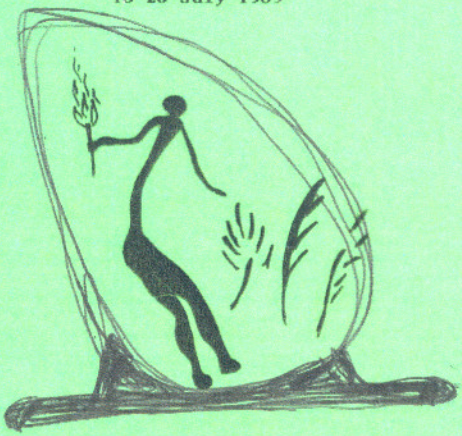
11TH ANNUAL RESEARCH MEETING

OF THE

FYNBOS BIOME PROJECT

Clanwilliam
18-20 July 1989



11DE JAARLIKSE NAVORSINGSVERGADERING

VAN DIE

FYNBOSBIOOMPROJEK

Clanwilliam
18-20 Julie 1989

Meeting convened by the CSIR'S Foundation for Research Development.

Vergadering byeengeroep deur die WNNR se Stigting vir Navorsingsontwikkeling

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INTRODUCTION

The overall and ultimate objective of the Fynbos Biome Project is to ***provide sound scientific knowledge of the structure and functioning of constituent ecosystems as a basis for the conservation and management of the fynbos biome.*** At the outset of the Project (11 years ago) it was intended that the objective would be realized by:

- synthesizing available knowledge in order to identify major gaps;
- stimulating and coordinating existing research in order to optimize present efforts;
- giving priority to the urgent launching of new research in order to gain a deeper understanding of:
    - the major natural influences which control the distribution, structure and functioning of ecosystems within the biome, as well as
    - the effect of major disturbances, especially fire and invasive weeds, on these systems. The results of these studies would be used to predict the effects of land management practices.

The research programme of the Fynbos Biome Project was divided into three phases: Phase I - baseline studies of the fynbos biome; Phase II - comparative studies of component ecosystem structure and functioning; Phase III - validation studies or testing of Phase II hypotheses and models.

Formal coordination at an inter-organizational level has been provided by the Steering Committee, while informal contact between field workers is maintained through workshop meetings, seminars, etc. As the Project has developed over the years, annual research meetings have become a major mechanism for bringing all parties together for an exchange of progress reports, research plans and the review of programme goals. The eleventh such meeting will be held from Tuesday 18 July to Thursday 20 July 1989, in the NG Church Hall, Leipoldt Street, Clanwilliam.

The Organizing Committee for the annual research meeting has decided to adopt the theme "Man and Fynbos" for the 1989 meeting. The bulk of the presentations on the first day comprise invited papers dealing with use of the fynbos in prehistoric and modern times. Those papers dealing with modern usage will reflect different attitudes to environmental issues. It is not necessarily the purpose of this meeting to determine the merits of the various attitudes, but rather to make different parties (research organizations and user agencies) aware of the prevalent spectrum of attitudes. Without aiming to formalize debate on the issues, therefore, this day should provide some food for thought for future environmental research.

The theme relates to the current relationship between the resource and society, superimposed on which are our various research interests. The organizing committee considers all good research, whether pure or applied, to be relevant to society. What is often missing is the placing of the work into perspective,

and following the outcome through into the real world. Although the theme of this meeting is not subject-related, and is not intended as a constraint to content, we would like contributors to consider their work from the viewpoint of its relevance to society. The ultimate goal, however, is that researchers in the fynbos biome will consider their position within society beyond the scientific community, and their contribution to the improvement of this society.

Contributed poster papers have been grouped into the categories:

- Fynbos and the human factor
- Organisms, communities and their fynbos environments
- Evolution and invasion in the fynbos
- Morphology and systematics of fynbos taxa
- In the wake of the great Swartboskloof conflagration

and authors will be provided with an opportunity for a brief verbal presentation during the poster session on Tuesday afternoon, 18 July.

The field trip on Wednesday, 19 July, will be from Clanwilliam to the central Cederberg, looking at the various environmental gradients between these points. Separate groups will partake in the excursion. The groups will have differing interests, but will follow the same route. In this manner the excursion should provide interest to all participants, regardless of different interests and levels of expertise. At the same time, however, all participants will partake in the same overall theme and will be able to make the same general observations. This should provide common interests in the discussions and debate in the afternoon. Each group leader has been asked to address a particular subject. The manner in which this is achieved (field surveys/observations/discussion groups) has be decided on by the group leader, but will not exceed two to three hours work on the day. Most groups will be looking at questions related to the gradients in vegetation, altitude and rainfall between Clanwilliam and Hoogvertoon. Preliminary surveys have been carried out prior to the meeting where necessary. All groups will be asked to conform to the general programme for the day and to take cognisance of other groups' objectives in order to allow some debate in the report-back session. At the session each programme leader will be given five minutes (maximum) to report on the essential findings of the day. This will be followed by a brief debate. Group leaders will be encouraged to produce at least a brief note in the Terrestrial Ecosystems Newsletter on the excursion, but the final destination of any products from the excursion will be decided on by the leaders.

SPEAKERS FROM SESSIONS V TO VII

SHOULD BE READY TO SPEAK ON DAY 2

IF WEATHER DOES NOT PERMIT

FIELD EXCURSION

FYNBOS BIOME PROJECT
1989 ANNUAL RESEARCH MEETING

FINAL PROGRAMME

Monday 17 July 1989

Late afternoon	Arrival and setting up of posters
19h00-20h00	Registration, Clanwilliam Hotel
20h00	Evening get-together

Tuesday 18 July 1989

08h00 Late registration, NG Church Hall, Leipoldt Street, Clanwilliam

Session I : Introduction to theme : Man and Fynbos

Chairman : Mr B J Huntley
Foundation for Research Development

08h30 **INTRODUCTION AND WELCOME**
Mr B J Huntley
Foundation for Research Development

08h40 **OPENING ADDRESS**
Dr F J Kruger
South African Forestry Research Institute

09h00 **ORIGINS AND EVOLUTION OF FYNBOS**
Prof H J Deacon
University of Stellenbosch

09h30 **USE OF FYNBOS BY EARLY MAN**
Prof J E Parkington
University of Cape Town

10h00 **GENERAL DISCUSSION**

10h15 **TEA**

Session II : Modern approaches

Chairman : Dr R M Cowling
University of Cape Town

10h45 COMMERCIAL EXPLOITATION – CAN THE FYNBOS SURVIVE?
(A PRODUCER'S PERSPECTIVE)
Mr I Bell
Hagelkraal, Gansbaai

11h15 ALIEN PLANT DISTRIBUTION IN THE SOUTH WESTERN CAPE
Mr E Azorin
University of Cape Town

11h45 BIOCONTROL OF *SESBANIA PUNICEA*
Dr J H Hoffmann
University of Cape Town

12h15 GENERAL DISCUSSION

12h30 LUNCH

Session III : Conservation philosophy

Chairman : Mr G J Breytenbach
South African Forestry Research Institute, Saasveld

14h00 AN IDEALIST'S APPROACH TO CONSERVATION IN SOUTH AFRICA
Mr I A W Macdonald
University of Cape Town

14h30 A PRAGMATIC VIEW OF NATURE CONSERVATION AND POSSIBLE LESSONS FOR RESEARCH ON THE FYNBOS BIOME
Dr F J Kruger
South African Forestry Research Institute

15h00 GENERAL DISCUSSION

15H15 TEA

Session V : Poster session

Chairman : Mr G W Davis
Botanical Research Institute

15h45 SEE POSTER ABSTRACTS ON PAGE 15 OF PROGRAMME
Poster authors will each be given the opportunity of presenting a short (maximum 5 minutes) verbal presentation of their poster

18h30 **DINNER**

20h45 **FIELD TRIP BRIEFING**
Mr P T Manders (Field trip chairman)
South African Forestry Research Institute, Jonkershoek

20h50 **PLANT COMMUNITIES IN THE NORTHERN CEDERBERG**
H C Taylor
Botanical Research Unit, Stellenbosch

20h00 ***"MOOI IS DIE WêRELD OM MY"* : WORKS OF C LOUIS LEIPOLDT**
Prof M M Walters
Departement van Afrikaans en Nederlands
Universiteit van Kaapstad

Wednesday, 19 July 1989

08h00 DEPART CLANWILLIAM HOTEL

FIELD EXCURSION

12h00 ARRIVE EIKEBOOM for ascent to Hoogvertoon

13h00 ARRIVE HOOGVERTOON

PICNIC LUNCH

DISCUSSION WITH FORESTER S W VAN DER MERWE ON HISTORICAL LAND USE AT HIGHER ALTITUDES.

14h30 BEGIN DESCENT AND DEPART FOR CLANWILLIAM, VIA NIEUWOUDTSPAS

16h30 REPORT-BACK SESSION IN HALL
Chairman : Mr P T Manders
South African Forestry Research Institute, Jonkershoek

Each group will be given the opportunity for a short presentation on their findings.

18h30 **GENERAL DISCUSSION AND CLOSURE**

Thursday, 20 July 1989

CONTRIBUTED PAPERS

- *20 minute talks which include 5 minutes for discussion.*

Session V : Conservation philosophy

Chairman : Prof W R Siegfried
Percy FitzPatrick Institute of African Ornithology
University of Cape Town

08h30 **CONSERVATION OF FYNBOS VEGETATION : THEORETICAL IDEALS**
A G Rebelo and W R Siegfried
University of Cape Town

08h50 **FYNBOS CONSERVATION AND THE DICTATES OF THE REAL WORLD ECONOMY - ENVIRONMENTALISM THROUGH THE LOOKING GLASS**
G W Davis
Botanical Research Institute

09H10 **FYNBOS CONSERVATION - A PRAGMATIC ALTERNATIVE**
J Jackelman and P D A Bairnsfather Cloete
Sea Farm Private Share Block Nature Reserve, Betty's Bay

09h30 **TEA**

Session VI : Palaeoecology

Chairman : Prof H J Deacon
University of Stellenbosch

10h00 **ENVIRONMENTAL CHANGE AND HUMAN ACTIVITY DURING THE LATE QUATERNARY OF THE CEDERBERG**
M E Meadows and J M Sugden
Department of Environmental and Geographical Science
University of Cape Town

10h20 **ENVIRONMENTAL CHANGE AND ARCHAEOLOGICAL RECORDS IN THE AREA SURROUNDING THE VERLORENVLEI**
E February
Archaeology Department, University of Cape Town

Session VII : Practical considerations for conservation

Chairman : Mr R H Andrag
Chief Directorate: Nature and Environmental Conservation

11h00 **CONSERVATION STATUS OF THE SIX ENDANGERED SOUTH AFRICAN REPTILES AND AMPHIBIANS - ALL FYNBOS BIOME ENDEMICS**
E H W Baard
Chief Directorate: Nature and Environmental Conservation

11h00 **VARIABLE RECRUITMENT OF A FYNBOS OVERSTOREY SHRUB : IMPACT ON COMMUNITY STRUCTURE AND IMPLICATIONS FOR MANAGEMENT**
R M Cowling and T Gxaba
Botany Department, University of Cape Town

11h20 **RECIPE FOR DISASTER : THE EFFECTS OF A MAN-INDUCED INCREASE IN FIRE INTENSITY ON WATER, SOILS AND PLANTS**
G.J Breytenbach and R de Villiers
South African Forestry Research Institute, Saasveld

12h00 **LUNCH**

Session VIII : Biological research

Chairman : Dr B W van Wilgen
South African Forestry Research Institute, Jonkershoek

13h30 **SPECIES COEXISTENCE : ROLE OF DISPERSAL AND DISTURBANCE**
W J Bond[1] and R Yeaton[2]
[1]Botany Department, University of Cape Town
[2]Botany Department, University of Natal, Pietermaritzburg

13h50 **THE EFFECTS OF POPULATION FRAGMENTATION ON GENETIC VARIATION AND PLANT REPRODUCTIVE PERFORMANCE**
D Jeffery
Botany Department, University of Cape Town

14h10 **GEOPHYTES IN THE FYNBOS BIOME : A NEGLECTED GUILD IN ECOLOGICAL STUDIES**
B McKenzie
Botany Department, University of the Western Cape

14h30 **ONTOGENETIC AND DEMOGRAPHIC PATTERNS IN A *HAEMANTHUS PUBESCENS* POPULATION ON THE CAPE FLATS**
C Ruiters, B McKenzie and L Raitt
Botany Department, University of the Western Cape

14h50 **PRIZE-GIVING**
J J Midgley
South African Forestry Research Institute, Saasveld

15h05 **CLOSING COMMENTS**
Dr N Fairall
Chief Directorate: Nature and Environmental Conservation

15h20 **TEA AND CLOSURE**

OPSOMMINGS / ABSTRACTS

UITGENOOIDE REFERATE OOR DIE TEMA : "MAN EN FYNBOS"
* alfabeties gelys volgens eerste outeur se van.

INVITED PAPERS ON THE THEME : "MAN AND FYNBOS"
* listed alphabetically according to first author's surname.

THE DISTRIBUTION AND ECONOMIC POTENTIAL OF ALIEN ACACIAS IN THE GREATER CAPE TOWN AREA

E J Azorìn and R M Cowling
Botany Department, University of Cape Town

Vast stands of alien acacias, mainly *Acacia cyclops* and *A saligna* girdle the Greater Cape Town region. Until relatively recently they were considered a problem, particularly by conservationists and agriculturalists. Recently they have begun to gain importance as a source of wood fuel. The project aims to quantify the extent of the resource in the North Western and Cape Flats regions of the Greater Cape Town area and to evaluate the economic potential and management strategies for various uses (eg charcoal, agricultural products). Such research is likely to contribute to job and wealth creation in the Cape Town region.

COMMERCIAL EXPLOITATION - CAN THE FYNBOS SURVIVE?
(A producer's perspective)

Mr I Bell
Hagelkraal, Gansbaai

A vast number of questions relating to the impact of commercial picking in the fynbos biome need answers. A number of these are presented for consideration based on observations of plant response to harvesting on one farm. They are:

For proteas:

a) Is post-harvest regeneration adequate?
b) Is soil nutrient status affected?
c) Do plants display a pruning effect?
d) Is the quality of the seed reserve compromised?

For leucadendrons:

a) What is the size and quality of the seed reserve?
b) What are the optimum levels and frequencies for harvest?
c) What are the general seed recovery and resowing practices amongst farmers?

For Cape Greens (Ericaceae, *Serruria, Berzelia, Phylica*)

a) What are the optimum levels and frequencies for harvest?
b) Do plants display a pruning effect?
c) What are the natural cycles of *Erica* spp?

More general concerns relate to the conservation of fynbos veld as a whole, jeopardised by a lack of knowledge and understanding concerning the correct management techniques. Possible solutions to these wider issues are:

- More research into orchard type production, especially with the Ericaceae;
- Education programmes for farmers;
- Elucidation of the financial benefits of proper veld management and the dangers of leasing of picking rights;
- Education via the media, eg TV coverage of fynbos conservation issues with respect to commercial utilization.

ORIGINS AND EVOLUTION OF FYNBOS

Prof H J Deacon
Department of Archaeology, University of Stellenbosch

The Cape floristic region corresponds to the physiographic unit comprising the Cape Fold Mountains and attendant coastal platform and has been accorded the status of the Capensis floral kingdom. This species-rich phytochorion, noteworthy for the high degree of endemism, is dominated by fynbos vegetation. The origins and evolution of the Capensis flora and fynbos vegetation have been the subject of much interest and some debate. Lacking hitherto has been any substantial body of palaeoecological evidence from geomorphology, sedimentology, palaeontology, palynology and palaeoclimatology against which to test hypotheses and models formulated on uniformitarian grounds from a knowledge of the present flora and vegetation. The publication, "Fynbos palaeoecology: a preliminary synthesis" remains the best compendium of information on fynbos origins and evolution. The view proposed here is that the distinctiveness of the Capensis flora *vis a vis* the flora of southern Africa has been over-emphasized and that the fynbos is a derived and specialized vegetation. Human activities in pre-Colonial times, principally through fire management, may not have been very significant in evolutionary terms but the introduction of alien taxa in the last 2000 years has had a significant impact.

BIOCONTROL OF *SESBANIA PUNICEA*

J H Hoffmann
Zoology Department, University of Cape Town

Evaluating the impact of insect herbivores that have been introduced into South Africa for biological control of the weed *Sesbania punicea* is primarily applied research. However, the system also provides an ideal experimental entree to examine some fundamental relationships between insect herbivores and their host plant. Results that illustrate this point are presented. The conclusion is that the proper design and execution of experiments is wholly dependant upon the hypothesis to be tested and not on perceptions of a problem as either pure or applied.

A PRAGMATIC APPROACH TO CONSERVATION IN SOUTH AFRICA

Dr F J Kruger
South African Forestry Research Institute

This short talk begins with a brief examination of the economic and environmental scenarios for South Africa. Research priorities identified for South Africa as a whole are discussed briefly. Next, I examine trends in the nature conservation scene. After a brief look at a consensus view on research priorities I turn to the challenges facing those interested in research on the fynbos biome.

Considerable challenges face fynbos ecologists. These range those arising from the need to enlist new technologies for cost-effective land management - remote sensing and geographical information systems, for example - to the need to understand the likely consequences of global climate change. Other important foci will include the need for research and information that will allow the many new users of fynbos landscapes - whether dollar-rich tourists, our own citizens cooking, recreation, or occupiers of the land - to understand and use their environment sensibly. Much of the conservation of fynbos will depend on policies and measures that must be valid outside the established nature conservation network.

AN IDEALIST'S VIEW OF NATURE CONSERVATION IN SOUTH AFRICA

I A W Macdonald
Percy FitzPatrick Institute of African Ornithology
University of Cape Town

The first requirement for an ideal conservation scenario in South Africa is a complete inventory of its natural resources: landscapes, climate, soils, habitats, species. This database should be computerised with free access to all interested parties. Conservation of these natural resources should be the responsibility of a single state department which should also have the rational utilization of these resources within its brief (ie conservation should not be seen as something distinct from utilization but rather as an integral part of it). Based on the national inventory and with the full cooperation of adjacent states, a plan should be drawn up which has the following features: (1) all management units to have catchment boundaries, (2) viable populations of all native species occurring in the subcontinent to be maintained, (3) deterioration of the abiotic components of the environment to be avoided (eg soil, water, air), (4) "limits to growth" to be set for each management area based on the above, non-negotiable criteria, (5) all new developments to be subjected to compulsory evaluation by an independent team of ecologists to ensure that these do not conflict with the agreed goals for the management unit(s) affected. The whole of South Africa should thus be viewed as a single "conservation area", with each portion of it having its own unique attributes and being zoned accordingly for appropriate levels of development and protection. Importation of non-native species should be strictly regulated and the undesirable spread of such species should be continuously monitored and control implemented as a state responsibility wherever necessary. This monitoring should be but one component of an ongoing nationwide programme of natural resource assessment based on continually updated technology. South Africa should play a leading role in implementing international conservation agreements (eg those limiting global pollution, conserving marine and migratory systems and regulating trade in natural resources). All South Africans should be educated so that conservation becomes an integral part of their philosophy and way of life, to the extent that it is not only seen as a duty but, in fact, becomes a pleasure.

The uncontrolled growth in human numbers, that currently poses the single most important threat to all nature conservation activities in the region, will initially have to be curbed through enlightened state intervention but, with education, will become self-controlled. The rise and fall of political parties and of individual politicians will come to depend, in main, on their performance in environmental matters.

USE OF FYNBOS BY EARLY MAN

Prof J E Parkington
Spatial Archaeology Research Unit, University of Cape Town

In order to understand the long term relationship between people and the fynbos landscape we need to know something of past population distributions and densities. Measures of these are hard to come by, but radiocarbon date lists provide one possible reflection of former settlement. This approach was pioneered by Janette Deacon. Bearing in mind possible taphonomic, preservational and sampling problems in using such observations, three issues are raised. These are (1) the origins of San hunter-gatherer people, (2) uneven population distributions through the Holocene period and (3) impacts of pastoralist groups over the past two millennia. The conclusion supports the notion that people shape and are shaped by their environmental context.

OPSOMMINGS VAN REFERAATBYDRAES
* alfabeties gelys volgens eerste outeur se van.

ABSTRACTS OF CONTRIBUTED PAPERS
* listed alphabetically according to first author's surname.

CONSERVATION STATUS OF THE SIX ENDANGERED SOUTH AFRICAN REPTILES AND AMPHIBIANS - ALL FYNBOS BIOME ENDEMICS

E H W Baard
Chief Directorate: Nature and Environmental Conservation, Stellenbosch

Owing to man's influence in the Fynbos Biome, many species' conservation status has changed for the worse. Presently, six herpetological species are regarded as endangered, mainly owing to habitat destruction and modification. Being endemic to the Biome, these species require attention and conservation action safeguarding them against eradication.

SPECIES COEXISTENCE : ROLE OF DISPERSAL AND DISTURBANCE

W J Bond[1] and R Yeaton[2]
[1]Botany Department, University of Cape Town
[2]Botany Department, University of Natal, Pietermaritzburg

Many new models have recently been developed to explain coexistence among "geographically equivalent" plant species. Several invoke a critical role for "disturbance". Here we present field data on inter-specific competition between a *Protea* and *Leucospermum* species. We show the importance of dispersal differences for prolonging coexistence. Using a Markov model of dynamic interactions between the species, we can indicate the potential role of disturbance in permitting coexistence. The model has implications for the management to maintain species diversity.

RECIPE FOR DISASTER : THE EFFECTS OF A MAN-INDUCED INCREASE IN FIRE INTENSITY ON WATER, SOILS AND PLANTS

G J Breytenbach and R de Villiers
South African Forestry Research Institute, Saasveld

Increased fire intensities were evaluated using biological indicators, eg length of underground stems killed, diameters of remaining stems. Increased fire intensities resulted in increased levels of soil hydrophoby and soil erosion levels. Local soil loss was determined using erosion pins. Total loss was evaluated using automatic water samplers, and analysing these for solids transported. Cover and diversity of both re-sprouting and re-seeding species decreased. The possible ways in which such impacts could be curtailed are discussed.

VARIABLE RECRUITMENT OF A FYNBOS OVERSTOREY SHRUB : IMPACT ON COMMUNITY STRUCTURE AND IMPLICATIONS FOR MANAGEMENT

R M Cowling and T Gxaba
Botany Department, University of Cape Town

Leucadendron laurcolum, a dominant non-sprouting overstorey proteoid in the southern Cape Peninsula, shows highly variable recruitment within fires. Understorey richness in dense stands is significantly lower than sparse stands. Dense stands promote the establishment of bird-dispersed species but inhibit seed regenerating and myrmecochorons taxa. After each fire, variable density of this species imposes a patchiness on the environment which could be important in maintaining community-wide richness. Fire regimes which promote dense stands of *L laurcolum* may decrease diversity in the long term.

FYNBOS CONSERVATION AND THE DICTATES OF THE REAL WORLD ECONOMY - ENVIRONMENTALISM THROUGH THE LOOKING GLASS

G W Davis
Botanical Research Institute

"'Well, in our country,' said Alice, still panting a little, 'you'd generally get to somewhere else - if you ran very fast for a long time as we've been doing."
'A slow sort of country!' said the Queen. 'Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!'
'I'd rather not try, please!' said Alice. 'I'm quite content to stay here -'"

Over the past 1,1 decades the Fynbos Biome Project has played an important role in consolidating and normalizing activities in a defined sphere of enquiry (- a slow sort of sphere, or a looking-glass sort of sphere?). Many of the issues raised in the forum have been directly related to real problems within real ecosystems. BUT, with regard to the long-term conservation of fynbos as part of the resource-base for future generations of people, there remains a conceptual chasm between the world of natural scientists, and the megalithic social edifice which ultimately dictates human behaviour and its impact on the environment.

The Fynbos Biome Project has been patently successful in promoting excellence in indigenous environmental science, and generating an extensive knowledge-base of natural processes in ecosystems of the biome. But there is still an important item that it needs to place on the agenda of the scientific community. That is the design and construction of a communications interface between the academic world of scientific investigation, and the secular world ruled by the economics of human prosperity - a means of decoding the apparent nonsense of running as fast as one can to remain in the same place, or to determine suitable Linnaean binomial labels for the Jabberwocky and the Bandersnatch.

ENVIRONMENTAL CHANGE AND THE ARCHAEOLOGICAL RECORD IN THE AREA SURROUNDING THE VERLORENVLEI

E February
Department of Archaeology, University of Cape Town

Certain wood anatomical features such as vessel size and number are directly related to climate. Researchers such as Xinyeng et al (1988) and Van der Walt (1988) have shown that with an increase in vessel size and decrease in vessel number there is a corresponding increase in rainfall.

Basing our approach on this type of research in ecological wood anatomy, we have measured and related a number of wood anatomical variables to climate in the modern environment. Using the results of this study we have reconstructed aspects of the climatic history of the last 4000 years at Elandsbay. This reconstruction provides a new perspective on some controversial issues in Western Cape archaeology. The issues include: (1) The reason for a four thousand year gap in the archaeological record between 8000 and 4000 BP. (2) The preference for people to live firstly in cave sites, then move from the caves to specific areas on the coast and then finally disperse all over the landscape.

It has often been argued by archaeologists that the reasons for the changes in site distribution patterns were not environmental, but social. We suggest that, even though there are purely social reasons for change in settlement patterns etc, environment and social organisation are intimately related and the scale of environmental change which our study suggests has occurred within the last 4000 years must have had a marked affect on human demography, settlement patterns and economy.

FYNBOS CONSERVATION - A PRAGMATIC ALTERNATIVE

J Jackelman and P D A Bairnsfather Cloete
Sea Farm Private Share Block Nature Reserve, Betty's Bay

The declaration of portions 108 and 166 of the farm Hangklip 559 in the District of Caledon, as a private nature reserve represents a unique solution to the problem of accommodating development in metropolitan fringe areas, particularly in sensitive areas along the coastline.

In view of the unique environmental attributes of the site and the established low agricultural potential, it is evident that the zoning for agricultural purposes was inappropriate, and that a change in the use to a private nature reserve is valid.

The appropriate solution, the "private nature reserve share block" system was devised in collaboration with a number of affected environmental agencies.

Revenue generating conservation of unique fynbos habitats may represent an appropriate future conservation strategy.

THE EFFECTS OF POPULATION FRAGMENTATION ON GENETIC VARIATION AND PLANT REPRODUCTIVE PERFORMANCE

D Jeffery
Botany Department, University of Cape Town

This paper reports initial results of a study of the consequences of population fragmentation. The study is the first of its kind in directly measuring the consequences of population size and isolation in a fynbos plant. It will provide empirical evidence for the hypothesized effects of population fragmentation on genetic variation and plant reproductive performance.

Observations on the reproductive biology of populations of *Agathosma collina* of different size and isolation have been carried out. The results of hand pollinations from pollen sources at different distances from the maternal plant have also been recorded.

GEOPHYTES IN THE FYNBOS BIOME : A NEGLECTED GUILD IN ECOLOGICAL STUDIES

B McKenzie
Department of Botany, University of the Western Cape

Despite the importance of geophytes in the nursery industry and the fact that the Fynbos biome has a proportionately larger geophyte flora than other mediterranean climate biomes, little ecological investigation of this group has taken place. A review of descriptive and autecological research is discussed and reasons presented why more emphasis should be placed on geophytic studies.

ENVIRONMENTAL CHANGE AND HUMAN ACTIVITY DURING THE LATE QUATERNARY OF THE CEDERBERG

M E Meadows and J M Sugden
Department of Environmental and Geograpahical Science
University of Cape Town

Palaeoecological evidence from two vleis on the Cederberg is presented and used to illustrate the interactions between plant community composition, environmental change, burning history and human activities. The case of the Clanwilliam cedar, *Widdringtonia cedarberginsis* is examined and it is concluded that a long record of exploitation is responsible for the demise of this species on the Cederberg.

CONSERVATION OF FYNBOS VEGETATION : THEORETICAL IDEALS

A G Rebelo and W R Siegfried
Percy FitzPatrick Institute of African Ornithology, University of Cape Town

Based on the distribution of the Proteaceae, 90% of fynbos species can be conserved in 27 optimally placed reserves covering a maximum of 11% of the area of fynbos vegetation. These "reserves" cannot possibly all be realized, and priority conservation areas for fynbos, based on real world options and Red Data Book species, are identified.

ONTOGENETIC AND DEMOGRAPHIC PATTERNS IN A *HAEMANTHUS PUBESCENS* POPULATION ON THE CAPE FLATS

C Ruiters, B McKenzie and L Raitt
Department of Botany, University of the Western Cape

Age structure and age-state analysis of the population indicates that *Haemanthus pubescens* reaches its first flowering period after nine calendar years, while maximum flowering occurs at fifteen years. The development of the bulb, and the production of roots, shoots and flowers are examined over a season and discussed with the age structure and age-state analysis in relation to disturbance factors.

THE ROLE OF VEGETATION STRUCTURE IN PREVENTING FIRE PENETRATION INTO FOREST PATCHES IN FIRE-PRONE FYNBOS SHRUBLANDS

B W van Wilgen and K B Higgins
South African Forestry Research Institute, Jonkershoek

The role of fire in controlling the extent and size of patches of Afromontane forest in mountain fynbos is often debated. We investigated differences in biomass, size and distribution of plant parts as fuel, foliar moisture contents, heat yields and volatile oils and waxes between forest and adjacent fynbos. Fire behaviour models were also used to simulate potential fire behaviour

OPSOMMINGS VAN PLAKAATBYDRAES
* alfabeties gelys volgens eerste outeur se van.

ABSTRACTS OF POSTER CONTRIBUTIONS
* listed alphabetically according to first author's surname.

MYCORRHIZAS IN NATURAL VEGETATION OF THE FYNBOS BIOME

N Allsopp
Department of Botany, University of Cape Town

The mycorrhizal colonization of plants occurring in a sandplain lowland fynbos site were studied. Vesicular-arbuscular mycorrhizas were the most commonly occurring type and were found on most of the perennial shrub species including the *Penaeaceae* and *Bruniaceae*. Ericoid and orchid mycorrhizas were present in members of the *Ericaceae* and *Orchidaceae* respectively.

CAPE PENINSULA GIS : IMPACTS OF MAN ON THE ENVIRONMENT

E R Ashton[1], M Webster[2] and R S Knight[2]
[1]Cape Town City Council
[2]Department of Botany, University of Cape Town

A Geographical Information System (GIS) for the management of natural resources in the Cape Peninsula is being established through a cooperative programme involving the Cape Town City Council, the CSIR's Foundation for Research Development, and the University of Cape Town. This environmental database will include physical data (eg geology) and vegetation data obtained from SPOT imagery, floristic and structural surveys. Current ecological theory will be used to interpret these data sets and the results will be synthesized and used to formulate management plans for the Cape Peninsula. Examples of conflict and cooperation between environmental management and economic development will be highlighted.

THE CLANWILLIAM CEDAR : A STRUGGLE IN AN INHOSPITABLE HABITAT

S A Botha
South African Forestry Research Institute, Jonkershoek

Evidence is presented to show that the presence of man has probably changed the vegetation in the natural habitat of the Clanwilliam cedar from a less flammable type to a highly flammable type, with a natural fire regime not reconcilable with cedar conservation. Research needs to be done to investigate means by which the vegetation can be changed to a type with a natural fire regime more suitable for cedar conservation.

THE EFFECT OF VARIOUS DEGREES OF DEFOLIATION ON *PROTEA LORIFOLIA*

G J Breytenbach and W Breytenbach
South African Forestry Research Institute, Saasveld

The effects of various levels of defoliation (0%, 20%, 40%, 50% and 70%) on the growth of 17-year old *Protea lorifolia* in the southern Cape mountains was evaluated. Vegetative growth was affected. Both the size and the number of leaves produced was reduced as was the number of stems formed. Reproductive output of the plants were also affected as the number of flowers formed per stem and per old flower was reduced. The implication of flower and foliage harvesting for the management of fynbos are discussed.

THE ROLE OF FIRE IN THE LIFE CYCLE OF *CYRTANTHUS VENTRICOSUS*

P J Brown
South African Forestry Research Institute, Jonkershoek

The biology of *Cyrtanthus ventricosus* will be discussed and its response to fire will be presented. Some unanswered questions, identified during research on the species, will be presented.

DIE INVLOED VAN ARGENTYNSE MIER TEENWOORDIGHEID, BRAND EN PLANTEGROEI-OUDERDOM OP DIE INHEEMSE MIERFAUNA EN ANDER ARTHROPODA IN DIE FYNBOS

A E de Kock[1] en J H Giliomee[2]
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Daar bestaan kommer oor die indringing van die Argentynse mier in die fynbos. Die teenwoordigheid van hierdie indringermier mag eerstens inmeng met die bestaande proses van mirmekochorie (waardeur sekere plantsade deur sekere mierspesies versprei en geberg word). Dit gebeur omdat die saadverspreidende mierspesies (veral van die genus *Anoplolepis*) skynbaar deur die Argentynse mier verdryf word. Die vraag was dus wat die invloed van die Argentynse mier op die inheemse mierfauna is asook op die res van die Arthropoda. Met die eksperimentele brand in die Swartboskloof-opvanggebied in die vooruitsig, is beplan om die invloed van brand sowel as plantegroeiouderdom terselfdertyd te bestudeer.

Aas (stukke vleis) is aanvanklik gebruik om te bepaal of die Argentynse mier teenwoordig was. Daarna is die Arthropoda oor 'n periode van twee jaar met putvalle gemonitor in die Swartboskloof-opvanggebied. Vier putvalroosters is uitgelê, drie in Argentynse miergebiede (maar in gebiede met verskillende plantegroei-ouderdomme) en een in 'n gebied sonder Argentynse miere. Die data is ontleed met behulp van Sorensons-indekse, diversiteitsprofiele en logvolop-heidsrangordekurwes.

Die resultate toon duidelike skieding in die diversiteiteprofiele vir die mierfauna wat daarop dui dat brand, plantegroei-ouderdom en die teenwoordigheid van die Argentynse mier wel 'n invloed het op spesierykheid en spesiegelyk-heid. Wat die ander Arthropoda-groepe aanbetref, is dit skynbaar veral die plantegroei-ouderom wat 'n rol speel. Omdat versteuring (Argentynse miere, brand en plantegroeiouderdomwisselinge) skynbaar 'n veel groter invloed op die mierfauna as op die ander Arthropoda het, sal mierfaunamonitering 'n veel beter barometer van versteuring as die res van die Arthropoda bied.

BIOLOGICAL CONTROL OF WEEDS IN THE FYNBOS - THE MANDATE AND CURRENT RESEARCH OF THE PLANT PROTECTION RESEARCH INSTITUTE

G B Dennill
Plant Protection Research Institute, Stellenbosch

An update of current research projects, the conflict with the wattle industry and comments on the sense in which our research is conservation based will be illustrated and discussed.

FYNBOS CANOPY DYNAMICS FOLLOWING FIRE : DOMINANCE, COVER, HEIGHT AND SEEDER/SPROUTER RATIOS

G Forsyth and B van Wilgen
South African Forestry Research Institute, Jonkershoek

Changes in fynbos vegetation cover, height and in species dominance was assessed on ten 50 m^2 quadrats, before and for two years after, a fire in March 1987. The quadrats were distributed over five plant communities in Swartboskloof. Particular attention was paid to the shifting importance of life forms and fire response categories within the dominant species, as well as to the significance of these for the hydrological balance of the catchment.

HORTICULTURE'S CONTRIBUTION TO CONSERVATION, A CASE STUDY *ADENANDRA UNIFLORA* (L) WILLD

M Gould
National Botanic Gardens, Kirstenbosch

The fynbos endemic *Adenandra uniflora* (L) Willd exhibits a wide range of phenotypic variability. The Kirstenbosch Rutaceae collection contains plants collected from numerous natural populations. A large genetic pool is thus provided to maximize the development of horticulturally superior forms. The maintenance of a large gene pool for horticultural purposes has the added advantage of conserving the genetic diversity of the species. Observations of the species performance in cultivation leads to better understanding of its growth requirements and adaptability and thus may aid in its conservation.

ECOLOGY AND PLANNING: CAN OPTIMUM LIMITS BE SET ON RECREATION IN NATURAL LANDSCAPES?

C Henderson
Botany Department, University of Cape Town

A serious problem facing management in the Cape shrublands and heathlands is the need to protect sensitive ecosystems, while at the same time providing for their recreational use.

Calls have been made to manage natural areas within their "recreational carrying capacity" (RCC). RCC is understood as that *amount and character of use an area can sustain without causing unacceptable change to the biophysical environment (ecological capacity) or to the experience of the user (social capacity)*. It is based on the implicit belief that each system has an inherent optimum limit in its capacity to tolerate recreational use without irreversible ecological degradation.

A major problem encountered in applying this concept is the meaninglessness of ecological capacity *per se*, that is, without prior consideration of the social aspects of different recreational types. Furthermore, there appears to be no way in which thresholds of irreversible breakdown of ecological processes can be predicted. The conclusion is that **no single number defines the carrying capacity.**

A procedure which explicitly recognizes these limitations, is presented for planning the allocation of recreation opportunities in natural landscapes.

Major features of the procedure are:

1. the survey and analysis of local conditions - biophysical, land uses and public attitudes - as a guide to

2. the establishment of precisely defined goals for conservation and recreation management.

3. the definition of a range of Recreation Opportunity Settings (ROS) or zones which are described in terms of their desired management, social and ecological conditions. These give practical expression to the goals identified in step 2.

4. the classification of the landscape, by land systems mapping, into land units characterised by internally homogenous natural attributes.

5. the establishment of standards for the **Limits of Acceptable Change** (LAC) in the natural attributes of each ROS zone.

6. the allocation of ROS zones in the landscape, using the ecological units mapped in step 4 as the basic management unit. The allocations are made by comparing resource conditions in these units with a set of specified criteria, which take the form of a decision-tree comprising a series of questions linked by YES/NO pathways.

The procedure will be illustrated using the Langebaan National Park, in which the major vegetation type is West Coast Strandveld.

Problems remain in the establishment of quantitative LAC standards and the assessment of vulnerability to human impact of different land units. The question remains: if ecologists are unable to identify the thresholds for irreversible breakdown of ecological processes (that is, the point at which stresses become unacceptable), what guides are there to ensure the sustained utilisation of natural ecosystems?

IS FIRE REALLY NECESSARY FOR *PROTEA NERIIFOLIA* REGENERATION?

K B Higgins
South African Forestry Research Institute, Jonkershoek

Senescence and the need for fire to regenerate *Protea neriifolia* is an accepted concept. Doubt exists that sufficient between-fire regeneration occurs to maintain a viable population. Surveys were done to determine regeneration and to examine what effects it has on the population as a whole.

MICROCLIMATE SHELTERS - A WAY TO IMPROVE SEEDLING SURVIVAL IN THE RE-ESTABLISHMENT OF THE CLANWILLIAM CEDAR

K B Higgins, P T Manders and A Lamb
South African Forestry Research Institute, Jonkershoek

Microclimate shelters are an excellent way to improve seedling survival of the Clanwilliam cedar. The shelters are placed over seedlings just after germination. Five different shelters, constructed from locally produced materials, were tested. The experiment covered two summer periods. A control (those having no shelters) returned a 4% survival while the most successful shelter returned a survival rate of 71%.

ERICAS AND MAN - A HORTICULTURAL PERSPECTIVE

A N Hitchcock
South African National Botanic Gardens, Kirstenbosch

Summary of the current state of horticultural evaluation, development and utilization of the genus Erica at the National Botanic Gardens Kirstenbosch with special reference to work done over the last twenty years.

The Ericaceae collection at Kirstenbosch has expanded from a mere collection of attractive garden plants to a collection of over 260 species with emphasis on species which can be manipulated and intensively cultivated as pot plants.

During this period intensive field work was and still is being undertaken to bring potentially suitable species into cultivation. Where possible each species is investigated over their distribution ranges in order to collect horticulturally superior forms and interesting variants.

Attention is also given to collecting and evaluating those species listed in the Red Data Book in order to bring them into cultivation and thereby help to conserve them. Thus far 300 species within the Genus Erica have been collected and evaluated with 105 found to be suitable as container plants.

The ultimate goal in undertaking this project was to establish which species in the genus have horticultural potential. This done, these plants are made available to the public through the Annual Plant Sale and the newly established Plant Utilization Section.

CONSERVATION COORDINATION

P J Ivey
South African National Botanic Gardens, Kirstenbosch

Plant recording in a botanical garden could be a vital interface between *in situ* and *ex situ* conservation of endangered flora. A botanical garden may be viewed as an interim holding place for rare and endangered plants but if this is not efficiently monitored then the garden may become the final resting place of threatened species. Plant recording is important in monitoring a plant's progress in a botanical garden.

This poster describes how plant recording could fit into conservation attempts, makes proposals as to how this system could be developed, and invites comments so that it may be improved - to enable greater efficiency in its conservation role.

FYNBOS CONSERVATION - A PRAGMATIC ALTERNATIVE

J Jackelman and P D A Bairnsfather Cloete
Sea Farm Private Share Block Nature Reserve, Betty's Bay

The declaration of portions 108 and 166 of the farm Hangklip 559 in the District of Caledon, as a private nature reserve represents a unique solution to the problem of accommodating development in metropolitan fringe areas, particularly in sensitive areas along the coastline.

In view of the unique environmental attributes of the site and the established low agricultural potential, it is evident that the zoning for agricultural purposes was inappropriate, and that a change in the use to a private nature reserve is valid.

The appropriate solution, the "private nature reserve share block" system was devised in collaboration with a number of affected environmental agencies.

Revenue generating conservation of unique fynbos habitats may represent an appropriate future conservation strategy.

***ACACIA CYCLOPS* IN THE WESTERN CAPE - RECONCILING THE NEED FOR FUELWOOD AND THE COSTS OF AN INVASIVE WEED**

D C le Maitre
South African Forestry Research Institute, Jonkershoek

Acacia cyclops is a fast growing exotic tree which provides valuable fuelwood for cooking and heating for many rural and urban communities in the Western Cape. It is also a major weed in natural vegetation on the coastal plain and in mountain areas, including important conservation areas. It was used extensively for drift-sand reclamation. This, together with the dispersal of its seeds by birds, notably the red-winged starling, has greatly facilitated its spread. *A cyclops* is costly to control because it has large, persistent seed banks in the soil. There is evidence that seed predation by indigenous weevils is reducing the size of the seed banks in certain areas. Biological control is being actively investigated by the Plant Protection Research Institute. The commercial market for *A cyclops* for braaiwood as sold by woodcutters, shops and supermarkets has an annual turnover of at least R1,15 million per annum. The wood of *A cyclops* and *A saligna* is used for fuel by at least 5% of the households on the Cape Flats. There is insufficient wood available to meet either the fuel or braaiwood demands. In order to avoid a crisis, particularly among the poorer communities, it will be necessary to establish woodlots. I suggest that a threefold plan of action is needed to solve this complex problem: (1) Investigate the potential of alternative species which can be grown for fuel and as commercial crops to supply the market for braaiwood and charcoal in the Western Cape; (2) To generate employment for the unskilled labour in cutting wood and preparing charcoal for the commercial market. This labour force can also be employed in clearing alien infestations in Nature Reserves and other areas; (3) To implement biocontrol measures to control the seed production of *A cyclops*.

***PANAEA DAHLGRENII* ROURKE - A NEW LANGEBERG ENDEMIC**

D J McDonald
Botanical Research Unit, Stellenbosch

A new species of *Penea*, *P dahlgrenii* Rourke endemic to the Langeberg, Cape Province, is described. The known distribution range of the species is indicated and its habitat described. *P dahlgrenii* is unlike the other species in the genus, having pink and white as opposed to yellow-red flowers and a different inflorescence morphology. A phylogenetic relationship of *P dahlgrenii* with respect to the other *Penaea* species is proposed, based on inflorescence morphology.

NULL MODELS AND PLANT : EXAMPLES BASED ON CORRELATIONS BETWEEN PLANT PARTS IN THE PROTEACEAE

J J Midgley
South African Forestry Research Institute, Saasveld

The study of plant form can be substantially broadened by using correlations between plant parts as a null model. Any exceptions to these correlations then serve as important indicators as to the reasons for, or consequences of, the correlations. Examples based on outliers in the Proteaceae are presented.

SEED GERMINATION AND SEROTINY
(-or how to spread your risks in the harsh world)

P J Mustart
Department of Botany, University of Cape Town

Different germination patterns are found in germination tests of seed from inflorescences/cones of different ages of four serotinous Proteaceae growing in the Agulhas area. In general, older plant-stored seed takes longer to germinate than current seed. This is interpreted as a means of spreading the risks of survival in areas of low or variable rainfall. This idea is extended to predict patterns of serotiny in general.

HABITAT RELATIONS OF *DRONOLAGUS RUPESTRIS*

D Pepler
Department of Nature Conservation, University of Stellenbosch

A survey of occurrence of red rock hare shows that this animal occurs in a wide variety of fynbos and karoo habitats. It is absent from low lying areas and concentrates on hilltops where there are sufficient rocky outcrops for escape and cover.

HUNTING BEHAVIOUR OF THE EUROPEAN HOBBY

D Pepler
Department of Nature Conservation, University of Stellenbosch

The hunting behaviour of the hobby has been studied in Stellenbosch. A variety of methods all used for different prey. The spacing of hunting birds is shown.

ALLOMETRIC IMPLICATIONS FOR MYRMECOCHORY?
S Pierce
Department of Botany, University of Cape Town

Small leaf size is often associated with low nutrient soils. The allometric consequence of small leaves is fine branching, and consequently the propagules they support must be small. Small seeds are prone to small predators, eg harvester ants. Dispersal is similarly constrained by seed size - small seeds must be dispersed by wind or by small dispersers. Myrmecochory probably evolved from accidental burials by harvesters. An increasing fire frequency with the onset of the mediterranean climate in the Cape would have provided a selective force for myrmecochory with increased survival of buried seeds relative to unburied seeds. Thus I infer that low nutrients favouring small leaf size, and the allometric consequence of small seeds and therefore small dispersers may explain the preponderance of myrmecochory in Cape fynbos.

RARE PROTEACEAE
R Pool
Chief Directorate: Nature and Environmental Conservation, Stellenbosch

There are 276 rare and threatened species of the Proteaceae. A summary of their distribution, and conservation status will be given, as well as information on threats, veld type and ownership. The protection needed for each population will also be summarized.

BRUNIACEAE AT KIRSTENBOSCH
F Powrie and N Leitch
South African Botanic Gardens, Kirstenbosch

The Bruniaceae collection at Kirstenbosch was only started in March 1988, though a few of the more common species have been in cultivation for many years. The reasons for building up a collection of this endemic fynbos family are:

1) The horticultural potential of many of the members of the Bruniaceae both as cut flowers and as garden plants.
2) The conservation of the family, both *ex situ* and *in situ*, in the light of the current classification of 30% of its species as endangered, rare or extinct.
3) As a cooperative effort associated with current National Botanic Garden research programmes connected with the Bruniaceae.

Propagation material is obtained largely from natural populations. Cutting material is collected from a number of plants within the population and where possible seed is collected. Cuttings are in most cases difficult and slow to root and seed germination is poor. Both these problems are in need of investigation. The current status of the collection will be presented.

PHYTOGEOGRAPHICAL CENTRES IN THE FYNBOS OF THE CAPE FLORA

A G Rebelo and J P Rourke
Percy FitzPatrick Institute of African Ornithology, University of Cape Town

The centres of endemism of the Cape flora based on a fine scale analysis of the Proteaceae, are outlined and compared to Weimark's scheme. The configuration has important implications for conservation and throws interesting light on the evolution of the Cape flora.

BIRD SPECIES HABITAT SEGREGATION IN SWARTBOSKLOOF

D M Richardson and A C Duckworth
South African Forestry Research Institute, Jonkershoek

A 12-month study was made of bird communities associated with forest and shrubland vegetation formations in Swartboskloof, a 375 ha catchment in the Jonkershoek Valley near Stellenbosch. Bird habitats were characterized in terms of the height and canopy cover of the dominant vegetation stratum.

Few bird species were confined to one of the major formations; most species utilized a variety of resources in several formations. The composition of bird communities in Swartboskloof was strongly influenced by the phenology of a few plant species. Nectar in the flowers of *Protea repens* and *P nitida* and the fruit if *Ilex mitis* provided resources for a variety of generalist feeders.

We derive a preliminary niche structure for birds in the different vegetation formations based on observations of feeding behaviour, resource availability. We then discuss the proximate factors that influence bird niche structure in this mountain fynbos ecosystem.

THE ECOLOGICAL WOOD ANATOMY OF FYNBOS VERSUS FOREST SPECIES

A Scholtz[1] and P T Manders[2]
[1]South African Museum
[2]South African Forestry Research Institute, Jonkershoek

Various species of woody plants associated with fynbos or forest vegetation were grown in a greenhouse under controlled conditions. After 20 months of growth the plants were harvested and a number of variables, including total plant mass and total leaf area were measured. The stem cross section and basic wood antomical features were also measured for each plant and this data set was examined in order to answer the following questions:

1) Descriptively, what are the main differences between the wood of the two sets of plants;
2) Apart from the allometric relationship between leaf area and stem thickness, are there any significant relationships which correlate with the success of the plants measured in terms of total mass;
3) Do particular relationships between the leaves and wood anatomy characterise the two sets of plants. Can particular xylem/leaf strategies be defined and do these have predictive value in indicating which species will do well under various moisture regimes;
4) Which species show most flexibility in their response to changes in the environment and vice versa.

The data and results of the analysis are reported and functional plant anatomy and water use discussed.

INCREASES IN OVERLAND FLOW AND SOIL LOSS FOLLOWING FIRE ON FYNBOS SITES

D Scott and G Moses
South African Forestry Research Institute, Jonkershoek

Standard overland flow plots were installed on steep mid-slopes in the Swartboskloof and Langrivier research catchments in Jonkershoek State Forest, to measure overland flow (runoff) and associated soil loss following fire. A control plot was laid out in Sosyskloof under 26-year old fynbos. Fire caused significant increases in runoff and soil loss from the plots. There was no significant difference in runoff and soil loss between the various plots in the same blocks, but there was a significant difference between two blocks of plots on different slopes within Swartboskloof. There was a marked reduction in overland flow and soil loss with time after the fire, as plant cover increased. In the second wet season after the fire in Swartboskloof runoff and soil loss was significantly lower than in the first wet season after the fire. The variation in runoff and soil loss is largely explained by treatment, plot characteristics and total precipitation, while rainfall intensity (over 30 and 60 minutes), though significant, contributed little to the explanation of variation in these dependent variables. A tendency for soil loss to occur in pulses was noted.

PHYTOCHEMICAL INVESTIGATION OF BRUNIACEAE AND PUTATIVE ALLIES

G Scott
National Botanic Gardens, Kirstenbosch

Man's proper management of fynbos is dependant upon an understanding of its constituent species. The all but endemic fynbos family Bruniaceae is of particular interest in view of its taxonomic isolation, evolutionarily relictual nature and great morphological variation. In conjunction with an extensive propagation programme at Kirstenbosch, a phytochemical investigation of the family and its putative allies is currently in progress and is aimed at elucidating the following aspects:

1 Infrafamilial taxonomy and phylogeny
2. Affinity with other fynbos families.

Leaf flavonoid patterns have been widely utilised in solving such problems and form the basis of the present investigation. Findings to date will be summarised in poster form.

COMPARATIVE WATER RELATIONS OF THREE PROTEA SPECIES

R E Smith
South African Forestry Research Institute, Jonkershoek

The recovery rate of fynbos vegetation after a fire is postulated to be a major determinant of the longevity of post-fire streamflow increases, and is dependant on the ratio of re-seeding to re-sprouting plants. This ratio may be altered by varying fire frequencies outside a 'safe' range (12-20 years). Communities with high seeder:sprouter ratios recover slower than those with low ratios. According to this hypothesis, streamflow reduction will be more gradual due to a lower leaf area and hence transpiration component, assuming that the transpiration rates per unit leaf area of seeders and sprouters are the same. This study compares the transpiration rates of three Protea species to test the latter assumption.

PLANT COMMUNITIES IN THE NORTHERN CEDERBERG
H C Taylor
Botanical Research Unit, Stellenbosch

I present a synopsis of the major plant communities in the northern Cederberg in relation to their habitats and the general landscape, which will be illustrated with colour photographs.

SWARTBOSKLOOF SMALL MAMMALS : POPULATION RECOVERY
H J van Hensbergen
Department of Nature Conservation, University of Stellenbosch

Two years post fire, small mammal populations have reached new heights (trapping success up to 30%). Community structures are changing as *Mus minutoides* becomes rarer. Differences between grids are still important.

THE ROLE OF VEGETATION STRUCTURE IN PREVENTING FIRE PENETRATION INTO FOREST PATCHES IN FIRE-PRONE FYNBOS SHRUBLANDS
B W van Wilgen and K B Higgins
South African Forestry Research Institute, Jonkershoek

The role of fire in controlling the extent and size of patches of Afromontane forest in mountain fynbos is often debated. We investigated differences in biomass, size and distribution of plant parts as fuel, foliar moisture contents, heat yields and volatile oils and waxes between forest and adjacent fynbos. Fire behaviour models were also used to simulate potential fire behaviour.

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OF THE FYNBOS BIOME PROJECT

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11TH ANNUAL RESEARCH MEETING OF THE FYNBOS BIOME PROJECT
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