pavetoides* (Bastard bride's bush). Ferns make an important contribution to the shrub layer throughout the swamp forests. Nine species, including the rare *Psilotum nudum* were identified. *Psilotum nudum* is one of the few living representatives of an earlier type of land flora. The most widespread fern species is the climber *Stenoclaena tenuifolia*, which has the habit of climbing up tree trunks in thick fronds. *Nephrolepis bisserata* is also fairly common, and in some forests forms impenetrable thickets, excluding to a large extent any regeneration of tree species.

Three types of swamp forest were identified in the Lake St. Lucia study area. The first type can be easily recognised in the field; here swamp figs (*Ficus trichopoda*) overshadow all the other species. The best examples of this type occur on the Dukuduku State Forest and within the Mfolozi swamps. A characteristic feature of the second type is the predominance of *Barringtonia racemosa*. An excellent example is the southern end of the Mfabeni swamp forest, on the Eastern Shores State Forest. The third type comprises the largest patches of swamp forest in the study area. These are characterized by large (up to 30 m high), but widely spaced, *Syzygium cordatum* trees. The most distinctive feature of this type of swamp forest however, is the predominance of the ferns *Nephrolepis bisserata* and *Stenoclaena tenuifolia*.

The oxygen deficiency of the waterlogged soils in the swamp forests is harmful to dryland plant species. The niche is however, opened to the typical swamp forest species by adaptive modifications to waterlogging. These can be morphological or metabolic (capacity for anaerobic respiration). The major types of morphological modifications which are evident in the Lake St. Lucia swamp forests are, stilt

roots (*Ficus trichopoda*), pneumatophores (*Voacanga thouarsii*), adventitious roots (*Bridelia micrantha*), and knee roots (*Syzygium cordatum*). Many tree species also have ventilating pores (lenticels) on their trunks and branches. All these features allow internal oxygen transport to satisfy the needs of root respiration. Many of the swamp forest tree species however, do not have any obvious morphological adaptations, and therefore most probably rely on anaerobic respiration.

Although the remaining swamp forests in South Africa are relatively small and isolated, we should view them in the light that they provide a desirable diversity in the landscape, and act as buffers and filters between man's urban and agricultural developments and his most vital natural resource - water. We cannot afford to view small patches of swamp forest as isolated local ecosystems, since all too often, a small patch can be a vital functional part of a larger riverine, estuarine or ground water system. Since so many values have been attributed to American swamp forests, it is most likely that our own forests possess the same potential.

ACKNOWLEDGEMENTS

This study was funded by the Department of Environment Affairs and the Wildlife Society. I wish to thank Rick Van Wyk for his assistance during the field work.

N. Wessels
Forestek: CSIR
Saasveld F.R.C.
Private Bag X6515
6530 George

REFERENCES AND FURTHER READING

- BRUTON, M.N. & COOPER, K.H. 1980. Studies on the Ecology of Maputaland. Rhodes University and the Natal Branch of The Wildlife Society of Southern Africa, Durban.
- COOPER, K.H. 1985. The conservation status of indigenous forests in Transvaal, Natal and O.F.S., South Africa. Wildlife Society of South Africa, Durban.
- GREESON, P.E., CLARK, J.R. & CLARK, J.E. 1978. Wetland functions and values: The state of our understanding. Proceedings of the National Symposium on Wetlands

(Florida). American Water Resources Association, Minneapolis.

HENKEL, J.S., BALLENDEN, S. St.C. & BAYER A.W. 1936. An account of the plant ecology of the Dukuduku forest reserve and adjoining areas of the Zululand coast belt. *Ann. Natal Mus.* 8:95-125.

KRIEL, J.P., ADLER, E., BAYER, A.M., BRYNARD, A.M., DAVIES, D.H., DAY J.H., McKAY, A.D. & STEWART, P.G. 1966. Report on the Commission of Inquiry, into the Alleged Threat to Animal and Plant Life in St. Lucia Lake. 1964-1966. Government Printer, Pretoria.

MALTBY, E. 1986. Waterlogged wealth: Why waste the world's wet places? An Earthscan publication by the International Institute for Environment and Development, London.

CAPTIONS FOR FIGURE, PHOTOGRAPHS AND SLIDES

1. The distribution of swamp forests in the Lake St. Lucia area. (Map)
2. Swamp forests are distinctly tropical in appearance. Dense entanglements of trees, creepers and ferns grow in stagnant surface water. (Slide 1 & 2; Photos 1, 2, 3, 4 & 15).
3. *Barringtonia racemosa* swamp forests, in contrast to the *Ficus trichopoda* forests, have fewer plant species and are more open beneath the canopy. (Slides 3 & 4; Photo 5)
4. Ferns are an important constituent of swamp forests. *Stenoclaena tenuifolia* has the habit of growing up tree stems into the canopy (Slides 5 & 6; Photos 6 & 7). *Nephrolepis bisserata* forms a dense ground cover in some swamp forests and may grow to a height of 3m. (Photos 8 & 12).
5. *Ficus trichopoda* trees spread outwards on horizontal branches supported by stilt roots. These stilts eventually develop into separate trees, and it becomes difficult to identify the parent tree. (Slides 7 & 8; Photos 11)
6. The rare fern *Psilotum nudum* is one of the few living representatives of an earlier type of land flora. (Photo 10)
7. The most common tree in the swamp forests of the Lake St. Lucia area is the Wild frangipani (*Voacanga thouarsii*). (Slide 13 & Photo 9)
8. Pneumatophores, pencil-like roots which protrude out of the water, are morphological adaptations to cope with the oxygen deficiency of the waterlogged soils in swamp forests. The roots seen here belong to *Syzygium cordatum* (red) and *Voacanga thouarsii* (white). (Photos 13 & 14)
9. Seedlings of *Voacanga thouarsii* germinate amongst the aerating roots of the parent tree. (Slide 9)
10. The *Voacanga thouarsii* tree seen growing here in a pool filled with *Nymphaea capensis*, has sent up aerating roots to cope with the anaerobic conditions it is experiencing. (Slide 10)
11. From a horizontal branch of a *Ficus trichopoda* tree, a string of roots are sent down. These roots will develop into a stilt-like structure to support the horizontal branch as it spreads outwards. Stilt roots may eventually develop into separate trees. (Slide 11)
12. These *Barringtonia racemosa* seedlings germinated in a stagnant pool. In the background, flowers of *B. racemosa*, resembling powder-puffs (hence the common name for the species), can be seen floating in the water. (Slide 12)
13. A number of swamp forest tree species have buttress roots to cope with the unstable soils. Here another common swamp forest species *Ficus sur*, is seen fruiting. (Slide 14)
14. Swamp forests are the habitat of a number of unusual species of frogs. (Slides 15 & 16)

