



Nylsvley – A South African savanna ecosystem project: objectives, organization and research programme

A report of the Committee for Terrestrial Biology
National Programme for Environmental Sciences

SOUTH AFRICAN NATIONAL SCIENTIFIC PROGRAMMES REPORT NO

27

MARCH 1978

(ii)

Issued by
Cooperative Scientific Programmes
Council for Scientific and Industrial Research
P O Box 395
PRETORIA 0001
from whom copies of reports in this series are available on request.

*Printed in 1978 in the Republic of South Africa
by the Graphic Arts Division of the CSIR*

ISBN 0 7988 1311 3

Compiler's address -

B J Huntley
Cooperative Scientific Programmes
CSIR
P O Box 395
PRETORIA 0001

PREFACE

The Savanna Ecosystem Project of the National Programme for Environmental Sciences is one of several national scientific programmes administered by the CSIR. The National Programme is a cooperative undertaking of scientists and scientific institutions in South Africa concerned with research related to environmental problems. It includes research designed to meet local needs as well as projects being undertaken in South Africa as contributions to the international programme of SCOPE (Scientific Committee on Problems of the Environment), the body set up in 1970 by ICSU (International Council of Scientific Unions) to act as a focus of non-governmental international scientific effort in the environmental field.

The Savanna Ecosystem Project being carried out at Nylsvley is a joint undertaking of more than fifty scientists from the Department of Agricultural Technical Services, the Transvaal Provincial Administration, the CSIR, the Transvaal Museum, and seven universities. As far as possible, participating laboratories finance their own research within the project. The shared facilities at the Study Area and the research of participating universities and museums are financed from a central fund administered by the National Committee for Environmental Sciences and contributed largely by the Department of Planning and the Environment.

The research programme of the Savanna Ecosystem Project has been divided into three phases - Phase I (mid 1974 to mid 1976) - a pilot study of the Nylsvley Study Area, in particular the description and quantification of structural features of the ecosystem, Phase II (mid 1976-1979) - studies in the key components and processes including the development of mathematical models, and Phase III (1979-1984) - extension to other sites and the study of management strategies for the optimal utilization of *Burkea* savanna ecosystems.

The first description of the project compiled by R G Noble, S M Hirst and B H Walker was published in 1975 (Anon 1975). Knowledge gained during the first phase of the project has made necessary the revision and more detailed description of the objectives, organization and current research programme. The present compilation is based on the original description but substantial changes have been introduced following a series of interdisciplinary workshops in which all researchers and several advisers participated. It is anticipated that a further edition of the project description will be needed at the initiation of Phase III activities.

ABSTRACT

A description of the objectives, organization and research programme of the Savanna Ecosystem Project being undertaken at Nylsvley in the northern Transvaal is presented. The project is a cooperative multi-disciplinary study of the structure and function of a savanna ecosystem being undertaken by researchers from seven universities and several government institutes. The programme commenced with a pilot study of the main research area (Phase I, 1974-1976) and current activities focus on the investigation of key components and processes (Phase II, 1976-1979). The final phase (Phase III, 1979-1984) will concentrate on validation studies and the development of land-use strategies.

SAMEVATTING

'n Beskrywing van die doelstellings, organisasie en navorsingsprogram van die Savanne-ekosisteesprojek te Nylsvley in die noordelike Transvaal word voorgelê. Die projek is 'n koöperatiewe multi-dissiplinêre studie van die struktuur en funksionering van 'n savanne-ekosistees wat onderneem word deur navorsers van sewe universiteite en etlike regeringsinstansies. Die program is met 'n loodsstudie van die navorsingsgebied geïnisieer (Fase I, 1974-1976) en huidige aktiwiteite fokus op ondersoeke van sleutelkomponente en -prosesse (Fase II, 1976-1979). Die finale fase (Fase III, 1979-1984) sal gemoeid wees met validasiestudies en die ontwikkeling van landpraktyke.

TABLE OF CONTENTS	Page
Preface	(iii)
Abstract	(iv)
Samevatting	(iv)
INTRODUCTION	1
OBJECTIVES AND PHASES OF THE STUDY	2
THE STUDY AREA	3
PHASE I : PILOT STUDY OF THE NYLSVLEY STUDY AREA	4
Aims	4
Abiotic component	4
Primary producer component	5
Consumer component	5
Decomposer and reducer component	6
Mineral cycling component	7
Modelling and data processing component	7
PHASE II : STUDIES OF KEY COMPONENTS AND PROCESSES	9
Aims	9
Theme I : Pattern and dynamics of the <i>Burkea/Acacia</i> savanna mosaic	9
Theme II : Climatic characteristics of the <i>Burkea</i> savanna	11
Theme III : Water relations within <i>Burkea</i> savanna	13
Theme IV : Factors influencing primary production in <i>Burkea</i> savanna	14
Theme V : The fate of photosynthate in <i>Burkea</i> savanna	16
Theme VI : Factors affecting faunal dynamics and secondary production	17
Theme VII : Influence of consumers on primary production	18
Theme VIII : Decomposition and reduction processes in <i>Burkea</i> savanna	20
Theme IX : The role of nutrients as limiting factors in <i>Burkea</i> savanna	21

Theme X : The ecological effects of fire in <i>Burkea</i> savanna	22
Theme XI : The influence of various management practices on the ecology of <i>Burkea</i> savanna	23
PHASE III : VALIDATION STUDIES AND THE DEVELOPMENT OF MANAGEMENT STRATEGIES FOR <i>BURKEA</i> SAVANNA	25
PROJECT ADMINISTRATION	26
REFERENCES	28
TITLES IN THIS SERIES	36

INTRODUCTION

The Savanna Ecosystem Project being undertaken at Nylsvley in the northern Transvaal is an attempt to improve our ability to predict events within southern African savannas, in particular to predict the consequences of management practices. The importance of such an understanding of ecosystem function may be gauged by the fact that 73% of Africa south of the equator comprises savanna in its various forms.

The concept of savanna followed here is that of a wooded grassland, an ecosystem in which two structural components - herbaceous and arborescent - often behave as two communities competing one with the other for available resources. The balance between these two strata, in terms of density, height and cover is increasingly tenuous as one moves from moist to arid environments. It is the sensitivity of this equilibrium to various natural and man-made stresses that accounts for the rapidity of change witnessed in many African savannas, in particular as a consequence of their exploitation by man over the last hundred years.

Research into environmental problems within savanna ecosystems has, in the past, focussed mainly on finding immediate solutions to aspects of imbalanced structural relationships such as thicket formation or desert spread. Such studies have had as their practical objective increased yields of either cattle or indigenous ungulate populations. There has been no integrated attempt to understand how the ecosystem operates as a whole. The Nylsvley project has been developed to meet the need for a fundamental examination of the whole ecosystem, to determine its structure, the major energy pathways and the key components and processes which regulate its dynamics.

African savannas fall within two major groups - the moist to mesic broad-leaf tall tree savannas and woodlands of the central and southern African plateaux and the mesic to arid, mainly microphyllous short tree savannas and shrub savannas of the coastal lowlands and major river valleys. These two savanna biomes may be characterized on a basis of floristic, physiognomic, climo-edaphic and faunistic criteria and in central Africa at least, are readily distinguishable. In South Africa, ecosystems representative of the two biomes form a mosaic pattern, often becoming so interwoven that their true affinities escape detection. The Nylsvley project is being undertaken in an area in which topographic and pedological conditions support such a mosaic - with broadleaf savanna woodland, dominated by *Burkea africana* and *Eragrostis pallens*, interspersed with patches of microphyllous *Acacia* spp short tree savanna.

The Nylsvley project differs from most past and present governmental research in the Republic in its fundamental nature. It differs from many ecosystem projects elsewhere in its emphasis on a small number of components and processes selected first for their apparent importance in controlling the system's dynamics and second because they can be manipulated in management programmes. It is aimed more at gaining new insights into these components and processes than at producing broadly applicable models of energy flow. It is not directly aimed at proving any one management practice superior to any other, or for example at proving whether cattle or game ranching is the better system of land-use. Rather, the project will aim at identifying and quantifying the determinants of savanna function, the factors which control primary production, influence secondary production, determine rates of nutrient transfer, etc, and how these processes might be manipulated to attain selected land-use objectives.

OBJECTIVES AND PHASES OF THE STUDY

The objectives of the Savanna Ecosystem Project were outlined in the first description of the project (Anon 1975). As the project has advanced, the need for a re-definition of the central objective in terms of both academic and pragmatic needs has become apparent, this now being spelt out as -

"To develop the understanding necessary to predict changes in the ecosystem's stability induced by various natural and man-made stresses".

This principal objective would be attained through :

- Studies of the structure and dynamics of the ecosystem as a whole.
- The identification of key components and processes which govern the structure and dynamics of the ecosystem.
- Research in detail into the more important of these key components and processes, with a view to understanding the controlling and limiting factors.
- Research into the effects of human use and manipulation of the ecosystem through fire, grazing and so forth, and to extend this research to experimental and observational studies in areas other than the main study site.

The project would also provide an educational facility for training scientists in interdisciplinary research (since such a combined team approach is the only way in which problems of this magnitude can be solved) and for teaching students, at all levels, the principles and methods of ecosystem ecology.

From its initiation, the study was divided into three phases, viz -

Phase I (mid-1974 to mid-1976) - a pilot study of the Nylsvley Study Area,

Phase II (1976 to 1979) - studies of key components and processes, and

Phase III (1979 to 1984) - extension to other sites and the impact of range management practices.

Experience has shown that the overall programme cannot be divided into three mutually exclusive phases - a large degree of overlap is apparent but for many reasons the concept of three phases is useful and will be retained.

Phase I studies continued into and were completed during 1977. A general synthesis of Phase I findings may be found in Huntley and Morris (1978).

Phase II commenced in 1976 and the consolidated research programme for this phase forms the major part of the present document.

Phase III activities will be initiated during 1978 with a survey of current and potential land use practices in *Burkea* savanna and the identification of sites for validation studies.

THE STUDY AREA

Phases I and II of the Savanna Ecosystem Project are being undertaken on a portion of the Nylsvley Provincial Nature Reserve in the northern Transvaal (latitude 24°29' S, longitude 28°42' E). Phase III validation studies and certain management experiments will be conducted in various representative savannas elsewhere in the northern and eastern Transvaal.

The Study Area lies in Mixed Bushveld (Acocks 1953, Veld Type 18) occupying sandy soils and lithosols derived from sandstones, conglomerates and grits of the Waterberg system. The major portion of the 745 ha Study Area lies on a plateau at 1 100 m asl, sloping north-westwards to approximately 1 080 m on the Nyl River floodplain.

The climate is typical of most areas occupied by savanna in the Republic, with a hot, wet season lasting from November through March, during which period 79% of the mean annual precipitation of 630 mm is received. From late April to the end of August the climate is cool and dry, while September and October are generally hot and dry.

The vegetation of the Study Area comprises a mosaic of deciduous wooded-grassland communities. *Burkea africana*/*Eragrostis pallens* tree savanna dominates the sandy latosols, with patches of *Acacia* spp/*Eragrostis lehmanniana* short tree savanna on latosols previously occupied by native villages. *Diplorhynchus condylocarpon*/*Barleria bremekampii* short tree savanna dominates the lithosols of Maroelakop, a sandstone outcrop which occupies 17% of the Study Area.

The woody component of the *Burkea* savanna is characterized by a high degree of aggregation, fairly open patches of grassland with occasional shrubs interspersed between clumps of trees. Open patches are dominated by the grasses *Eragrostis pallens* and *Digitaria eriantha*, with scattered shrubs of *Ochna pulchra* and *Grewia flavescens* up to 2 m, while the clumps of trees of up to 12 m height comprise *Burkea africana*, *Terminalia sericea*, *Ochna pulchra*, *Combretum molle* and *Combretum zeyheri*. The grass *Panicum maximum* dominates the shaded areas of the bush clumps. Canopy cover of the woody component averages 27,5% with the herbaceous canopy cover ranging from 30 to 50% and basal cover of grasses averaging 5,9%.

The animal communities of the Study Area include 46 species of mammals of which impala *Aepyceros melampus* and kudu *Tragelaphus strepsiceros* are the most important indigenous ungulates. Some 152 bird species, 11 amphibia, 48 reptile and over 1 250 insect species have thus far been identified in the Study Area.

During the 50 years prior to the initiation of the project, the area had been managed as a cattle ranch, up to 300 head of cattle being grazed in the Study Area for the 4 months January through April. The abundance of *Dichapetalum cymosum*, a poisonous woody geophyte, made longer grazing periods impractical. In order to maintain the existing management policy through Phase I of the project, cattle were introduced into the Study Area from January through April in 1975, 1976 and 1977.

PHASE I : PILOT STUDY OF THE NYLSVLEY STUDY AREA

AIMS

The aims of Phase I of the research programme were outlined in the original project description (Anon 1975) as :

- To survey and map the soils and vegetation of the Nature Reserve and describe its abiotic features and biotic components.
- To undertake a structural analysis of the vegetation of the Study Area, plan the study site and install its weather recording and other facilities.
- To identify major components and pathways within the ecosystem.
- To determine standing crops of the components and their fluxes over a full year.
- To develop crude mathematical simulation models of the ecosystem based on the information gained above and from the literature.
- To identify components and processes in the ecosystem relative to the defined objectives, which have to be investigated further during Phase II.

The pilot study was concluded during 1977 and a summary of its more important findings is provided in Hirst (1975), Huntley (1977) and Huntley and Morris (1978). Phase I extended a year longer than originally planned, but in view of delays caused by logistic problems and the fact that many Phase II activities were initiated in advance of the programme, progress to date has been most encouraging. The activities of the pilot study were organized into six component groups and individual projects undertaken within each group are listed below. Full descriptions of each project are available from the Coordinator on request.

ABIOTIC COMPONENT

1. Soils of the Nylsvley Nature Reserve. Professor H J vM Harmse (Department of Soil Science, Potchefstroom University for CHE), 1974. (Completed : see Harmse 1975, 1977).
2. A pilot project for the study of the role of water in the ecosystem. Professor J J P van Wyk (Department of Botany, Potchefstroom University for CHE), 1975. (Terminated : see Van Wyk 1975b).
3. An analysis and summary of the climate of Nylsvley. Professor J M de Jager (Department of Agrometeorology, University of the Orange Free State), 1975-1984. (Ongoing : see De Jager 1976, 1977).

PRIMARY PRODUCER COMPONENT

4. A phytosociological classification of the Nylsvley Nature Reserve. Mr B J Coetzee, Mr F van der Meulen, Miss S Zwanziger, Mr P Gonsalves and Dr P J Weisser (Botanical Research Institute, Department of Agricultural Technical Services), 1974. (Completed : see Coetzee *et al* 1976, 1977).
5. Quantitative ecological surveys of the woody vegetation of the Nylsvley Study Area. Dr R A Lubke (Department of Botany, Rhodes University), 1974-1977. (Completed : see Lubke 1976, 1977 and Lubke, Clinning and Smith 1975, 1976).
6. Quantitative ecological surveys of the grasses and forbs of the Nylsvley Study Area. Dr G K Theron (Department of Botany, University of Pretoria), 1974-1977. (Completed : see Van Rooyen and Theron 1975, 1977).
7. Seed production studies of the more common species in the Nylsvley Study Area. Dr H J T Venter (Department of Botany, University of the Orange Free State), 1975-1976. (Terminated : see Venter 1976).
8. Change in above-ground standing crop of the grass layer in *Eragrostis pallens* - *Burkea* savanna in protected plots in the Nylsvley Study Area. Professor J O Grunow (Department of Plant Production, University of Pretoria), 1974-1975. (Completed : see Grunow 1975).
9. Determination of above-ground standing crop and litter mass, productivity and losses, in the grass layer of *Eragrostis pallens* - *Burkea* tree savanna under grazing conditions. Professor J O Grunow (Department of Plant Production, University of Pretoria), 1975-1977. (Completed : see Grunow 1976, 1977).
10. Determination of biomass relations in dominant tree and shrub species of *Burkea* savanna. Dr M C Rutherford (Botanical Research Institute, Department of Agricultural Technical Services), 1974-1977. (Ongoing : see Rutherford 1975, 1977, Rutherford and Carr 1976).
11. A study of underground biomass and dynamics of the *Burkea* savanna. Professor J J P van Wyk (Department of Botany, Potchefstroom University for CHE), 1974-1980. (Ongoing : see Van Wyk 1975a, 1976, 1977).

CONSUMER COMPONENT

12. Survey of the vertebrate fauna of Nylsvley with special reference to the Study Area. Mr N H G Jacobsen (Transvaal Provincial Administration), 1974-1977. (Completed : see Jacobsen 1977b).
13. Population dynamics, feeding and energy turnover of small mammals at Nylsvley. Dr J A J Nel (Mammal Research Institute, University of Pretoria), 1975-1976. (Completed : see Bragg 1975, Temby 1976, 1977).
14. A study of the bird population at Nylsvley. Mr W R Tarboton (Transvaal Provincial Administration), 1974-1976. (Completed : see Tarboton 1975, 1976, 1977).

15. A study of the reptile and amphibian populations of the Nylsvley Study Area. Mr N H G Jacobsen (Transvaal Provincial Administration), 1975-1978. (Ongoing : see Jacobsen 1975a, 1975b, 1977a).
16. Grazing behaviour, food intake and growth of Afrikaner steers on *Burkea africana* savanna. Professor J D Skinner (Mammal Research Institute, University of Pretoria), 1975-1978. (Ongoing : see Carr 1975, 1976, Zimmerman 1976, 1977).
17. Population dynamics, movements and feeding ecology of impala *Aepyceros melampus* in the Study Area. Professor J D Skinner (Mammal Research Institute, University of Pretoria), 1975-1978. (Ongoing : see Carr 1976, Kingston 1976, Monro 1976, 1977).
18. Biology and ecological energetics of the Lepidoptera larvae associated with woody vegetation in a savanna ecosystem. Dr E Holm (Department of Entomology, University of Pretoria), 1975-1976. (Completed : see Scholtz 1976a, 1976b).
19. Ecology of dominant leaf and seed-eating insects on woody vegetation, excluding Lepidoptera. Professor H E Paterson (Department of Zoology, University of the Witwatersrand), 1976-1978. (Completed : see Levey 1976, 1977a, 1977b).
20. The role of herbivorous insects in the grass stratum of *Acacia* and *Burkea* savannas. Professor H E Paterson (Department of Zoology, University of the Witwatersrand), 1976-1978. (Ongoing : see Gandar 1976, 1977).
21. The effect of nematode infestation on cattle productivity. Dr I G Horak (Department of Parasitology, University of Pretoria), 1976-1977. (Completed : see Horak 1975, 1976b, 1977a).
22. The seasonal incidence of parasitic infestations of impala and cattle at Nylsvley. Dr I G Horak (Department of Parasitology, University of Pretoria), 1975-1976. (Completed : see Horak 1975, 1976a, 1976b, 1977a, 1977b, 1977c, Horak, Londt and Stewart 1976, Londt, Horak and De Villiers 1977).
23. Pilot study on the ecological role of the rhizophagous mesofauna in the Nylsvley savanna ecosystem. Dr E Holm (Department of Entomology, University of Pretoria), 1977. (Terminated : see Holm and Mostert 1977).
24. Role of predacious arthropods in the tree foliage stratum - pilot study. Dr E Holm (Department of Entomology, University of Pretoria), 1977. (Terminated : see Holm and Ferreira 1977).
25. Quantitative ecology of social Hymenoptera. Dr E Holm (Department of Entomology, University of Pretoria), 1975-1977. (Completed : see Holm 1975, Holm and Kirsten 1977, Kirsten 1976).

DECOMPOSER AND REDUCER COMPONENT

26. Population dynamics of and dung removal by Coleoptera in the Nylsvley area. Dr S Endrödy-Younga (Transvaal Museum), 1975-1977. (Completed : see Endrödy-Younga 1975, 1976a, 1977).

27. Population dynamics and biomass of litter-feeding arthropods. Dr S Endrödy-Younga (Transvaal Museum), 1975-1976. (Completed : see Endrödy-Younga 1975, 1976b, 1977).
28. Decomposition of litter. Professor P L Steyn (Department of Microbiology and Plant Pathology, University of Pretoria), 1975-1977. (Completed : see Steyn and Bezuidenhout 1976, 1977a, 1977b).
29. Dynamics of soil Acari, Oligochaeta and Collembola in the Nylsvley Study Area. Dr G C Loots (Department of Zoology, Potchefstroom University for CHE) and Dr J F Prinsloo (Department of Zoology, University of Fort Hare), 1975-1976. (Completed : see Loots 1975, Loots and Theron 1976a, 1976b, 1976c, Prinsloo 1975).
30. Seasonal and spatial variation in the kind and rate of litter input from trees and shrubs in *Burkea* and *Acacia* savannas. Mr B J Huntley (CSIR), 1976-1978. (Ongoing).
31. The role of wood-boring Coleoptera as reducing agents in *Burkea* savanna. Dr E Holm (Department of Entomology, University of Pretoria), 1976-1978. (Ongoing : see Hasenjager 1976, Holm and Hasenjager 1977).
32. The ecological role of termites in *Acacia* and *Burkea* savannas. Professor H E Paterson (Department of Zoology, University of the Witwatersrand), 1976-1978. (Ongoing : see Ferrar P 1977).

MINERAL CYCLING COMPONENT

33. Uptake and global rates of biological nitrogen fixation and denitrification in the Nylsvley Study Area. Professor N Grobbelaar (Department of Botany, University of Pretoria), 1975-1976. (Completed : see Grobbelaar 1975a, Grobbelaar and Rösch 1976a).
34. Nitrogen content of plant material and soil samples from Nylsvley. Professor P L Steyn (Department of Microbiology and Plant Pathology, University of Pretoria), 1974-1975. (Terminated : see Steyn 1975).
35. Development of a nitrogen budget for the *Burkea* savanna. Dr G C Bate (Department of Botany and Microbiology, University of the Witwatersrand), 1977-1979. (Ongoing).
36. The role of mineral nutrients as controlling factors in the structure and productivity of *Burkea* savanna. Professor B H Walker (Department of Botany and Microbiology, University of the Witwatersrand), 1977-1979. (Ongoing : see Walker and Horne 1977).

MODELLING AND DATA PROCESSING COMPONENT

37. Sensitivity analysis of a simple linear model of a savanna ecosystem at Nylsvley. Professor A M Starfield (Department of Applied Mathematics, University of the Witwatersrand), 1975. (Completed : see Getz and Starfield 1975).

38. Modelling within the Savanna Ecosystem Project. Professor A M Starfield (Department of Applied Mathematics, University of the Witwatersrand), 1975-1977. (Ongoing : see Furniss 1976, 1977, Furniss and Starfield 1977, Starfield and Furniss 1975, 1976).
39. Data handling for the Savanna Ecosystem Project. Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services), 1975-1984. (Ongoing : see Morris 1976, 1977).

PHASE II : STUDIES OF KEY COMPONENTS AND PROCESSES

AIMS

- To undertake a selected number of studies of components and processes within the Nylsvley Study Area, identified during Phase I to contribute to the long-term objectives of the ecosystem project.
- To develop mathematical models to simulate the dynamics of structure and function within the ecosystem and to reflect advances in understanding achieved during Phase II.
- To design validation experiments to be carried out during Phase III, so that the models developed during Phase II can be tested at other comparable sites elsewhere.
- To design experiments to be carried out during Phase III, in which the effects on the ecosystem of such management factors as fire, different grazing strategies and fertilizer application can be investigated.

These aims were formulated in the initial planning of the project (Anon 1975) and will be pursued during the current programme. While the structuring of research within various component groups was useful during Phase I, the need for an integrated, multi-disciplinary approach has become essential in the study of ecosystem processes. Phase II activities will therefore centre on a series of themes, the understanding of which is considered essential to the achievement of overall project objectives and the fulfilment of Phase II aims.

The themes and related key questions were identified during a series of review workshops held during 1977. It is to be expected that the range of questions to which answers are required will be refined as the project progresses.

The interpretation of the various process studies and their integration towards a holistic description of the ecosystem will most effectively be achieved through the development and validation of predictive simulation models. Model building will therefore receive special attention during Phase II, with the various research groups working in close association with the modelling team.

THEME I : PATTERN AND DYNAMICS OF THE BURKEA/ACACIA SAVANNA MOSAIC

Rationale

The savanna within the Study Area at Nylsvley comprises three main components : *Burkea africana* savanna on nutrient-poor sands, *Acacia* spp savanna on sites with nutrient enriched sands, probably due to occupation by pastoralists until approximately 50 years ago, and *Diplorhynchus condylocarpon* savanna on the shallow lithosols of a sandstone hill. The productivity and utilization by consumers of these three components varies considerably. An understanding of the ecology of the Study Area requires investigation of the nature, cause and dynamics of the mosaic pattern of the two major sand-substrate communities.

Key questions for research

1. What is the nature of this mosaic?
 - What is the structure and scale of pattern between and within the *Burkea/Acacia* mosaic?
 - How general is this pattern over the whole area?
 - Is the distribution of animal species within the Study Area related to the vegetation mosaic? Do distinctive *Acacia* savanna and/or *Burkea* savanna faunas exist?
2. What factors account for this pattern?
 - What is the land-use history of the *Acacia* savanna sites? What is their age?
 - What is the nature and origin of differences in soil chemistry and structure between *Acacia* and *Burkea* savannas?
 - Do autecological factors such as seed dispersal, nutrient and moisture requirements, root distribution, etc account for the observed pattern?
3. What structural changes are taking place within and between the *Burkea/Acacia* mosaic?
 - Are the *Acacia* patches increasing, decreasing or remaining constant in size?
 - If changes are occurring, what are the causal factors involved?
 - Are such changes occurring only on the margins of the *Acacia* patches or are they occurring throughout the patches?
 - These same questions apply to the *Burkea* patches, and to changes in the transition zone between *Acacia* and *Burkea* communities.
 - What is the nature and degree of change in the *Burkea* savanna (long term)?
 - What is the change in the ratio of trees : shrubs : grass? Is there a change in the percentage covered by woody vegetation?
 - Are changes occurring in the species composition of the herbaceous layer and, if so, do they represent seasonal fluctuations or a successional trend?

Past research reports relating to this theme

Carr (1975, 1976), Coetzee *et al* (1976, 1977), Ferrar P (1977), Gandar (1976, 1977), Grunow (1975, 1976, 1977), Harmse (1975), Holm, Kirsten and Scholtz (1976), Holm (1976), Jacobsen (1975a, 1975b, 1977b), Levey (1977a, 1977b), Lubke (1976, 1977), Lubke, Clinning and Smith (1975, 1976), Rutherford (1975, 1976, 1977), Tarboton (1977), Temby (1977), Van Rooyen and Theron (1975, 1977), Venter (1976), Zimmerman (1977).

New projects

1. Analysis of species association within the *Burkea* savanna permanent belt transects. Dr G K Theron (Department of Botany, University of Pretoria), 1977-1978.
2. A study of the distribution and change in status of the *Acacia/Burkea* mosaic on Nylsvley and the adjacent areas by means of aerial photographic analyses. Professor B H Walker (Department of Botany and Microbiology, University of the Witwatersrand), 1978.
3. An analysis of changes in the ratio of trees : shrubs : open patches within *Burkea* savanna by means of aerial photographic analyses. Professor B H Walker (Department of Botany and Microbiology, University of the Witwatersrand), 1978.

Future projects

4. Interpretation of causal factors accounting for the existence of closed and open patches within the *Burkea* savanna. (Synthesis of available information by the Planning Panel), 1978.
5. Analysis and interpretation of the age and population structure of dominant trees in the *Acacia/Burkea* patches and interfaces. (No project leader as yet).
6. Autecological studies in selected species of trees, shrubs and grasses of *Acacia* and *Burkea* savannas, in particular in terms of factors influencing their distribution and productivity. (No project leader as yet).
7. Determination of the productivity and available biomass of the herbaceous component of the *Acacia* savanna. (No project leader as yet).

Related projects

Numbers 12, 13, 24, 25, 27-33, 42, 43, 49, 52 and 53.

THEME II : CLIMATIC CHARACTERISTICS OF THE BURKEA SAVANNA

Rationale

Measurements of the environmental driving forces, including incoming solar radiation, net radiation, air and soil temperatures, rainfall and evaporation provide basic information essential to the characterization of the site in terms of its macro- and mesoclimate. The understanding of functional processes requires more specific information on the nature of particular microclimates within the ecosystem.

Key questions for research

1. Major macroclimatic features.

- What are the most important driving force variables influencing the ecosystem?
- Are soil parameters or meteorological parameters the most effective ecological determinants?
- How do the driving forces control the performance of the savanna?
- What are the magnitudes of the daily and hourly values of the driving forces acting upon the savanna and what are their seasonal patterns?

2. Seasonal phenomena.

- What is the magnitude of inter- and intra-seasonal variation in productivity and phenology and their relationships with climatic and other variables?

3. Microclimatic environments.

- What microclimatic variables are of importance to the functioning of *Burkea* savanna?
- What are the microclimatic characteristics of the upper soil and litter layers, the grass, shrub and the tree strata and the internal tussock and canopy environments?
- Can microclimatic conditions be predicted from a model which uses macroclimatic measurements as input variables?

Past research reports relating to this theme

De Jager (1975, 1976, 1977), De Villiers (1977), Van Rooyen (1977).

Ongoing project

8. An analysis and summary of the climate of Nylsvley. Professor J M de Jager (Department of Agrometeorology, University of the Orange Free State), 1974-1984.

New project

9. Development of models relating microclimatic variables to the macroclimatic in *Burkea* savanna. Professor J M de Jager and Mr T D Harrison (Department of Agrometeorology, University of the Orange Free State), Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand) and Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services), 1977-1979.

Future projects

10. Phenological studies in selected tree, shrub and grass species. (No project leader as yet).
11. Temporal and spatial rainfall distribution patterns in *Burkea* savanna. (No project leader as yet).

Related projects

Numbers 12-15, 17-21, 27-30 and 46.

THEME III : WATER RELATIONS WITHIN BURKEA SAVANNA

Rationale

Water availability is believed to be the major determinant of the structure and efficiency of *Burkea* savanna at Nylsvley and detailed information on water cycling through the ecosystem as a whole and on the water relations of individual species is a high priority.

Key questions for research

1. What is the net input of moisture to the savanna? How is precipitation redistributed by the vegetation and within the soil?
2. How efficient is the primary producer component of the *Burkea* savanna in relation to water use? What is the difference in efficiency of water use between the most important species of the *Burkea* savanna?
3. What is the amount of water used by different species per gram of carbon dioxide fixed and per gram dry mass, in relation to photosynthetically active radiation; leaf and soil water potential; leaf, stem, root, air and soil temperatures; relative humidity; CO₂ concentration; and leaf age and position?
4. How do the anatomical, morphological and phenological differences between species influence water use efficiency?
5. What role does dew and/or plant guttation play in plant water use?

Past research reports relating to this theme

De Jager (1975, 1976, 1977), De Villiers (1977), Van Wyk (1975b), Van Rooyen (1977), Ferrar P J (1977).

Ongoing projects

12. Surface and sub-surface hydrology of *Burkea* savanna. Dr D J van Rooyen (Department of Soil Science, University of the Orange Free State), 1977-1980.

13. Determination of net precipitation and the quantification of parameters of interception loss and rainfall redistribution in *Burkea* savanna. Dr G du T de Villiers (Department of Geography, University of Durban-Westville), 1977-1978.
14. Development of models of the water cycle in *Burkea* savanna. Dr P'R Furniss (Department of Applied Mathematics, University of the Witwatersrand), Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services) and Dr D J van Rooyen (Department of Soil Science, University of the Orange Free State), 1977-1978. Incorporates projects 8, 11-13, 15 and 19.

New project

15. The measurement of transpiration rates in relation to carbon dioxide uptake for the major species in *Burkea* savanna under different environmental conditions. Dr G C Bate (Department of Botany and Microbiology, University of the Witwatersrand), 1978-1980.

Related projects

Numbers 4, 6, 8-11, 14, 16-21 and 46.

THEME IV : FACTORS INFLUENCING PRIMARY PRODUCTION IN BURKEA SAVANNA

Rationale

The need for the accurate determination of net primary production has been questioned and its relevance to the overall project objectives is doubted. A more meaningful approach to understanding the functioning of the *Burkea* savanna might be obtained through establishing the main determinants of photosynthesis, respiration and biomass accumulation rates. Themes II, III, VII, IX and X relate directly or indirectly to the central question of this theme. They are listed separately in order to emphasise their particular fields of investigation, but could equally well have been included within the present theme.

Key questions for research

1. What are the key factors influencing the rate of primary production in *Burkea* savanna?
2. What is the carbon dioxide and water vapour exchange rate in the dark and light under varying conditions of photosynthetic active radiation (PAR); leaf water potential and soil water potential; leaf, stem and root temperatures; vapour pressure; carbon dioxide concentration; nutrient supply - particularly with respect to its influence on the salt respiration component of root respiration; and leaf age and leaf position?
3. What are the direct and indirect influences of consumers on primary production?

Past research reports relating to this theme

Ferrar P J (1977), Grunow (1975, 1976, 1977), Gandar (1976, 1977), Holm, Kirsten and Scholtz (1976), Holm and Mostert (1977), Rutherford (1975, 1976, 1977), Scholtz (1976a, 1976b), Tew (1976), Tew and Cresswell (1975, 1976).

Ongoing projects

16. A comparative study of the effect of environmental variation on the rate of photosynthesis and above-ground respiration of the vegetation at Nylsvley. Professor C F Cresswell and Mrs P J Ferrar (Department of Botany and Microbiology, University of the Witwatersrand), 1975-1979.
17. Determination of seasonal biomass change in trees and shrubs of *Burkea* savanna. Dr M C Rutherford (Botanical Research Institute, Department of Agricultural Technical Services), 1975-1979.
18. Development of a model of factors influencing plant growth in *Burkea* savanna. Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand), Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services) and Mrs P J Ferrar (Department of Botany and Microbiology, University of the Witwatersrand), 1977-1979. Incorporates projects 8, 10, 12, 13, 16, 19, 23-25, 36-41 and 49.

New projects

19. Effects of major driving force variables on the biomass accumulation rates of selected grasses under simulated grazing. Professor J O Grunow (Department of Plant Production, University of Pretoria), 1978-1979.
20. Development of a model of factors controlling photosynthesis in *Burkea* savanna. Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand) and Mrs P J Ferrar, Department of Botany and Microbiology, University of the Witwatersrand), 1978-1979. Incorporates projects 8, 12, 15 and 16.
21. Development of a model relating biomass accumulation rate under simulated grazing to macroclimatic variables. Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand), Professor J O Grunow (Department of Plant Production, University of Pretoria) and Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services), 1978-1979. Incorporates projects 8 12, 13 and 19.

Related projects

Numbers 8, 11-13, 15, 31-33, 36-41, 48, 49 and 52.

THEME V : THE FATE OF PHOTOSYNTHATE IN BURKEA SAVANNA

Rationale

Although the determination of net primary production is considered of lesser importance than the study of factors influencing photosynthesis, knowledge on the ways in which photosynthate passes from the primary producer to other components in the ecosystem is necessary for the development of management strategies.

Key questions for research

1. What proportion of photosynthate is translocated, and to what organs?
2. How much photosynthate is lost to leaching and exudation?
3. How much photosynthate is lost to standing dead and to litter, in what form and when?
4. How much photosynthate is lost to consumers, from which organs and when?

Past research reports relating to this theme

Bragg (1975), Carr (1975, 1976), Gandar (1976, 1977), Grunow (1975, 1976, 1977), Holm, Kirsten and Scholtz (1976), Holm and Mostert (1977), Jacobsen (1975a, 1975b, 1977b), Levey (1976, 1977a, 1977b), Monro (1976, 1977), Rutherford (1975, 1976, 1977), Scholtz (1976a, 1976b), Temby (1976, 1977), Tew, Cresswell, Ambler and Baldwin (1976), Van Wyk (1975a, 1976, 1977), Zimmerman (1976, 1977).

Terminated project

22. A study of the translocation and distribution of the photosynthetic products with respect to leaf age and time of season of the dominant grasses at Nylsvley. Professor C F Cresswell (Department of Botany and Microbiology, University of the Witwatersrand), 1975-1976.

Ongoing projects

23. Determination of biomass relations in dominant trees and shrub species of *Burkea* savanna. Dr M C Rutherford (Botanical Research Institute, Department of Agricultural Technical Services), 1975-1980.
24. A study of underground biomass and dynamics in *Burkea* savanna. Professor J J P van Wyk (Department of Botany, Potchefstroom University for CHE), 1975-1979.

Future project

25. Redistribution of photosynthetic products in selected species of trees and grasses in *Burkea* savanna and the development of a model which will simulate these processes. (No project leader as yet).

Related projects

Numbers 18, 20 and 42.

THEME VI : FACTORS AFFECTING FAUNAL DYNAMICS AND SECONDARY PRODUCTION

Rationale

The faunal populations of the Study Area vary considerably in space and time. Changes in animal biomass and species composition may be accounted for in terms of weather variables, food quality and availability, migration, mortality, etc. Studies in their structure formed a major part of Phase I activities; monitoring of changes in the populations of selected taxa will be continued through Phase II. Detailed knowledge of the factors which either limit or stimulate production of the more important animal taxa is needed for the development of management systems aimed at increasing yields of selected species.

Key questions for research

1. Are the various animal populations in a steady state, do they show cyclic or successional trends, do eruptions occur in populations?
2. What consumer species play a sufficiently important role in the ecosystem to justify detailed studies in the factors limiting their numbers?
3. What factors limit the population size of selected animal species in the Study Area? What is the influence of predation, competition, disease, weather, fire and poisonous plants on these animals?

Past research reports relating to this theme

Bragg (1975), Carr (1975, 1976), Endrödy-Younga (1975, 1976a, 1976b, 1977), Ferrar P (1977), Gandar (1976, 1977), Grobbelaar (1975b), Grobbelaar and Rösch (1976b), Hasenjager (1976), Holm (1975, 1976), Holm and Ferreira (1977), Holm and Hasenjager (1977), Holm and Kirsten (1977), Holm and Mostert (1977), Horak (1975, 1976a, 1976b, 1977a, 1977b, 1977c), Horak, Londt and Stewart (1976), Jacobsen (1975a, 1975b, 1977a, 1977b), Kingston (1976), Kirsten (1976), Levey (1975, 1977a, 1977b), Londt, Horak and De Villiers (1977), Loots (1975, 1976a, 1976b, 1976c), Monro (1976, 1977), Scholtz (1976a, 1976b), Tarboton (1971, 1975, 1976, 1977), Temby (1976, 1977), Zimmerman (1976, 1977).

Terminated project

26. Determination of the monofluoroacetate activity of gifblaar, *Dichapetalum cymosum*. Professor N Grobbelaar (Department of Botany, University of Pretoria), 1975-1976.

New projects

27. Long-term monitoring of the structure of the invertebrate fauna of *Acacia* and *Burkea* savannas at Nylsvley. (No project leader as yet).
28. Long-term monitoring of the structure of the mammalian fauna of *Acacia* and *Burkea* savannas at Nylsvley. Professor J D Skinner (Mammal Research Institute, University of Pretoria), 1977-1984.
29. Long-term monitoring of the structure of the reptile and amphibian fauna of the *Acacia* and *Burkea* savannas at Nylsvley. Mr N H G Jacobsen (Division of Nature Conservation, Transvaal Provincial Administration), 1977-1984.
30. Long-term monitoring of the structure of the avifauna of *Acacia* and *Burkea* savannas at Nylsvley. Mr W R Tarboton (Division of Nature Conservation, Transvaal Provincial Administration), 1977-1984.

Related projects

Numbers 33, 40, 41, 43, 44 and 53.

THEME VII : INFLUENCE OF CONSUMERS ON PRIMARY PRODUCTION

Rationale

The consumer component of the savanna communities at Nylsvley exert various influences on the primary production of individual plants, populations and on the ecosystem as a whole. The manner in which direct, (usually consumptive) and indirect influences operate needs elucidation.

Key questions for research

1. What are the main patterns of herbage use by the herbivores? To what extent are area, species or seasonal preferences exhibited?
2. What determines selection of species and area at different seasons? What amounts of what species combination determines preference of one habitat type over another?
3. How does the intake of consumers compare with primary production throughout the year? How do energy conversion ratios vary between trophic and taxonomic groups?
4. What are the effects of defoliation and subsequent second flush on the productivity of individual plants? What is the effect of bud-destruction on terminal shoot growth and total production?
5. Are plant-pathogens important limiting factors in primary production at Nylsvley? What insect groups are the main vectors?
6. How important are insect pollinators to reproductive success in the Nylsvley savanna? Does seed destruction have a significant influence on vegetation production and dynamics?

Past research reports relating to this theme

Bragg (1975), Carr (1975, 1976), Gandar (1976, 1977), Holm and Ferreira (1977), Holm and Kirsten (1977), Holm, Kirsten and Scholtz (1976), Holm and Mostert (1977), Levey (1976, 1977a, 1977b), Monro (1976, 1977), Scholtz (1976a, 1976b), Temby (1976, 1977), Zimmerman (1976, 1977).

Ongoing projects

31. Population dynamics, movements and feeding ecology of impala *Aepyceros melampus* in the Study Area. Professor J D Skinner and Mr R H Monro (Mammal Research Institute, University of Pretoria), 1976-1978.
32. Grazing behaviour, food intake and growth of Afrikaner steers on *Burkea africana* savanna. Professor J D Skinner and Mr I Zimmerman (Mammal Research Institute, University of Pretoria), 1976-1978.
33. The role of herbivorous insects in the grass stratum of *Acacia* and *Burkea* savannas. Professor H E Paterson and Mr M V Gandar (Department of Zoology, University of the Witwatersrand), 1976-1978.
34. Development of an accounting model for major trophic components, material pathways and flows in *Burkea* savanna. Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services), Professor B H Walker (Department of Botany and Microbiology, University of the Witwatersrand), Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand) and Mr B J Huntley (Cooperative Scientific Programmes, CSIR), 1977-1978.
35. Development of a model of forage selection by herbivores. Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand) and Mr M V Gandar (Department of Zoology, University of the Witwatersrand), 1977-1978. Incorporates projects 19, 31-33 and 37-41.

New project

36. The effects of bud destruction by insects on the productivity of selected tree species in *Burkea* savanna. Mr C H Scholtz (Department of Entomology, University of Pretoria), 1978.

Future projects

37. Consumption by leaf-eating insects in selected trees and shrubs : determination of the error in quantitative estimates. (No project leader as yet).
38. The effects of various levels of defoliation on the productivity of selected trees, shrubs and grasses in *Burkea* savanna. (No project leader as yet).
39. The effects of trampling by large vertebrates on the structure and productivity of *Burkea* savanna. (No project leader as yet).

40. The effects of nematodes on root growth in *Burkea* savanna. (No project leader as yet).
41. Effects of sap-sucking insects on primary production in *Burkea* savanna. (No project leader as yet).

Related projects

Numbers 4, 6, 16, 18, 19, 21 and 27-30.

THEME VIII : DECOMPOSITION AND REDUCTION PROCESSES IN BURKEA SAVANNA

Rationale

The acidic sandy soils occupied by *Burkea* savanna are known to be poor in nutrients, while a considerable mass of litter, probably containing appreciable amounts of potentially available minerals, remains undecomposed at the end of successive seasons. The processes of litter formation, reduction and decomposition must be studied and the rates of nutrient release from litter, with and without the passage of fire, quantified.

Key questions for research

1. What are the types and rates of litter input from the various vegetation components? How do these vary in space and time?
2. What are the rates of carcass, dung and frass inputs from the faunal component? Are they of sufficient importance to merit detailed study?
3. What are the rates of litter, carcass, dung, frass, etc, reduction and decomposition. Which organisms are responsible for these processes?
4. How do these rates vary in space and time and how do they correlate with driving force variables?
5. What are the rates of mineral release from dead animal and plant matter?

Past research reports relating to this theme

Endrödy-Younga (1975, 1976a, 1976b, 1977), Ferrar P (1977), Grunow (1975, 1976, 1977), Hasenjager (1976), Holm and Hasenjager (1977), Loots (1975), Loots and Theron (1976a, 1976b, 1976c), Olivier (1976), Prinsloo (1975), Steyn and Bezuidenhout (1976, 1977a, 1977b).

Ongoing projects

42. Seasonal and spatial variation in the kind and rate of litter input from trees and shrubs in *Burkea* and *Acacia* savannas. Mr B J Huntley (Cooperative Scientific Programmes, CSIR), 1976-1978.

43. The ecological role of termites in *Acacia* and *Burkea* savannas. Professor H E Paterson and Mr P Ferrar (Department of Zoology, University of the Witwatersrand), 1976-1979.
44. The role of wood-boring Coleoptera as reducing agents in *Burkea* savanna. Dr E Holm and Miss L A Hasenjager (Department of Entomology, University of Pretoria), 1976-1978.
45. The seasonal and spatial variation in the rates of litter decomposition in *Burkea* savanna and the role of micro-organisms in the decomposition process. Professor P L Steyn and Mr J J Bezuidenhout (Department of Microbiology and Plant Pathology, University of Pretoria), 1976-1978.
46. Development of models of litter decomposition and nutrient release in *Burkea* savanna. Dr J W Morris (Botanical Research Institute, Department of Agricultural Technical Services), 1977-1979. Incorporates projects 42-45 and 47-49.

Future project

47. A pilot study of the decomposition of roots in *Burkea* savanna. (No project leader as yet).

Related projects

Numbers 9, 14, 34, 48-50 and 54.

THEME IX : THE ROLE OF NUTRIENTS AS LIMITING FACTORS IN BURKEA SAVANNA

Rationale

Burkea savanna occurs on sands known to be deficient in a number of nutrients. It is necessary to know which of these are important and why and where they are limiting - eg overall shortage, losses to leaching, slow rate of mineralization, etc.

Key questions for research

1. Which mineral nutrients act as control mechanisms in *Burkea* savanna?
2. What are the sources of input and destinations of loss of nutrients to and from the system, in particular for such important elements as N, P and K?
3. Do different forms of N have differential effects on the savanna species, and how do they relate to primary production?
4. Do any elements, eg lack of iodine, sodium, etc, act on the consumer component as control factors?

Past research reports relating to this theme

Grobbelaar (1975a), Grobbelaar and Rösch (1976a), Harmse (1975, 1977), Steyn (1975), Walker and Horne (1977).

Ongoing projects

48. Development of a nitrogen budget for the *Burkea* savanna. Dr G C Bate (Department of Botany and Microbiology, University of the Witwatersrand), 1977-1979.
49. The role of mineral nutrients as controlling factors in the structure and productivity of *Burkea* savanna. Professor B H Walker and Mrs J C Horne (Department of Botany and Microbiology, University of the Witwatersrand), 1977-1979.
50. Development of a model of the nitrogen budget in *Burkea* savanna. Dr G C Bate (Department of Botany and Microbiology, University of the Witwatersrand) and Dr P R Furniss (Department of Applied Mathematics, University of the Witwatersrand), 1978-1979. Incorporates projects 45, 48 and 49.

Related projects

Numbers 4, 34 and 42-47.

THEME X : THE ECOLOGICAL EFFECTS OF FIRE IN BURKEA SAVANNA

Rationale

Fire is a key determinant of savanna structure and function but little is known of the manner in which it influences ecological processes within individual ecosystems. Studies of selected fire effects must be initiated during 1978.

Key questions for research

1. What are the effects of fire on the ecosystem in terms of vegetation and faunal structure and dynamics, soil characteristics, microclimates, hydrology, decomposition processes and nutrient cycling?
2. How do these effects differ between habitat types, season, weather conditions, frequency and fire behavioural characteristics?

Past research reports relating to this theme

None.

New project

51. The effect of fire on the numbers of free-living ticks. Dr I G Horak (Department of Parasitology, University of Pretoria), 1978-1979.

Future projects

52. The short-term effects of fire on vegetation structure, nutritive value and production following a spring burn in *Burkea* and *Acacia* savannas. (No project leader as yet).
53. The short-term effects of fire on faunal structure, distribution and feeding behaviour following a spring burn in *Burkea* and *Acacia* savannas. (No project leader as yet).
54. The short-term effects of fire on litter and soil characteristics, in particular in terms of availability of N, P and K and the distribution and form of organic materials following a spring burn in *Burkea* and *Acacia* savannas. (No project leader as yet).
55. A study of the characteristics of the underground organs of selected plant species in terms of fire survival. (No project leader as yet).

Related projects

Numbers 2, 4, 6, 10, 27-32, 42, 45, 48 and 57.

THEME XI : THE INFLUENCE OF VARIOUS MANAGEMENT PRACTICES ON THE ECOLOGY OF BURKEA SAVANNA

Rationale

The long-term value of the Savanna Ecosystem Project will be judged both on its scientific merit and pragmatic benefits. The identification of key ecosystem processes which lend themselves to manipulation for management purposes is an urgent priority.

Key questions for research

1. Management options :
 - What current land-use practices are applied in *Burkea* savanna?
 - What ecological factors can be identified as limiting to the success of these land use practices?
 - Can improvements be introduced by management options such as fire, fertilization, mowing, bush clearing, changes in stocking rate, alteration of animal composition, etc?

2. Management effects :

- What are the effects of burning and other management practices on biomass accumulation rate and other parameters of productivity, and efficiency of water use?
- What are the effects of various management practices on the faunal population of the *Burkea* savanna?
- What are the influences of various management practices on vegetation pattern?

Past research reports relating to this theme

None.

Ongoing projects

None.

Future projects

56. A survey of existing and potential land-use practices in *Burkea* savanna. (No project leader as yet).
57. Field trials of various management options in *Burkea* savanna. (No project leader as yet).

PHASE III : VALIDATION STUDIES AND THE DEVELOPMENT OF MANAGEMENT STRATEGIES FOR *BURKEA* SAVANNA

The long-term value of the Savanna Ecosystem Project will be determined by the applicability of its findings to other savannas and by the practical benefits derived from improved land-use principles formulated during the applied research phase of the programme.

From an early stage in the development of the project, management objectives were sought within each individual investigation and a pragmatic approach adopted in research priority assessment. As reflected in the central objective of the project, emphasis is being given to quantifying the effects of various kinds of stress on the ecosystem's stability in order to build and test a series of predictive simulation models. The various process studies undertaken during Phase II will be repeated in related savanna types in order to generate the data necessary for model validation.

Some of the activities which will be undertaken during Phase III and which are currently being planned include :

- Selection of validation study sites - these will probably include existing agricultural research stations and nature reserves such as Soutpan, Mara, Towoomba, Percy Fyfe, Loskop, Kruger National Park, etc.
- Survey of existing land-use practices and development of management models. (See project 56).
- Controlled management experiments involving bushclearing, modification of grazer : browser ratios, modification of fire regimes, fertilization, etc both on Nylsvley and validation sites. (See project 57).

PROJECT ADMINISTRATION

The Savanna Ecosystem Project is one of several large multi-disciplinary projects currently being undertaken within the National Programme for Environmental Sciences. The National Programme includes the South African Programme for SCOPE (Scientific Committee on Problems of the Environment), set up by ICSU (International Council of Scientific Unions) and is a cooperative research undertaking of scientists and scientific institutions concerned with environmental problems. It is administered by a National Committee (Chairman : Dr C vd M Brink, CSIR).

The Nylsvley project is the largest of three ecosystem studies being undertaken under the auspices of the Committee for Terrestrial Ecosystems (Chairman : Dr J C Strydom, Department of Agricultural Technical Services) of the National Programme. The project itself is administered by a Project Steering Committee, specific responsibilities within the project being as follows -

Chairman, Steering Committee : Dr A J Pienaar, Department of Agricultural Technical Services.

Chairman, Planning Panel : Professor B H Walker, University of the Witwatersrand.

Component Group Leaders :

Abiotic component : Professor J M de Jager, University of the Orange Free State

Primary Producer component : Professor C F Cresswell, University of the Witwatersrand and Professor J O Grunow, University of Pretoria (alternate)

Consumer component : Vacant

Decomposer component : Dr J W Morris, Botanical Research Institute

Mineral cycling component : Dr G C Bate, University of the Witwatersrand

Modelling component : Professor A M Starfield, University of the Witwatersrand.

Representatives of participating organizations :

Botanical Research Institute : Dr B de Winter

Transvaal Provincial Administration : Dr P F S Mulder and Mr R Parris

National Programme for Environmental Sciences : Dr R G Noble.

Coordinator : Mr B J Huntley, CSIR.

Data Coordinator : Dr J W Morris, Botanical Research Institute.

Liaison Officer : Miss G U Schirge.

Visiting Advisers :

Professor D A Jameson, Colorado State University - August 1974

Professor C D Pigott, University of Lancaster - January to May 1975,
February 1978

Dr J Phillipson, Oxford University - July 1975, September 1977

Dr I Noy-Meir, Hebrew University of Jerusalem - September 1976
Dr D W Goodall, CSIRO, Australia - August 1977
Dr S McNiell, Imperial College, London - September 1977
Professor D M Gates, University of Michigan, USA - March 1978.

Address of the Savanna Ecosystem Project :

Coordinator
Savanna Ecosystem Project
Cooperative Scientific Programmes
CSIR
P O Box 395
PRETORIA 0001

REFERENCES

- Acocks J P H 1953. Veld types of South Africa. *Bot Surv Mem S Afr* 28, 1-192.
- Anonymous 1975. A description of the Savanna Ecosystem Project, Nylsvley, South Africa. *South African National Scientific Programmes Report* 1, 1-24.
- Bragg C 1975. Population dynamics, feeding and energy budget of small mammals at Nylsvley. Report to the National Programme for Environmental Sciences, 14 pp. Typescript.
- Carr R D 1975. Report on grazing studies of cattle on Nylsvley. Report to the National Programme for Environmental Sciences, 11 pp. Typescript.
- Carr R D 1976. Progress report on large mammal observations. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Coetzee B J, F van der Meulen, S Zwanziger, P Gonsalves and P J Weisser 1976. A phytosociological classification of the Nylsvley Nature Reserve *Bothalia* 12, 137-160.
- Coetzee B J, F van der Meulen, S Zwanziger, P Gonsalves and P J Weisser 1977. A phytosociological classification of the Nylsvley Nature Reserve. *South African National Scientific Programmes Report* 20, 1-31.
- De Jager J M 1975. The automatic weather station. Report to the National Programme for Environmental Sciences, 14 pp. Typescript.
- De Jager J M 1976. The analysis and summary of the climate of Nylsvley. Report to the National Programme for Environmental Sciences, 2 pp. Typescript.
- De Jager J M 1977. The climate of Nylsvley and its measurement. Report to the National Programme for Environmental Sciences, 10 pp. Typescript.
- De Villiers G du T 1977. Ground rainfall in a semi-arid savanna region. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Endrödy-Younga S 1975. Dung arthropod and ground-living components. Report to National Programme for Environmental Sciences, 3 pp. Typescript.
- Endrödy-Younga S 1976a. Dung-feeding arthropods. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Endrödy-Younga S 1976b. Litter-feeding arthropods. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Endrödy-Younga S 1977. The role of dung and litter-feeding arthropods in *Burkea* savanna. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.

- Ferrar P 1977. Termites in the *Burkea* and *Acacia*. Report to the National Programme for Environmental Sciences, 7 pp. Typescript.
- Ferrar P J 1977. The primary production of the dominant trees and grasses of Nylsvley by means of CO₂ gas exchange. Report to the National Programme for Environmental Sciences, 10 pp. Typescript.
- Furniss P 1976. The DRIVER programme. Report to the National Programme for Environmental Sciences, 7 pp. Typescript.
- Furniss P R 1977. Description and manual for the use of DRIVER - an interactive modelling aid. *South African National Scientific Programmes Report* 17, 1-23.
- Furniss P R and A M Starfield 1977. Progress report. Modelling component. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Gandar M V 1976. A preliminary survey of herbivorous insects in the grass/forb stratum. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Gandar M V 1977. Survey of phytophagous insects of the grass/forb stratum. Report to the National Programme for Environmental Sciences, 20 pp. Typescript.
- Getz W M and A M Starfield 1975. Sensitivity analysis of a simple linear model of a savanna ecosystem at Nylsvley. *South African National Scientific Programmes Report* 2, 1-18.
- Grobbelaar N 1975a. Biologiese stikstofbinding te Nylsvley. Report to the National Programme for Environmental Sciences, 8 pp. Typescript.
- Grobbelaar N 1975b. Vorderingsverslag oor die bepaling van monofluorasetaat (MFA) in die blare van *Dichapetalum cymosum* wat op Nylsvley tydens verskillende tye van die jaar versamel is. Report to the National Programme for Environmental Sciences, 2 pp. Typescript.
- Grobbelaar N and G Rösch 1976a. Biologiese stikstofbinding. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Grobbelaar N and G Rösch 1976b. Studies oor *Dichapetalum cymosum*. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Grunow J O 1974. General information on Nylsvley farm. Report to the National Committee for Environmental Sciences, 6 pp. Typescript.
- Grunow J O 1975. Change in above-ground biomass and litter of the grass layer in *Eragrostis pallens* - *Burkea africana* savanna in protected plots in the Nylsvley Study Area. Report to the National Programme for Environmental Sciences, 8 pp. Typescript.
- Grunow J O 1976. Determination of above-ground standing crop and litter mass, productivity and losses, in the grass layer under grazing conditions. Report to the National Programme for Environmental Sciences, 12 pp. Typescript.

- Grunow J O 1977. Determination of above-ground standing crop and litter mass, productivity and losses, in the grass layer of *Eragrostis pallens* - *Burkea* tree savanna under grazing condition. Report to the National Programme for Environmental Sciences, 46 pp. Typescript.
- Harmse H J von M 1975. Gronde van die Nylsvley-natuurreservaat. Report to the National Programme for Environmental Sciences, 96 pp. Typescript.
- Harmse H J von M 1977. Grondsoorte van die Nylsvley-natuurreservaat. *South African National Scientific Programmes Report* 16, 1-64.
- Hasenjager L A 1976. Wood decomposition. Report to the National Programme for Environmental Sciences, 2 pp. Typescript.
- Hirst S M 1975. Savanna Ecosystem Project - Progress report 1974/1975. *South African National Scientific Programmes Report* 3, 1-27.
- Holm E 1975. Arthropod consumers and social insects. Report to the National Committee for Environmental Sciences, 13 pp. Typescript.
- Holm E 1976. A general survey of the arthropod fauna at Nylsvley. Report to the National Programme for Environmental Sciences, 6 pp. Typescript.
- Holm E and J G Ferreira 1977. Role of predacious arthropods in the tree foliage stratum - pilot study. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Holm E and L A Hasenjager 1977. A study of the role of wood-boring Coleoptera. Report to the National Programme for Environmental Sciences, 25 pp. Typescript.
- Holm E and J F Kirsten 1977. Quantitative ecology of social Hymenoptera at Nylsvley. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Holm E, J F Kirsten and C H Scholtz 1976. A general survey of feeders on woody vegetation : diversity, abundance and crude energetics. Report to the National Programme for Environmental Sciences, 11 pp. Typescript.
- Holm E and L Mostert 1977. Pilot study on the ecological role of the rhizophagous mesofauna in the Nylsvley savanna ecosystem. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Horak I G 1975. A survey of endo- and ectoparasites of impala and cattle at Nylsvley. Report to the National Programme for Environmental Sciences, 7 pp. Typescript.
- Horak I G 1976a. A survey of endo- and ectoparasites of impala and cattle at Nylsvley. Report to the National Programme for Environmental Sciences, 8 pp. Typescript.
- Horak I G 1976b. The effect of nematode infestation on cattle productivity and the seasonal incidence of helminth infestation. Report to the National Programme for Environmental Sciences, 2 pp. Typescript.

- Horak I G 1977a. The effect of nematode infestation on cattle productivity and the seasonal incidence of helminth infestation in cattle. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Horak I G 1977b (in press). Parasites of domestic and wild animals in South Africa XI. Helminths in impala. *Onderstepoort J Vet Res.*
- Horak I G 1977c (in press). Parasites of domestic and wild animals in South Africa XIII. Helminths in cattle in natural pastures in the northern Transvaal. *Onderstepoort J Vet Res.*
- Horak I G, J G H Londt and C G Stewart 1976. The seasonal incidence of ticks on and the prevalence of tick-borne diseases in cattle. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Huntley B J 1977. Savanna Ecosystem Project - Progress report 1975/1976. *South African National Scientific Programmes Report* 12, 1-42.
- Huntley B J and J W Morris 1978 (in press). Savanna Ecosystem Project - Progress report 1976/1977. *South African National Scientific Programmes Report.*
- Jacobsen N H G 1975a. A study of the reptile and amphibian population of the *Burkea africana* - *Eragrostis pallens* association at Nylsvley Nature Reserve : Progress report. Report to the National Programme for Environmental Sciences, 12 pp. Typescript.
- Jacobsen N H G 1975b. Reptile and amphibian populations of the *Burkea africana* - *Eragrostis pallens* savanna on the Nylsvley Nature Reserve. Report to the National Programme for Environmental Sciences, 29 pp. Typescript.
- Jacobsen N H G 1977a. The reptiles and amphibians of Nylsvley. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Jacobsen N H G 1977b. An annotated checklist of the amphibians, reptiles and mammals of the Nylsvley Nature Reserve. *South African National Scientific Programmes Report* 21, 1-65.
- Kingston T J 1976. Censuses of large mammals at Nylsvley. Report to the National Programme for Environmental Sciences, 7 pp. Typescript.
- Kirsten J F 1976. Quantitative ecology of social Hymenoptera. Report to the National Programme for Environmental Sciences, 6 pp. Typescript.
- Levey B 1976. Detailed quantitative ecology of dominant leaf eating insects on woody vegetation (excluding Lepidoptera). Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Levey B 1977a. Detailed quantitative ecology of dominant leaf and seed eating insects on woody vegetation (excluding Lepidoptera). Report to the National Programme for Environmental Sciences, 2 pp. Typescript.
- Levey B 1977b. Detailed quantitative ecology of dominant leaf and seed eating insects on woody vegetation (excluding Lepidoptera). Report to the National Programme for Environmental Sciences, 5 pp. Typescript.

- Londt J G H, I G Horak and I L de Villiers 1977 (in press). Parasites of domestic and wild animals in South Africa X. The seasonal incidence of ticks (Acarina : Ixodidae) on cattle in the northern Transvaal. *Onderstepoort J Vet Res*.
- Loots G C 1975. 'n Faunistiese studie van die Acari en Oligochaeta in 'n savanne-ekosisteem te Nylsvley. Report to the National Programme for Environmental Sciences, 17 pp. Typescript.
- Loots G C and P Theron 1976a. 'n Faunistiese studie van die Acari en Oligochaeta in 'n savanne-ekosisteem te Nylsvley. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Loots G C and P Theron 1976b. 'n Taksonomiese studie van die Prostigmata (Acari) van 'n savannebiotoop te Nylsvley. Report to the National Programme for Environmental Sciences, 1 pp. Typescript.
- Loots G C and P Theron 1976c. 'n Kwantitatiewe en kwalitatiewe studie van die invloed wat die dominante spesies van die Acari en Collembola op die verrotting van die organiese materiaal in die studiegebied te Nylsvley het. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Lubke R A 1976. A reassessment of the woody vegetation of the Nylsvley Study Area. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Lubke R A 1977. The woody vegetation (1974, 1975, 1976) of the Nylsvley Study Area. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Lubke R A, C F Clinning and F R Smith 1975. A quantitative ecological survey of the woody vegetation of the Nylsvley study Area. Report to the National Programme for Environmental Sciences, 123 pp. Typescript.
- Lubke R A, C F Clinning and F R Smith 1976. The pattern of the woody species of the Nylsvley Savanna Ecosystem Project Area. *Proc Grassl Soc Sth Afr* 11, 29-35.
- Monro R H 1976. Growth and feeding studies on tame impala. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Monro R H 1977. Growth and feeding studies on impala. Report to the National Programme for Environmental Sciences, 12 pp. Typescript.
- Morris J W 1976. Data processing panel : Progress report. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Morris J W 1977. Data processing panel : annual report. Report to the National Programme for Environmental Sciences, 18 pp. Typescript.
- Olivier P A S 1976. 'n Taksonomiese studie van die Prostigmata (Acari) in 'n savannebiotoop te Nylsvley. MSc thesis, Potchefstroom University for CHE. 137 pp.

- Prinsloo J F 1975. Die taksonomie en bevolkingsdinamika van die hemieudafiese en eudafiese Collembola in 'n savannebiotoop. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Rutherford M C 1975. Woody species productivity. Report to the National Programme for Environmental Sciences, 14 pp. Typescript.
- Rutherford M C 1977. Above-ground subdivisions in woody species of the Savanna Ecosystem study Area. Report to the National Programme for Environmental Sciences, 32 pp. Typescript.
- Rutherford M C and P Carr 1976. Woody species productivity within the South African Savanna Ecosystem Project. Report to the National Programme for Environmental Sciences, 14 pp. Typescript.
- Scholtz C H 1976a. Biology and ecological energetics of Lepidoptera larvae associated with woody vegetation in a savanna ecosystem. MSc thesis, University of Pretoria. 192 pp.
- Scholtz C H 1976b. Quantitative feeding ecology of Lepidoptera larvae associated with woody vegetation. Report to the National Programme for Environmental Sciences, 8 pp. Typescript.
- Starfield A M and P R Furniss 1975. Savanna Ecosystem Project : modellers report, July 1975. Report to the National Committee for Environmental Sciences, 2 pp. Typescript.
- Starfield A M and P R Furniss 1976. Modelling component progress report. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Steyn P L 1975. Stikstofbepalings van plant-materiaal, grond en water as diensfunksie aan die produseerder- en dryfkragspan van die Savanne-ekosisteenprojek. Report to the National Programme for Environmental Sciences, 4 pp. Typescript.
- Steyn P L and J J Bezuidenhout 1976. Die bepaling van die aktiwiteit van mikro-organismes in die grond. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Steyn P L and J J Bezuidenhout 1977a. Die tempo van ontbinding van plantafval in die Studiegebied te Nylsvley. Report to the National Programme for Environmental Studies, 4 pp. Typescript.
- Steyn P L and J J Bezuidenhout 1977b. Evaluering van die aktiwiteite van mikroorganismes van die Nylsvley savanne-ekosisteen. Report to the National Programme for Environmental Sciences, 2 pp. Typescript.
- Tarboton W R 1971. Birds of the Mosdene Nature Reserve, Naboomspruit. *S Afr Avifauna Series* 78, 1-51.
- Tarboton W R 1975. Avian populations in the *Burkea* community. Report to the National Programme for Environmental Sciences, 7 pp. Typescript.
- Tarboton W R 1976. Population ecology of black tits *Parus niger* in *Burkea* woodland. Report to the National Programme for Environmental Sciences, 13 pp. Typescript.

- Tarboton W R 1977. Birds of the Nylsvley Nature Reserve. *South African National Scientific Programmes Report* 15, 1-14.
- Temby I D 1976. Population dynamics, feeding and energy budget of small mammals at Nylsvley. Report to the National Programme for Environmental Sciences, 6 pp. Typescript.
- Temby I D 1977. The non-ungulate mammals at Nylsvley. Report to the National Programme for Environmental Sciences, 57 pp. Typescript.
- Tew A J 1976. Definition of the basic concepts and terms of primary production. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Tew A J and C F Cresswell 1975. The photosynthetic characteristics of the trees and grasses of the *Eragrostis pallens* - *Burkea africana* woodland at Nylsvley. Report to the National Programme for Environmental Sciences, 24 pp. Typescript.
- Tew A J and C F Cresswell 1976. A study of the primary production of the dominant trees and grasses of Nylsvley by means of CO₂ gas exchange. Report to the National Programme for Environmental Sciences, 9 pp. Typescript.
- Tew A J, C F Cresswell, C Ambler and M Baldwin 1976. A study of the translocation and distribution of the photosynthetic products with respect to leaf age and time of season of the dominant grasses at Nylsvley. Report to the National Programme for Environmental Sciences, 12 pp. Typescript.
- Van Rooyen D J 1977. Preliminary appraisal on hydrological data in pedons of the hydrological response units of the *Burkea* veld. Report to the National Programme for Environmental Sciences, 14 pp. Typescript.
- Van Rooyen N and G K Theron 1975. 'n Intensiewe opname en beskrywing van die kruidstratum van die *Eragrostis pallens* - *Burkea africana* boomsavanne op die Nylsvley-natuurreservaat. Report to the National Programme for Environmental Sciences, 22 pp. Typescript.
- Van Rooyen N and G K Theron 1977. 'n Intensiewe opname en beskrywing van die kruidstratum van die *Eragrostis pallens* - *Burkea africana* boomsavanne op die Nylsvley-natuurreservaat. Report to the National Programme for Environmental Sciences, 5 pp. Typescript.
- Van Wyk J J P 1975a. Verslag van pilootstudie in verband met ondergrondse biomassa in die *Burkea*-savanne te Nylsvley. Report to the National Programme for Environmental Sciences, 46 pp. Typescript.
- Van Wyk J J P 1975b. Verslag van pilootstudie in verband met grondvogtoestande in die *Burkea*-savanne op Nylsvley. Report to the National Committee for Environmental Sciences, 14 pp. Typescript.
- Van Wyk J J P 1976. 'n Studie van die ondergrondse biomassa in 'n savanne-ekosisteem op Nylsvley. Report to the National Programme for Environmental Sciences, 10 pp. Typescript.

- Van Wyk J J P 1977. 'n Studie van die ondergrondse biomassa van die *Eragrostis pallens* - *Burkea africana* savanne op Nylsvley. Report to the National Committee for Environmental Sciences, 13 pp. Typescript.
- Venter H J T 1976. Grond-saadreserwes van die *Eragrostis pallens*/*Burkea africana*-veld, Nylsvley. Report to the National Programme for Environmental Sciences, 10 pp. Typescript.
- Walker B H 1973. Recommendations for the development of a simulation model for a Transvaal savanna ecosystem. Report to the National Committee for Environmental Sciences, 14 pp. Typescript.
- Walker B H and J C Horne 1977. The role of minerals as control factors on plant growth in the *Burkea* savanna. Report to the National Programme for Environmental Sciences, 3 pp. Typescript.
- Zimmerman I 1976. Grazing behaviour, food intake and growth of Afrikaner oxen on *Burkea africana* veld. Report to the National Programme for Environmental Sciences, 10 pp. Typescript.
- Zimmerman I 1977. The feeding ecology of cattle at Nylsvley. Report to the National Programme for Environmental Sciences, 13 pp. Typescript.

TITLES IN THIS SERIES

1. *A description of the Savanna Ecosystem Project, Nylsvley, South Africa. December 1975. 24 pp.
2. *Sensitivity analysis of a simple linear model of a savanna ecosystem at Nylsvley. W M Getz and A M Starfield. December 1975. 18 pp.
3. *Savanna Ecosystem Project - Progress report 1974/1975. S M Hirst. December 1975. 27 pp.
4. Solid wastes research in South Africa. R G Noble. June 1976. 13 pp.
5. *Bibliography on marine pollution in South Africa. D A Darracott and C E Cloete. June 1976. 131 pp.
6. *Recycling and disposal of plastics waste in South Africa. R H Nurse, N C Symington, G R de V Brooks and L J Heyl. June 1976. 35 pp.
7. South African Red Data Book - Aves. W R Siegfried, P G H Frost, J Cooper and A C Kemp. June 1976. 108 pp.
8. South African marine pollution survey report 1974-1975. C E Cloete and W D Oliff (editors). September 1976. 60 pp.
9. Modelling of the flow of stable air over a complex region. M T Scholtz and C J Brouckaert. September 1976. 42 pp.
10. Methods and machinery for pulverising solid wastes. M J Simpkins. October 1976. 29 pp.
11. South African Red Data Book - Small mammals. J A J Meester. November 1976. 59 pp.
12. Savanna Ecosystem Project - Progress report 1975/1976. B J Huntley. March 1977. 41 pp.
13. Disposal and recovery of waste paper in South Africa. G R de V Brooks. April 1977. 35 pp.
14. South African Red Data Book - Fishes. P H Skelton. July 1977. 39 pp.
15. A checklist of the birds of the Nylsvley Nature Reserve. W R Tarboton. September 1977. 14 pp.
16. Grondsoorte van die Nylsvley-natuurreservaat. H J von M Harmse. September 1977. 64 pp.
17. Description and manual for the use of DRIVER - an interactive modelling aid. P R Furniss. September 1977. 23 pp.
18. South African Red Data Book - Large mammals. J D Skinner, N Fairall and J du P Bothma. November 1977. 29 pp.

19. Introducing you to satellite operated Data Collection Platforms (DCP's). C C Stavropoulos. September 1977. 9 pp.
20. A phytosociological classification of the Nylsvley Nature Reserve. B J Coetzee, F van der Meulen, S Zwanziger, P Gonsalves and P J Weisser. December 1977. 31 pp.
21. An annotated checklist of the amphibians, reptiles and mammals of the Nylsvley Nature Reserve. N H G Jacobsen. December 1977. 65 pp.
22. Cooperative National Oceanographic Programme. SANCOR. January 1978. 19 pp.
23. South African Red Data Book - Reptiles and amphibians. G R McLachlan. February 1978. 53 pp.
24. Guidelines for the disposal of dangerous and toxic wastes so as to minimize or prevent environmental and water pollution. R T Rudd. January 1978. 12 pp.
25. Richards Bay mesometeorological data. Vertical profiles of air temperature and wind velocity and surface wind statistics. M T Scholtz, E T Woodburn, C J Brouckaert and M Mulholland. March 1978. 104 pp.
26. Studies of mineralization in South African rivers. G C Hall and A H M Görgens. March 1978. 24 pp.
27. Nylsvley - A South African Savanna Ecosystem Project : Objectives, organization and research programme. March 1978. 37 pp.

* Out of print.