BUTTERFLY SURVEY REPORT ON THE RYNEFIELD Ext 51 DEVELOPMENT

By
P.Roos & G.Henning CC.
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P.ROOS & G.HENNING.CC
P.0.BOX 38827
BOOY5ENS
2016
GAUTENG, SOUTH AFRICA
011-683-5266

E.MAIL:
SAFSHENN@MWEB.CO.ZA
PROOS@ICON.CO.ZA
TEL. & FAX (H): (011) 763-1949
TEL. (B): (011) 434-1345
FAX (B): (011) 434--1359

Rooisysie Bellegings Bk.

P.O.Box 7851,

PETIT ; 1512.

South Africa.

Attn: **Mr S.D.Maartens./ Nico Botha,**

BUTTERFLY REPORT ON THE RYNEFIELD EXTENTION 51 DEVELOPMENT IN BENONI.

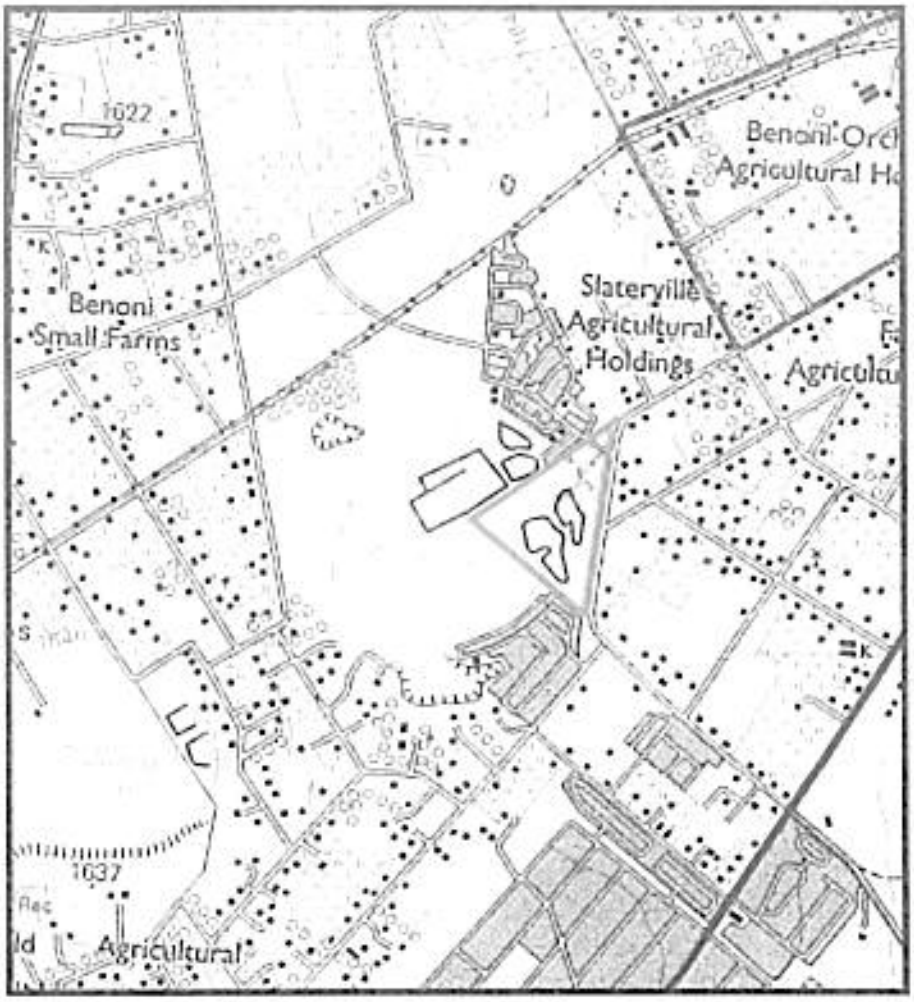
Dear Sir.

We have pleasure in submitting herewith our report as requested and as per your correspondence dated 6 February 2003 / Ref 100017/RB/jem.

This is our report on the possible habitats of Rare and Endangered Lepidoptera on the proposed township development at the indicated Rynefield Extention 51 property in Benoni, Gauteng Province. This study has been carried out in accordance with the provisions of Regulations gazetted in the Government Notice No R1183 of 6/9/1997 for the Department of Nature Conservation, of the Gauteng Province of South Africa.

Rynafield Extn 51 from Vlei Road.

The site has been visited on the 8th February 2003. by Peter Roos, Graham Henning and Keith Roos The area was surveyed to identify Lepidoptera habitats and to locate any suitable food plants. The site surrounding the pan (grassy highveld wetland biome) was surveyed during the correct flight period when the target butterfly *Metisella meninx* (Marsh Sylph) is expected to be flying.



Rynefield Extention 51 Locality Plan

SURVEY METHOD

SITE DESCRIPTION

The Site was surveyed on foot during the daylight hours of 10h00 and 13h30 during which the weather was fine and hot. The temperature reaching 30 degrees centigrade. Butterflies were identified by observation,except where there was doubt where the individual butterflies were caught using a standard 60cm handnet. Some voucher specimens were taken for specialist identification and to keep a permanent record.

Each of us transversed the property covering all land areas to identify suitable habitats and foodplants of the butterflies at least twice over the same transect.
Photographs were taken for the record of each species where possible.
The results are recorded below.

Locality

The Property is situated north of Benoni city in Gauteng on the Northwestern side of Vlei Road bounded by the existing Rynefield Extention 10 complex on the southern boundary, and Rynefield Extention 11 on the Northern boundary. The area is designated as Portion 18 of the farm Vlakfontein 69IR . Benoni.
Average Altitude 1600m ASL.
The site area studied is estimated at approximately 100 HA.
The centre of the main study area is 26 07'40"S / 28 20' 25"E.
The site is fenced and unprotected.
The area selected for the study was the immediate area around the pan shown in the diagram below.
The greater portion of the surrounding land has been used for Sand Mining previously and now left fallow allowing the land to be invaded by weeds. There appears to be very few indigenous Invertebrates on these old lands.

Geology & Soil

The site surveyed is generally in a wetland system of the East Rand consisting of a series of natural pans of the VENTERSDORP system, within the Witwatersrand system. Shale (Witwatersrand Supergroup), andesitic lava (Ventersdorp Supergroup) and other substrates where undisturbed.. The soils alongside and around the pans are sandy and may be good for agronomy, but now extensively degraded.
There are heaps of buried rubble, now overgrown by Kikuyu grass.

Climate

We classify the climate as Warm Temperate, Summer Rainfall region.
Rainfall 600-700mm p.a. Summer.
Temperature variation –11C to +38C, with an average of +17C.

Vegetation

We classify the site as Moist Cool Highveld Grassland. (Louw & Rebelo 1998)
In pristine condition Redgrass *Themeda triandra* dominates entirely plus some dicotoledonous forbes. There are a lot of exotic plants and trees around the property, some obviously purposely planted for aesthetic reasons. Kikuyu grass seems to predominate the waters edges with reeds and bulrushes. None of these are butterfly larval foodplants.

Moist Cool Highveld Grassland.

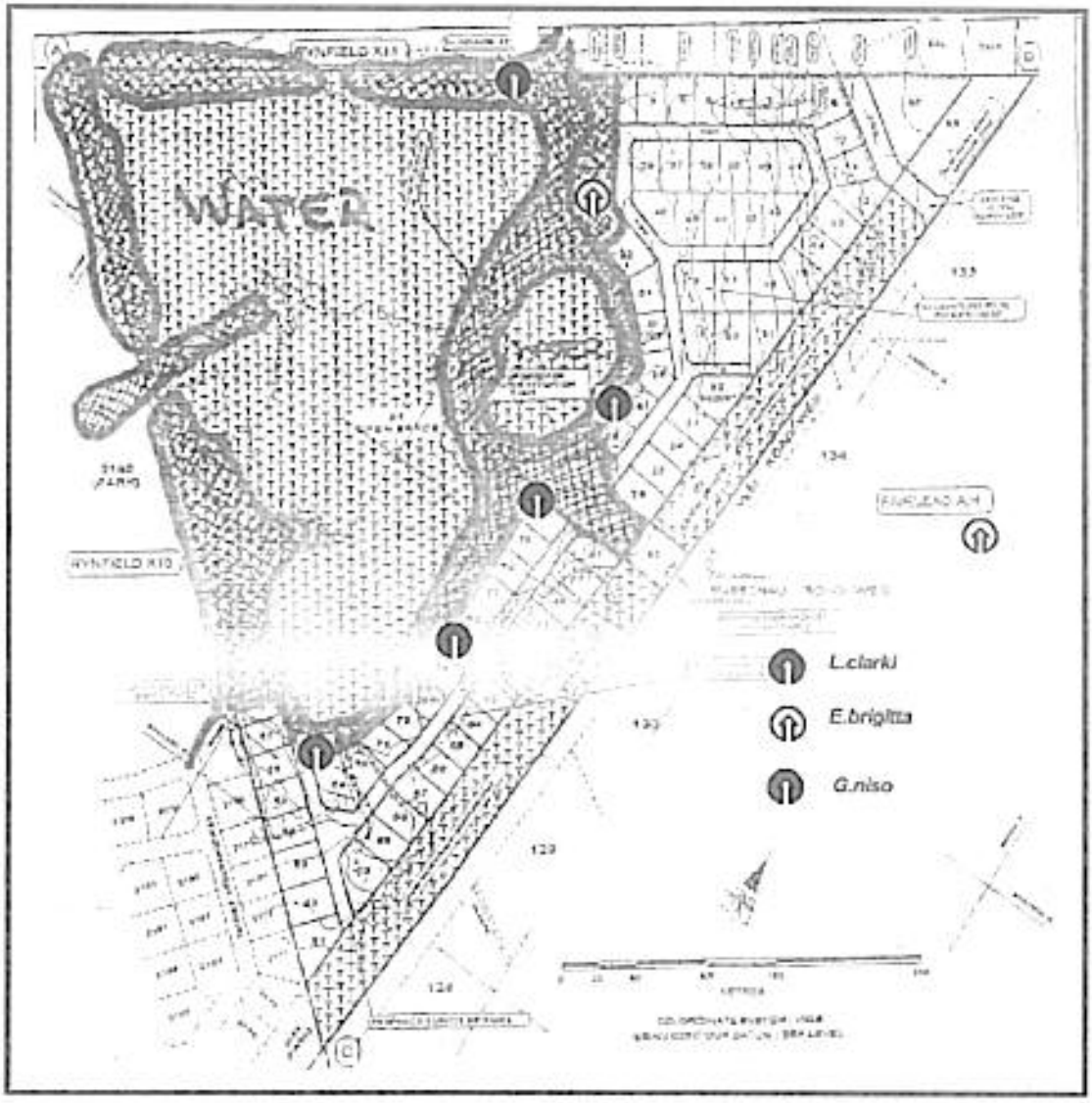
Statistics South Africa.
48959 square Km ; +/-72% transformed ; 0.29% Conserved.

SURVEY RESULTS

On the 8th February 2003 during the visit to the site no Red Data species were located. *Metisella. meninx* was not found to be present, nor was there any evidence of the foodplant *Leerzia hexandra.*

The expected emergence of *M.meninx* was generally poor during this year, probably due to the heavy rains earlier in the season and it being unreasonably hot and dry at present .

The property studied appeared not to have been burned during the winter months, judging by the dense undergrowth, which could also influence the Lepidoptera populations.



Detail of the Survey Area and main butterfly colonies.

The map above shows the approximate positions of the breeding habitats for the three most healthy butterfly populations.

The habitat was found to be unsuitable and devoid of the foodplants of the other rare butterfly species such as the Heidelberg Copper (*Chrysoritis aureus*) which feeds on *Clutia pulchella*, and *Aloeides dentatis dentatis*, which feeds on *Hermannia depressa*. The Control populations used as indicators were on the Alice Glockner Nature Reserve and Suikerbosrand Nature Reserve and the control site for *M.meninx* is a site alongside the N3 Highway close to Suikerbosrand.

Butterflies Identified

Most butterflies noted were the usual widespread or migratory species, Pieridae, (Whites) which are not under any threat in Gauteng.
No Red Data Butterfly species were identified.
Counts were done by observations and estimations during the survey.

The following list of Butterflies were seen on the property:

FAMILY	SPECIES	Common English Name
SUBFAMILY HESPERIINAE		
Gegenes Hubner	Gegenes niso niso (Linnaeus)	Common Hottentot Skipper
FAMILY PAPILIONIDAE		
SUBFAMILY PAPILIONINAE		
TRIBE PAPILIONINI		
Papilio Linnaeus		
	Subgenus *Princeps* Hubner	
	Papilio (Princeps) demodocus demodocus Esper	Citrus Swallowtail, Christmas Butterfly or Orange Dog
FAMILY PIERIDAE		
SUBFAMILY COLIADINAE		
Catopsilia Hubner	*Catopsilia florella* (Fabricius)	African Migrant or African Vagrant
Colias Fabricius	*Colias electo electo* (Linnaeus)	African Clouded Yellow or Luceme Butterfly
	Subgenus *Eurema* Hubner	

Eurema Hubner	*Eurema (Eurema) brigitta brigitta* (Stoll)	Broad Bordered Grass Yellow
	Subgenus *Belenois* Hubner	
Belenois Hubner	*Belenois (Anaphaeis) aurota aurota* (Fabricius)	Brown Veined White
Pontia Fabricius	*Pontia (Pontia) helice helice* (Linnaeus)	Meadow White
SUBFAMILY DANAINAE		
TRIBE DANAINI	Subgenus *Anosia* Hubner	
Danaus Kluk	*Danaus (Anosia) chrysippus aegyptius* (Schreber)	African Monarch
SUBFAMILY NYMPHALINAE		
Junonia Hubner / Precis	*Junonia hierta cebrene* Trimen	Yellow Pansy
Junonia Hubner / Precis	*Junonia orithya madagascariensis* Guenée	Eyed Pansy
FAMILY LYCAENIDAE		
SUBFAMILY LYCAENINAE		
Lycaena Fabricius	*Lycaena clarki* Clark and Dickson	Eastern Sorrel Copper
Tarucus Moore	*Tarucus sybaris sybaris* (Hopffer)	Dotted Blue
Eicochrysops Bethune-Baker	*Eicochrysops messapus mahallakoaena* (Wallengren)	Cuprous Blue

Although we observed a few small day flying moths, only two were recorded. There are no rare or endangered moths in Gauteng.

Please refer to the attached Appendix for the complete list of butterflies and their foodplants.

Lepidoptera Larval and Nectar foodplants Identified

The first four species are common on degraded lands.

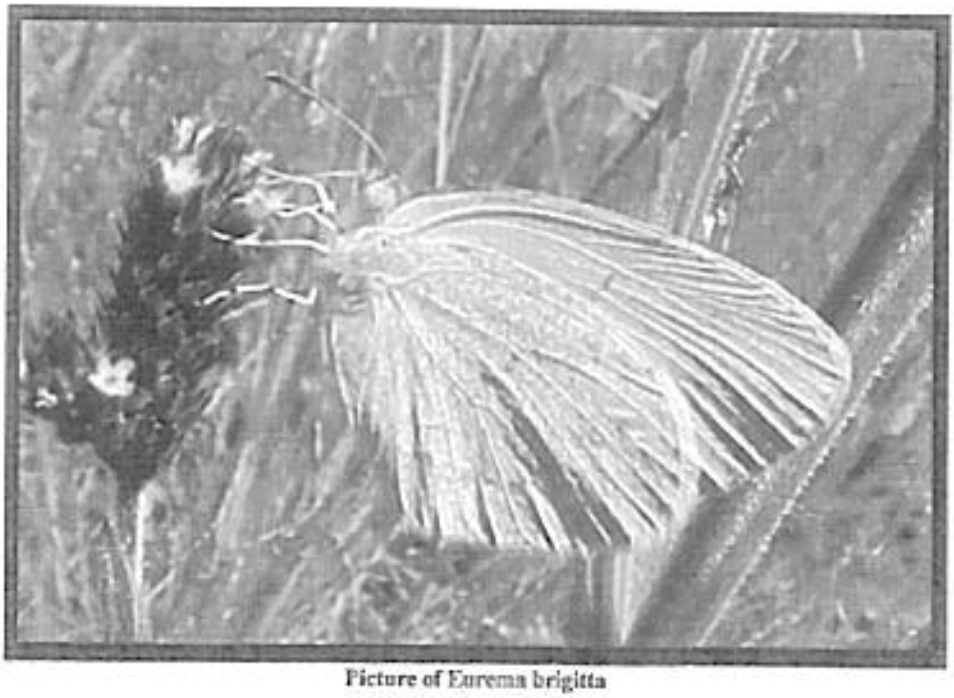
Verbena brasilliensis (nectar plant)
Rumex angiocarpus (L.clarki foodplant)
Polygonum lapathifolium (H.rahira foodplant.)
Cassai comosa (E. brigitta foodplant.)
Indigofera species ? (E.messapus mahallakoena)
Asclepias fruticosa,(Danaus chrysippus foodplant)
Pennisetum clandestinum (Kikuyu)(*G.niso niso* foodplant)
Themeda triandra) (*G.niso niso* foodplant)

The area surveyed revealed a degraded wetland / marshland with limited indigenous flora with a few flowering plants and herbs providing a source of nectar for invertebrates, Lepidoptera and Hymenoptera .

Verbena brasiliensis, nectar-plant of Pontia Helice and many other Butterflies.

Special Notes
***Eurema (Eurema) brigitta brigitta* (Stoll)**
Broad Bordered Yellow.

Eurema Brigitta was found to be the most active and abundant butterfly species at the site . There were more than 100 individuals flying, concentrated at the locality shown on the map above. They were mating and laying on *Cassai comosa* the larval food plant. The food plant was growing in abundance between the remnants of the original and undisturbed vegetation throughout the site. *Cassai comosa* is a common perennial herb species with a woody rootstock and grows in our grasslands. It was found at least 50m from the dam embankments.

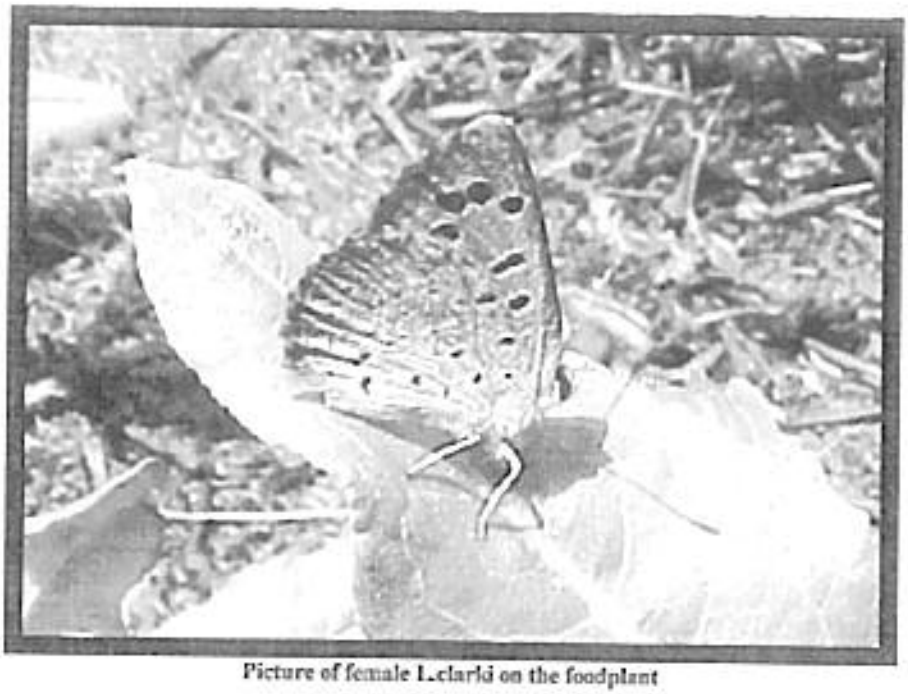


Picture of Eurema brigitta

***Lycaena clarki* Clark and Dickson**
Eastern Sorrel Copper

Lycaena clarki was found in two localities as shown on the above map.

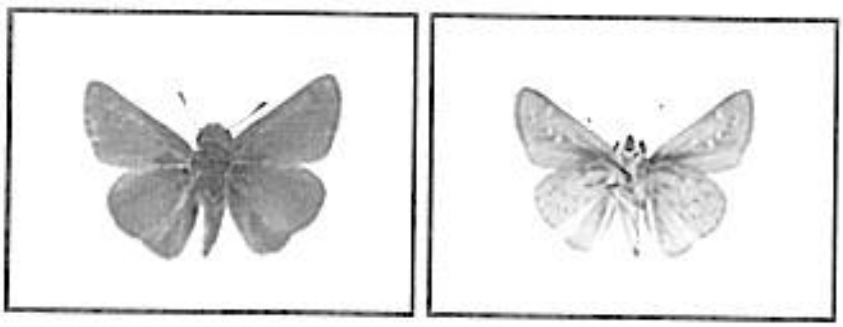
The food plant of *L.clarki* is *Rumex angiocarpus*, which is usually found within 30meters of water sources. *L.clarki* also feeds on *R.lanceolatus* and *R. crispus* which is considered a perrenial weed besides streams and water resources.
L.clarki is a wetland / marsh species of butterfly, weak flier and seldom venturing very far from it's food plant. It's distribution is widespread in the central plateau of South Africa, but recent studies reveal that the populations are dwindling as agriculture and development drain our water resources.
From recent studies by Roos and Henning, *L.clarki* and *M.meninx* never fly together as each has a particular habitat requirement. Therefore we are proposing that *L.clarki* be used as an habitat indicator where *M. meninx* does not exist. (As yet unpublished)



Picture of female L.clarki on the foodplant

Gegenes niso niso (Linnaeus)
Common Hottentot Skipper

Gegenes niso niso was found at the localities shown on the above map. *G. niso niso* displays territorial behaviour patrolling it's territory, therefore usually only seen as individuals spaced at intervals of 10 – 30meters within range of the foodplant. It flies very fast and always returns to it's selected vantage point. The foodplants *Ehrhatra erecta* (also found in disturbed habitats), *Themeda triandra*, and also recorded *Pennisetum clandestinum* (Kikuyu) and other soft grasses i.e. Poaceae.
T.triandra (Rooigras) was growing over the large portions of the site where the ground had not been disturbed. The *Pennisetum clandestinum* (Kikuyu) was in evidence over large areas nearer the dam embankments, and is expected to spread as it is an invasive species given the oppourtunity. We were unable to establish on which grass the *G..niso niso* were breeding but it is also noted as a garden butterfly where it's foodplant is available.



Picture of G.niso niso (male)

Conclusions

Biodiversity Studies

Rapid biodiversity assessment surveys, based on morphospecies or regonisable Taxonomic Units (RTU's) provides a short method of assessing habitat status. As has been demonstrated by many others, that the presence of a strong relationship exists between morphospecies and actual species richness scores and indicates a reasonable surrogate for the traditional systematic identification of samples for biodiversity monitoring. (Oliver & Beattie : Ecological Applications 6 ;1996)

In this survey it has been clearly demonstrated that the relationship between the common species of butterflies in the area and the Marsh Sylph cannot be compared, however because of the delicate and specialized habitat and nature of the Marsh Sylph being found in fairly healthy numbers around the pans at Park Haven and Blaauwpan, indicates an unsuitable water feature, artificial and degraded in spite of the abundance of avian life at the Sandpan. It can therefore be deducted that from the species of butterflies found at Sandpan, there is a limited and degraded flora sustaining diverse habitat tolerant species only.

It can be assumed that if further species studies were carried out, there would be a further relationship found between the water quality and the vertebrate diversity (there was an abundant avian diversity on the pan itself).

Biodiversity Monitoring Potential and landuse Indicators

Changes in landscape due to such activities as agriculture, fishing, urban sprawl and transportation infrastructure have been recognized for some time as one of the major causes of the loss of biodiversity worldwide.

There have been several efforts at all levels from the local to the global to develop indicators for land use that would capture the effects of changing land use patterns on biodiversity (Oregon Biodiversity Project; Heinz Center Project; WWF project; TNC and Natural Heritage efforts). However, there is no consensus framework for measuring or tracking these impacts as yet. In addition, there has been little work that attempts to link indicators of land use that are valid at the local level (i.e. the level of the individual landowner) and the regional and national level indicators that are important to the public policy debate.

The lack of a consistent measurement tool or tools (i.e., indicators) makes it difficult to assess relative impacts and direct programs towards better conservation practices. It makes it difficult for the individual decision maker to tell what steps should be taken on a particular piece of land to promote biodiversity.

We propose Invertebrate Biodiversity Monitoring Potential can be done using *L.clarki, G.niso niso and even E. brigitta* as a useful warning and monitoring surrogates for other taxa during and after the commercial development takes place in the Rynefield Extention 51 area.

Buffer Zones

Buffer zones need to be established around the pan to ensure the existing invertebrate and butterflies survival as shown in your plans of development.. this obviously includes the existing avian population

There needs to be a reasonable buffer zone established between the marsh edges and any roadways or building operations envisaged in the future.

The purpose of a buffer will also weaken the long term effects of local artificial lights on the natural environment. Yellow Sodium lights should be prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife.

Sodium lamps require a third less energy. When used in thousands of street lights, they could yield big savings -- and reductions in power-plant emissions.

Protected areas remain one of the key tools for conserving habitats and species, but as climatic conditions shift, species and habitats may also alter. It will be critical to allow for this, and to encourage the development of integrated and connected systems of protected areas to allow species and habitats to move as conditions change.

The identification of rare and endangered species is widely used as a means of campaigning for their protection.

Many modern approaches to nature conservation focus on the sustainable use of species and habitats, as most of the world's wildlife now lives in close proximity to humans and can sustain or even rely on a degree of utilisation. These relationships may change, and will change, perhaps allowing for increased utilisation in some areas, but similarly threatening wildlife as these patterns of human use and landscape change. i.e. Use of the dam for recreational activities.

We also may need to develop more innovative approaches to mitigate the impacts in certain areas. As sea levels inundate coastal lowlands, the concept of managed retreat may be an option in many areas, maintaining areas of marshes at far lower costs than maintaining hard sea defences. Similarly, plans for increasing forest cover as a means of removing carbon dioxide from the atmosphere (carbon sequestration) might also be focussed on providing new areas for wildlife. Reality is that Home owners will develop gardens and plant trees. These must be carefully planned so as not to compromise species relying on open landscapes, such as grasslands, bogs and wetlands.

The maintenance of Buffer zones will have to be a community effort to keep and maintain the quality of the buffered areas. It was noted that there was a resident on the Rynefield Extention 10 side that was using the area behind his residence as a storage area and was most untidy.

The community effort will have to include all residents surrounding Sandpan, declaring a Conservancy supported by local government.

A Robberfly taken a *E.brigitta* as prey at Rynefield Ext 51.

Corridors

If we wish to have indicators of land use, they must provide useful guidance to decision makers on actions that should be taken. In this context, the issues of ecosystem integrity and scale must be taken into account. Ecologists have known for decades that the fragmentation of environments leads to the loss of species diversity. So the question arises: how large a piece of land must be preserved in order to preserve it's biodiversity values? Some sources have suggested that units of 25,000 acres were appropriate units to evaluate,especially in a grasslands/prairie ecosystem. This size of planning unit permits management of mammals and birds. If at least 30% the land is being managed for biodiversity values, then bird populations seem quite healthy. Others suggested that quite small units, on the order of one acre can be important for the preservation of amphibians and reptiles and most Invertebrates. The general consensus that the appropriate planning size depends on the species one is interested in preserving and that progress can be made on all scales.

Possibly the most important issue of preserving systems integrity is access to open waters. The interface between water and land is important to all animals,vertebrates and Invertebrates and protecting this area may well be the best first step towards preserving it's wildlife.

There is also general recognition that the focus on animals was less useful than the focus on plants. Animals are entirely dependent on the primary production and the physical environment provided by plants, and being mobile, they have the opportunity to leave undesirable habitats. Animals are also often flexible with respect to the actual plants they associate with. For example, agricultural lands have replaced native grasses as a source of protective habitat and to a lesser extent, food for some birds. In

a similar fashion, flooded quarry sites and adjacent fields provide habitat for migrating water birds, such as the flamingos at Sandpan.
Another approach for indicators of biodiversity and land use is to focus on the issue of the functions of the ecosystem, rather than its specific components. In looking at system function, we might look at ground cover, soil fertility, the interaction of land and water and so forth. Focusing on these issues, especially as they pertain to plant species coverage and specialist invertebrates such as butterflies, might give good indicators of the environmental state of the system.

Some considerations of Biodiversity Indicators
Protection of priority habitats/species
Soil characteristics: soil health
Proximity to and protection of high priority vegetative communities
Interface between water and terrestrial habitats/buffer zones
Assimilative capacity of water and land (TMDL process); hydrological function;
Percent coverage of invasive species (within protected areas)
Road density
Percent native-dominated vegetation
Restoration of native vegetation
Adoption of Domestic Practices linked to biodiversity objectives
Distribution (patchiness; evenness, etc.)
Connectivity of native habitat

There must be Connecting Corridors left between the Township development and the other existing water sources to ensure a flow of genes and taxa between the species and also for natural dispersion of species to take place.
In an ideal situation we would encourage green corridors between the Van Ryne Dam, the Sandpan, the Bullfrog dam and the Van Ryne Goldmine Wetlands system, which is in turn connected to the Benoni lakes system. The benefits will not only be for the Inveterbrate and Vertebrate species, but also for the economic value of the area in the form of small mammals, and avian communities.
This will necessitate some in depth research and further planning for the area.

Vegetation alongside Dam : Shows the foodplants *of L.clarki* and *H. rubira*.

We hope that the information presented will add some awareness of the distribution, requirements and plight of the wetland butterflies, and will give added impetus to the preservation of these valuable areas.

DETAILS OF TARGET SPECIES

We are at present continuing the study of the Life history and conservation measures to protect the Rare Butterfly *Metisella meninx* (Marsh Sylph) in the Gauteng Province . It has now become essential to protect these Lepidoptera due to the unexpected commercial and human influences being exerted on the existing populations. In addition to the concern over the Heidelberg Copper Butterfly, Gauteng Nature Conservation has further concerns about the three other Rare species in Gauteng, ie *M. meninx* , *C. aureus* and *A. dentatis*.

The aim of Biodiversity and Invertebrate conservation is to prevent communities from becoming extinct, either locally, regionally or globally.

Many invertebrate populations are being pushed towards the brink of extinction due to the fragile nature of their survival requirements; some have already passed beyond the point of recovery. Most cases are not recorded due to lack of awareness and understanding of the requirements of invertebrate species. Ultimately the continued

exploitation of our resources and degradation of the environment will depend on the expertise of our ecologists.

Population dynamics are not the issue in butterfly conservation; it is almost entirely the well being of the habitat that is the priority. Insects interact with other insects in the environment that keeps the whole in balance. The butterfly and other insect populations are largely determined by a predator/prey ratio in which the major predators are parasitic and predatory insects. Insect communities may have an entire population turnover of a matter of weeks, compared to plant communities that have trees and seed resources that can have a turn over of many decades or even centuries. It is generally considered that the only cause in the loss of insect populations throughout the world is habitat destruction.

Conversion of natural habitats for commercial and agricultural purposes has resulted in the greatest loss of native insect populations. Not only is man directly involved in habitat destruction but also indirectly, by introducing alien fauna and flora. Alien vegetation has invaded and even destroyed large tracts of natural flora, a process which is extremely difficult to reverse and very expensive to control on a large scale. Alien vegetation usually is unsuitable as food for indigenous fauna, including our butterflies and moths. The establishment of plant invaders in existing plant communities upsets the delicate balances that operate between competitive plant communities, This usually results in the dominance of the invader species over the indigenous, usually multispecies, plant communities.

When an ecosystem has changed, either due to habitat destruction or by invasive vegetation, it is usually no longer suitable for the fauna associated with the original plant communities. There are about 650 species of butterfly in South Africa with about 16% having some level of threat. Significant is the fact that 96% of threatened species are endemic. Of these about 75% are lycaenids, most of which are ant associated in some way (Henning & Henning 1989; Henning & Henning, 1996; Henning G.A., 1997; Henning, Henning, Joannou & Woodhall,1997).

Most insects, including butterflies, often have more precise biological requirements than their food-plants. The plant must be growing in the microhabitat preferred by the butterfly and in sufficient quantities to sustain a viable population of the butterfly.

The relationship between the biological character of a butterfly species and the nature of the environment where they are found has been the subject of several theoretical strategies. The question is how to select the environmental factors controlling population dynamics that can be used in planning for species conservation and nature reserve management.

The analysis of the key biological characteristics is a method to detect the specialization of a species and hence to what environmental circumstances it is adapted. Before butterflies can be used as environmental indicators, we first have to describe the butterfly habitat in terms of relevant environmental factors.

Two of the most vital ecosystems in South Africa - the grasslands and wetlands, which make up our water catchment areas, are under considerable threat. The people of South Africa are as dependent upon the good management of these 'water factories' as are the grassland and wetland inhabitants, such as birds, plants and butterflies. Hundreds of wetlands have been drained or degraded, making them unsuitable as

habitats for wetland dependent creatures and as a source of water for human consumption. Our grasslands and wetlands are now as endangered as some of the birds, such as cranes, plants and butterflies that inhabit them. More than 60% of South Africa's grassland biome has been modified – agriculture and forestry being the major role players.

The Department of Water Affairs and Forestry acknowledges the importance of controlling aforestation in catchment regions, arresting the degradation of wetlands and grasslands and so encourages the good management of our catchmerrts.
An increasing awareness of conservation by the government coupled with the willingness of some of the timber companies to enter into conservation research with conservation bodies is a good indication that they are recognizing the seriousness of the situation and are willing to do something to rectify the problem.

Wetland butterflies

There are two South African genera that have threatened species dependent on wetlands. These are the Skipper genus *Metisella* and the Brown genus *Pseudonympha*, both genera being grass feeders. None of the above were found at the Saltpan in Benoni.
Other Wetland species are *Hyalites rahira rahi*ra (Marsh Aeraea) and *Gegenes Hottenttota* (Red Data species), which where not found at Sandpan.

QUALIFICATIONS

G.A Henning has been researching the Red Data Species *Aloeides dentatis dentatis* in the Ruimsig Entomological Reserve since its proclamation 1985. He is the author of the South African Red Data Book – Butterflies published by the CSIR in 1989.

P.Roos & G.Henning CC was registered to complete the initial study of the Heidelberg Copper Butterfly in the Heidelberg area of Gauteng in 1998 and has subsequently confirmed it's existence at five sites.

The first South African Red Data Book – Butterflies was published in 1989 and written by S.F. Henning and G.A. Henning. It was a report of the Committee for Nature Conservation National Programme for Ecosystem Research, published as the South African National Scientific Programmes Report No:158 and issued by the Foundation for Research Development, Council for Scientific and Industrial Research.

The concept of habitat conservation for insects was probably first generally accepted with this publication. The Red Data Book information was revised and updated by G.A. Henning & S.F. Henning in 1992 and 1995.

This is the result of our true and unprejudiced findings of our survey and study of the Rynefield Extention 51 Township Development site.

We thank you for the opportunity of doing this study, as it also provides valuable information towards our aim of conserving our butterflies. We also urge you to influence the developers of the property to undertake an analysis of the requirements to conserve the pan before any further decision on the development is made.

We remain at your service for any further queries or questions regarding this study or any other related EIA.

Yours Sincerely,

Peter S Roos
9/2/2003

Graham A. Henning.

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