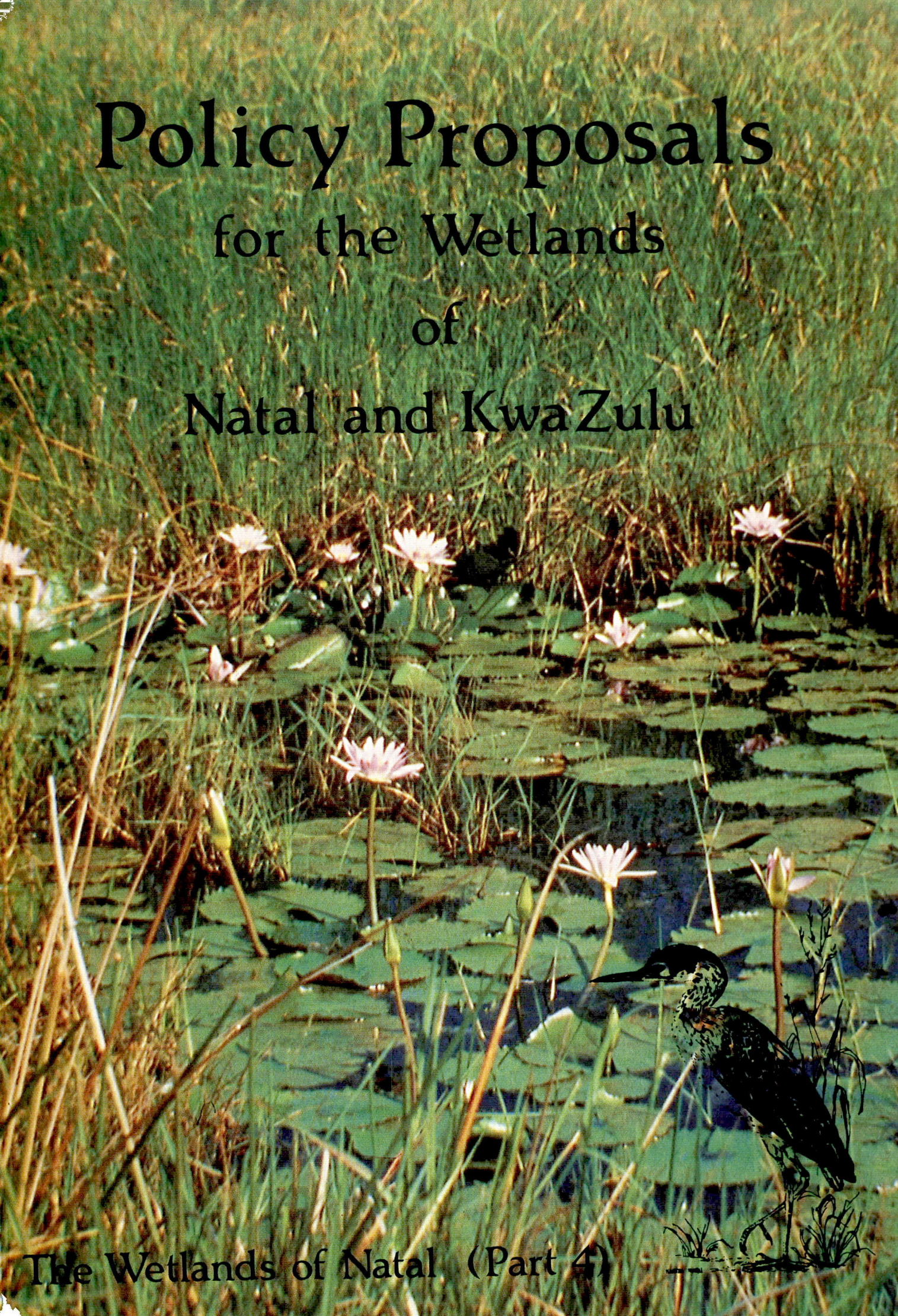
Policy Proposals

for the Wetlands of Natal and KwaZulu



The Wetlands of Natal (Part 4)

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Policy Proposals

for the Wetlands

of

Natal and KwaZulu

G. Begg

NATAL TOWN AND REGIONAL PLANNING REPORT VOLUME 75

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Foreword

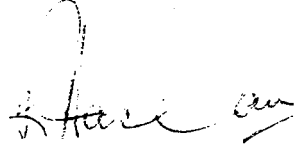
As the title implies, this report is the principal product of the *Natal Wetland Study* and, for anyone that has watched the study develop over the past six years, it should contain no surprises. The purpose of the report is to secure a commitment to the idea that wetland conservation, in our own self-interest, is imperative for economic, sociological and ecological reasons.

In the face of expanding populations and economic pressures for urban expansion, agricultural production, and other economic uses, wetlands throughout Natal and KwaZulu face continued destruction. Without government regulations and economic incentives to counteract these pressures, our wetland resources will continue to be threatened. The Natal Town and Regional Planning Commission hold the conviction that intelligent stewardship of the environment is our prime responsibility, and that government and non-government organizations must work together to protect our remaining wetlands and their resource values.

Indeed, to rectify the steady erosion of wetland resources in Natal and KwaZulu we should take advantage of our improved understanding of wetlands, we should explore ways of restoring wetlands, and consider *increasing* the wetland resources.

The conclusions and recommendations that are contained in this report therefore, not only provide a focus for ensuring the conservation of wetland resources, but also create a more efficient policy context within which the economic and social needs of the country can be met.

To bring these ideas to reality is now up to the so-called decision makers. This will require individual sacrifice, a commitment of funds and a grave long term commitment. However, given the spirit of co-operation that was forthcoming from the large number of organizations and individuals that helped to formulate this policy statement, we are convinced that it can be done and that it must be started as soon as possible.



R. HASLAM

Acting Chairman, Natal Town and Regional Planning Commission

Executive Summary

Cross Reference

This report represents the culmination of a six year research project on freshwater wetlands which was initiated in June 1984 by the Natal Town and Regional Planning Commission in conjunction with the Department of Environment Affairs. The purpose of this report is "***to develop and to ensure the implementation of sound, broadly supported recommendations on how the existing wetland resources of Natal and KwaZulu could best be conserved and managed and, where appropriate, to establish how the functions and values of degraded wetlands could be restored***". *pg 11*

Representatives from 13 different government agencies and 9 different private sector organizations, collectively referred to as the *Wetland Steering Committee*, were involved in the policy formulation process. Regular meetings of the Committee were called to review successive drafts which, although largely based on policy initiatives developed in the USA, were tailored to suit the circumstances peculiar to the wetlands of Natal and KwaZulu. *pg. 3 and 4*

After 3 Steering Committee meetings and 5 Technical Sub-Committee meetings, consensus was achieved in respect of the following:

Wetland definition

Wetlands are to be regarded as "***those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions***". *pg. 13*

Incentives for private protection of wetlands

The Wetlands Steering Committee strongly endorses the use of non-regulatory programmes for wetland conservation, and *recommends* specifically:

- That the *Natal Provincial Administration* promotes a coherent programme of incentives which encourages and assists the private sector to exercise its social responsibility towards wetland conservation, whilst preserving a reasonable return on its investment. *pg. 21 – 23*
- That the *KwaZulu Administration* establishes an innovative programme of incentives which encourages and assists tribal authorities and individuals to exercise their responsibility towards wetland conservation. *pg. 22 and 24*
- That *market values* for different types of wetlands be established for the purpose of negotiating subsidies and servitude agreements. *pg. 18*
- That government should *recompense landowners* who enter into long term and permanent wetland servitude agreements. *pg. 18*

- That a *Wetlands Protection Trust* be established, and registered members of the Trust who make an investment in wetland conservation (either through donations of property or money), become eligible for tax relief. The Trust should offer a prestigious annual award to individuals and organizations outstanding in their efforts to conserve wetlands.
- That all government agencies should examine their full range of development controls to identify and modify those that unintentionally promote wetland alteration. Among other things, *improved planning* at the scale of farm development is implied. *pg. 29 – 37*
- That in order to protect regional water supplies, to reduce non-point source pollution and to trap sediment transported from adjacent uplands, the value of the existing *government subsidy* available to convert marginal ploughed lands to perennial pasture be substantially increased by the Department of Agricultural Development. *pg. 18 and 19*
- That in order to stimulate increased public interest in the private and communal conservation of wetlands, the Natal and KwaZulu Administrations should diligently expand their *education and public outreach programmes* concerning the ways and means of optimising resource values. *pg. 23*
- That financial institutions such as the *Land Bank* and the *Development Bank of Southern Africa* be requested to consider making *loans* available for farmers conditional upon the conservation of wetlands. *pg. 19*

Improving government protection of wetlands

The Wetlands Steering Committee strongly endorses the need for improving wetland regulation at all three levels of government, and urges that central government take the lead by developing a more coherent and consistent wetlands management effort.

More specifically, it is *recommended* that:

- In the interests of society, a *joint statement* by the *Administrator of Natal* and the *Chief Minister of KwaZulu* be issued which urges each agency within the Natal and KwaZulu Administrations to take the necessary action to minimize the injudicious destruction, loss or degradation of wetlands within its area of jurisdiction.
- The Directorate of Resource Conservation (Department of Agriculture) clarify and co-ordinate the *roles and responsibilities* of all government agencies responsible for wetland management in Natal. *pg. 73 – 85*
- The **Conservation of Agricultural Resources Act (Act No. 43 of 1983)** be revised to *eliminate existing inconsistencies* and to reduce the chance of misinterpretation. Above all else, provision should be made to ensure that all forms of wetland alteration be planned in accordance with the Integrated Environmental Management (IEM) procedure advocated by the Council for the Environment. *pg. 30 – 32*
- In developing *wetland management plans* the Department of Agricultural Development consult with the full range of agencies with an interest in or responsibility for the maintenance of wetland functions.
- With a view to improving the co-ordination between the activities of the agencies involved in development programmes which could

directly or indirectly affect wetlands, the KwaZulu Government formally constitutes an *Interdepartmental Conservation Liaison Committee.*

- The Department of Water Affairs and the Branch of Forestry and Environmental Conservation of the Department of Environment Affairs adopt a comprehensive set of *policies to control the impacts of altering the hydrology* of wetlands. It is strongly *recommended* that the *Central Committee for the Allocation of Afforestation Permits* be expanded to include representation from all agencies with a responsibility towards the conservation of soil, water and wildlife resources in Natal and KwaZulu. The present grounds for refusal to issue an *Afforestation Permit* must be expanded to take into account issues other than just a reduction in mean annual run-off. *pg. 29 and 30* *pg. 32 and 33*
- The State should recognize wetlands as a beneficial use of water. To ensure that the water cleansing function of wetlands is fully utilized, for example, the **Water Act, No. 54 of 1956** needs to be revised to ensure that all wetlands are regarded as "*public water*" instead of "*private water*". *pg. 33 and 34*
- The Department of Environment Affairs consider *acquiring priority wetlands* which comply with the objectives of the *Southern African Plan for Nature Conservation* and the *South African Natural Heritage Programme.*
- In order to protect key wetland types and values, the Natal Parks Board and the Bureau of Natural Resources (KwaZulu) *review its inventory* of wetlands in order to identify current holdings and gaps where additional wetlands should be acquired. Serious consideration should be given to the introduction of legislation which is specifically designed to prevent the alteration of habitats known to be critical to the survival of certain species of wildlife. *pg. 45 and 46*
- Due to high cost of law enforcement, the government should mount a *publicity campaign* that deliberately draws attention to the rights of private citizens and public interest groups to notify the government agencies responsible for wetland management of wetland abuse.
- All government agencies and private contractors recognize that wetlands are areas totally *unsuited* to unplanned *solid waste disposal.* *pg. 34 and 35*
- Far *more explicit* and *comprehensive legislation* needs to be drafted which is specific to wetlands. Provision must be made for the authorization of a *Priority Wetland Conservation Plan* to guide acquisition efforts, and the completion of a countrywide wetland inventory. Care must also be taken to ensure all forms of physical and non-physical forms of alteration are addressed. *pg. 37* *pg. 54*
- That, in areas other than KwaZulu, **Section 16** of the **Environment Conservation Act No. 73 of 1989,** is used, if need be, to declare priority wetlands as "*protected natural environments*".

The sustainable use of wetlands

Agricultural management policies

The Steering Committee *recommends* that as a matter of policy: *pg. 30 – 32*

- wetland utilization should meet all the requirements of the **Conservation of Agricultural Resources Act No. 43 of 1983;**

- agricultural use is planned so as to ensure that at least the minimum water requirements of wetlands are met. This includes the volume, rate, timing, direction and quality of water flow;
- wetland areas representing important habitats are managed to maintain and enhance their natural values;
- construction of flood protection works such as levees are discouraged. If built, their construction should be subjected to application of the IEM procedure;
- a review for wetland alteration based on the IEM procedure advocated by the Council for the Environment be established. This should be achieved through group consultation among specialists, and economic analysis of both the on-site and off-site consequences of wetland alteration should be undertaken to evaluate all of the implications;
- depending on soil type, alteration should be restricted to wetlands with a slope gradient of less than 1,5%. Furthermore, should the surface drainage of wetlands be undertaken, plans for re-instatement of the original moisture regime (if known or required) must be provided; and
- where cultivation of wetlands is permitted, provision should be made for protective strips of vegetation to remain along drainage lines. Where possible, ploughing should always be undertaken at right angles to the direction of streamflow.

Silvicultural management policies

The Steering Committee *recommends* that the guidelines recently defined by the Forest Industry be adopted wherein it is suggested that: *pg. 32 and 33*

- all wetland areas should be demarcated, defined and identified; *pg. 45*
- management practices which ensure the proper functioning of wetlands must be introduced; and
- the Industry should abide by the provisions and conditions of the **Forest Act, No. 122 of 1984**, and give particular emphasis to defining the margin around wetlands which should remain unplanted.

Wildlife management policies

Wildlife protection is recognized as one of the major beneficial uses of wetlands in Natal and KwaZulu. Consequently, the Steering Committee *recommends* that wherever practicable:

- wetlands be protected to maintain their value as wildlife production areas;
- selected areas representative of each type of wetland in Natal and KwaZulu be designated by conservation agencies as nature reserves and witness areas;
- management strategies are designed to conserve the diversity of plant and animal species occurring in wetland areas;
- professional advice be sought before the alteration of any wetland is undertaken; and

- the deliberate introduction of alien plants and animal species into wetlands be avoided or, at least, preceded by an environmental impact study. Where already established, steps necessary to control or eliminate undesirable alien species should be taken.

Water resource management policies

The Steering Committee *recommends* that:

- wetland managers come to regard the maintenance of hydrological processes as a critical element of the wetland conservation effort in Natal and KwaZulu; *pg. 29 and 30*
- all activities which could result in a major reduction or increase in the flow regime of rivers delivering water to wetlands be investigated and assessed. If found to be potentially damaging, the activities in question should be regulated as far as possible; *pg. 33 and 34*
- only under exceptional circumstances should the "keypoint" controlling the exit of water from functional wetland areas be interfered with;
- waste water should not be discharged in wetland areas unless it complies with the latest gazetted standards laid down by the **Water Act, No. 54 of 1956**, unless the implications are understood and acceptable, and unless proper waste load studies have been undertaken;
- wetland protection should be seen as an essential component of integrated catchment planning, and that the conservation of soil and water in the catchment is just as important, if not more so, than the management of wetlands *per se*;
- the modification of wetland areas, by dam construction for example, is not permitted without application of the IEM procedure; and
- where permits for dams are being considered (in terms of **Section 9B** of the **Water Act, No. 54 of 1956**) wetland functions and values are taken into account in the planning, location, construction and operation thereof.

Development planning policies

The Steering Committee *recommends* that all branches of the Natal and KwaZulu Administrations accept that where demonstrated to be in society's best interest: *pg. 35 and 36*

- wetlands should be protected from conditions that reduce wildlife habitat, water-holding capacity, and water quality;
- land management systems are needed (such as protective zoning) that demonstrate and encourage wetland protection;
- drainage filling and interference with wetlands, as well as with the sources of water supplying them, be avoided to the greatest practicable extent;
- approval for developments in wetlands are subject to application of the IEM screening procedure;
- an inventory of areas designated as wetlands should be compiled and distributed to all branches of the Natal and KwaZulu Administrations.

In the case of priority wetlands, the appropriate landowners should also be notified; and

- wetlands be taken into consideration in the location, design and construction of all roads. If feasible, transport systems must either be located in such a way as to avoid wetlands, or designed and constructed to minimize the alteration of wetlands.

Waste disposal policies

The Steering Committee *recommends* that the views of the Institute of Waste Management of Southern Africa be adopted. These are that: *pg. 34 and 35*

- wetlands are not used for the disposal of solid waste of any form;
- in the case of soundly engineered and well managed landfill sites the discharge of leachates into wetlands may be acceptable under closely monitored circumstances. At the first significant sign of pollution the site should be closed down; and
- biologically damaging shock loadings of landfill leachates are avoided at all costs.

Wetland restoration and creation

In order to promote the concept of re-establishing wetlands in areas where they formerly existed before being eroded or otherwise converted, the Steering Committee *recommends* that: *pg. 50*

- The Department of Agriculture should provide the technical and financial support to encourage restoration of wetlands on private land.
- The Department of Agriculture and Forestry (KwaZulu) should provide the technical and financial support to encourage and restore wetlands on communal land.
- The Department of Agricultural Development should actively promote the rehabilitation of degraded wetlands through the existing soil conservation subsidy scheme.
- Guidance materials and a training programme should be prepared for individuals wishing to implement wetland restoration projects.
- After construction is complete, all restoration projects are monitored to evaluate the ability of the restored wetland to provide the functions intended.
- A research programme co-ordinated by the Department of Environment Affairs should be initiated to improve the scientific understanding of wetland restoration.
- The government should consider acquiring the damaged portions of priority wetlands that have the potential for restoration and enhancement.

Chapter 1

Introduction

In June 1984, with financial support from the Department of Environment Affairs, the Natal Town and Regional Planning Commission (NTRPC) initiated a six year research project which was to address the major conservation concerns of freshwater wetlands in Natal and KwaZulu.

The project was to be expedited in four phases:

- *Phase 1* (June 1984 - December 1985)

  Aimed at producing a report on the extent, role and present status of wetlands in Natal and KwaZulu (Begg, 1986).

- *Phase 2* (January 1986 - June 1987)

  Aimed at conducting an inventory of wetlands in the Mfolozi catchment (Begg, 1988).

- *Phase 3* (July 1987 - March 1989)

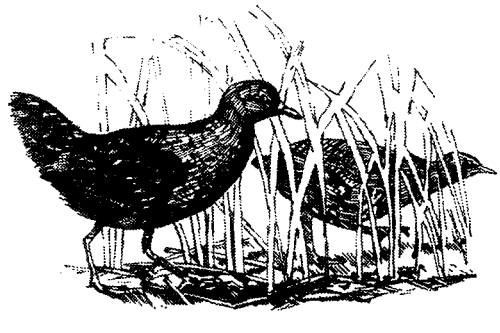
  Aimed at describing the location, status and function of the priority wetlands in Natal and KwaZulu (Begg, 1989).

- *Phase 4* (April 1989 - March 1990)

  Aimed at the formulation of a wetland policy statement.

When complete this report will be the last of the series on the "*Wetlands of Natal*". Its purpose (see Section 4.2) is "*to develop and to ensure the implementation of sound, broadly supported recommendations on how the existing wetland resources of Natal and KwaZulu could best be conserved and managed and, where appropriate, to establish how the functions and values of degraded wetlands could be restored*".

The consultation process (Fig. 1) by which consensus over the question of wetland management is to be derived, is probably more important than the policy itself. The reason for this is because during the process outlined, as many perspectives about wetlands as possible are taken into account, and drawn into, the policy formulation process. Through interaction of the parties concerned, commitment to implementation of the policy is also strengthened.



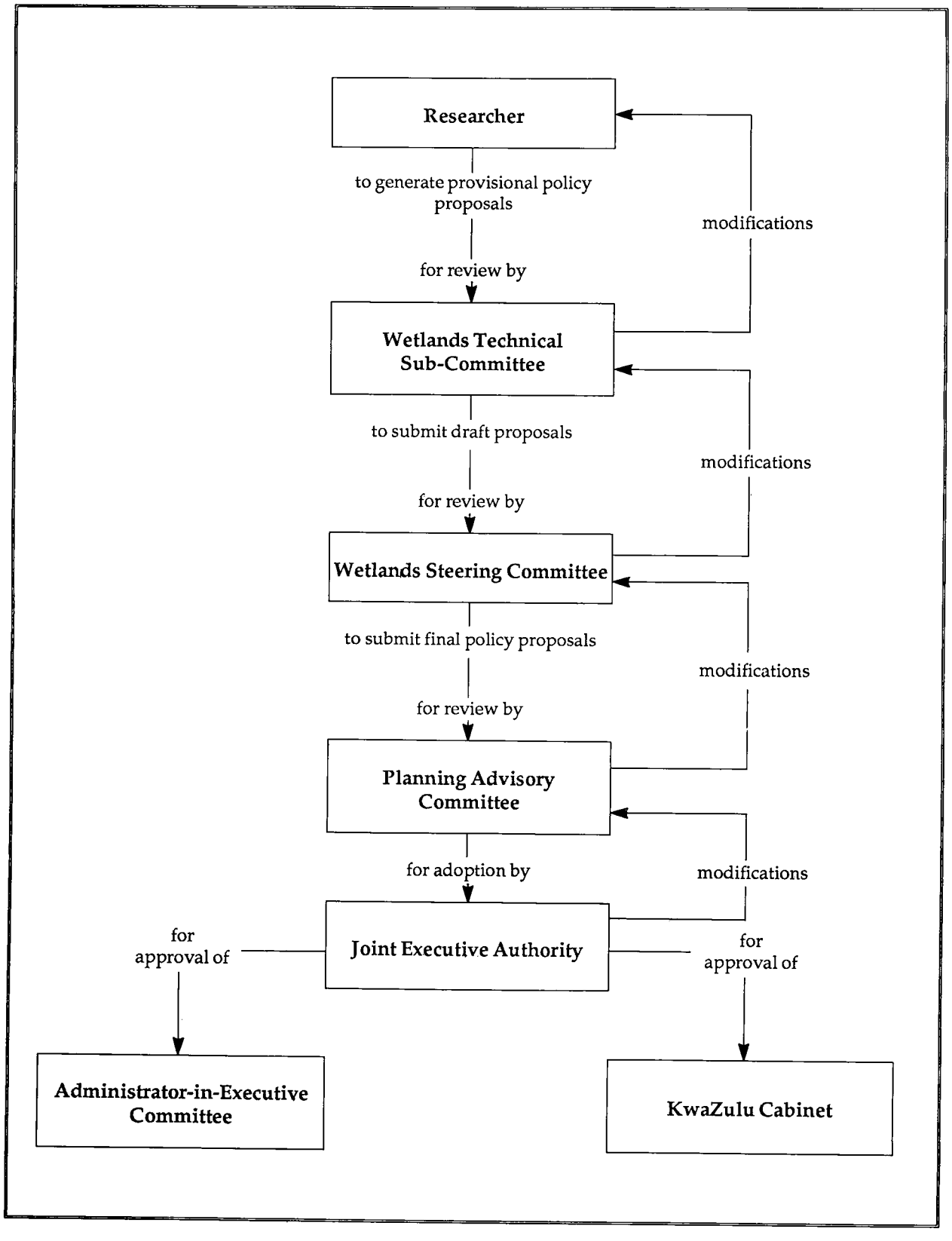


Fig. 1: The proposed policy formulation process.

Chapter 2

Wetlands Steering Committee and Technical Sub-Committee

2.1 Steering Committee

The members of the Wetlands Steering Committee have been deliberately chosen from a wide range of disciplines such as provincial legislators, local officials, the heads of government agencies, executive officers of various public interest and business groups, private citizens, farmers and academics.

The reason for doing so is because the functions and values of wetlands are widely felt, both directly and indirectly, at all levels of society. Furthermore, it is now acknowledged in many parts of the world that planning for the effective and coherent management of wetlands can only be achieved through consensus, and a multi-disciplinary approach to decision-making.

The Steering Committee comprised:

Commission Members

Mr R. Whiteley (*Chairman*)
Mr A.K.I. Akoo
Mr R. Haslem

Member of Provincial Executive Committee and Joint Executive Authority

Mr C.J. Pierce

Member of Parliament

Mr R.S. Schoeman

Director of Land Usage

Mr A.M. Little (*representing Director-General*)

Natal Town and Regional Planning Commission (staff members)

Mr J.B. Anderson (*Chief Town and Regional Planner*)
Mr P.Curry
Mr M. Underwood (*Secretary*)
Mr J. van der Vegte

Natal Municipal Association

Councillor C.H. Wilkins (*President*)

Regional Development Advisory Committee

Mr C. Proctor (*Director*)

Department of Agriculture

Mr C.H.B. Theron (*Deputy Director, Directorate of Resource Conservation*)

Department of Agricultural Development

Mr S.D. le Roux (*Deputy Director, Extension*)

Department of Water Affairs

Mr J.G.G. Hansmann (*Regional Director*)
Mr J.C. Perkins (*Deputy Chief Engineer (Water Supply), Natal*)

Department of Environment Affairs

Mr G. Cowan
Dr D.W. van der Zel (*Senior Specialist Scientist, Forestry*)

Department of Development Aid

Mr P.F. Jordaan

Department of National Health and Population Development

Mr R.D. Winter

Natal Roads Department

Mr R.A.F. Smith (*Executive Director*)

Natal Parks Board

Mr J. Alletson (*representing the Director*)

Department of Agriculture and Forestry (KwaZulu)

Mr E. le Roux (*Acting Secretary*)

Bureau of Natural Resources (KwaZulu)

Mr N. Steele (*Director*)

Natal Agricultural Union

Mr A.M. Bosworth-Smith

Private Sector

South African Timber Growers Association represented by Mr M.J. Melle (*HL&H Timber*)
Lion Match Company represented by Mr H. Churchill (*Chief Forester*)
Umgeni Water Board represented by Mr W.N. Richards (*Director: Scientific Services*)
South African Sugar Association represented by Mr G. Platford (*Head, Farm Planning Division*)
Division of Water Technology (CSIR) represented by Mr W. Scott
Institute of Waste Management of Southern Africa represented by Mr R. Lombard (*Vice-President*)

Environmental Groups

Wildlife Society of Southern Africa represented by Mr K. Cooper (*Director, Conservation*)
South African Ornithological Society represented by Mr H. Wilson (*Chairman*)

Academic Experts (University of Natal)

Prof. N. Tainton (*Pasture Science*)
Prof. C. Breen (*Institute of Natural Resources*)
Prof. J.R.L. Milton (*Faculty of Law*)

2.2 Technical Sub-Committee

In between meetings of the Steering Committee, formulation of the policy was supervised by a Wetlands Technical Sub-Committee, comprising:

Chairman

Prof. C. Breen (*INR*)

Secretary

Mr P. Curry (*NTRPC*)

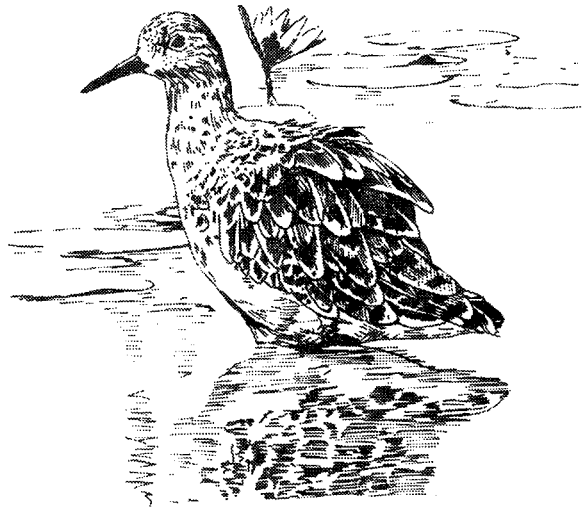
Members

Mr J.B. Anderson (*NTRPC*)
Mr W. Russell (*DAWS*)
Mr J. Alletson (*NPB*)
Mr R.A. Conant (*BNR, KwaZulu*)
Mr H. Dixon-Paver (*DWA*)

2.3 Consistency with overseas policy proposals

In the latter half of 1988, the *United States National Wetland Policy Forum* issued its final report to the US Congress on policies for improving the regulation and management of wetlands in the United States of America (USA) (Conservation Foundation, 1988). An operational draft of these proposals was obtained during a study tour of the USA in June 1988.

Therefore, although tailored to suit the circumstances that are peculiar to wetlands in Natal and KwaZulu, the policy proposals which follow have been based on the latest initiatives developed in the USA.



Chapter 3

The Wetland Problem

Until recently, the traditional view that held throughout the world of "*wetlands as wastelands*" (Maltby, 1986) was equally prevalent in Natal. For example, forty years ago the government encouraged wetlands such as the Mfolozi swamps to be drained and converted to purposes considered to be more useful (Department of Irrigation, 1948). The wholesale drainage of wetlands for urban and industrial development on the outskirts of Durban, Pietermaritzburg and Richards Bay was condoned and subsidized (Begg, 1978), and as recently as 1980, agricultural techniques deliberately designed to convert wetlands to alternative uses were being developed by the then Department of Agriculture and Fisheries (Hill *et al.*, 1981).

Events of this nature are understandable when one considers that wetlands are frequently the only large, flat, centrally-located parcels of land available near metropolitan areas. Furthermore, the demand to produce sufficient food for the ever-growing population in South Africa necessitates at times, the exploitation of resources that have alternative values. It is also understandable that, from a farmer's perspective, the land that wetlands occupy and the water that wetlands contain are resources that can be used to better their livelihood.

The problem is simply this. When the number of wetlands throughout Natal and KwaZulu that have been converted to agriculture, dams, plantations of exotic trees, and waste disposal sites, or ruined through overgrazing is quantified, the end result is that over half of Natal and KwaZulu's wetland resource base has disappeared (Begg, 1988).

In short, public awareness of the multiple values of wetlands in Natal and KwaZulu is sadly lacking, the agencies responsible for management of Natal and KwaZulu's wetland resource base have not been clearly defined, and what little legislation exists, is both cumbersome and ineffective (Begg, 1986). To complicate matters further, the agencies concerned have too few resources at their disposal to remedy the situation, and are too sectoral in their thinking.

3.1 Wetland functions and values

A review of the major functions and values of wetlands is seen to be necessary to remind decision-makers that "*... the strain on future resources of this country (such as freshwater) means that in the face of exponential population growth* ***man's dependence upon wetlands is steadily increasing***" (Breen and Begg, 1989).

3.1.1 Hydrological functions

It is generally accepted that wetland functions are closely linked to hydrology, but this does not mean to say that the hydraulic and hydrologic characteristics of wetlands are well understood (Sather and Smith, 1984).

- *Flood attenuation*

  Riverine wetlands often form natural floodways that convey floodwaters from upstream to downstream locations (Plate 1).

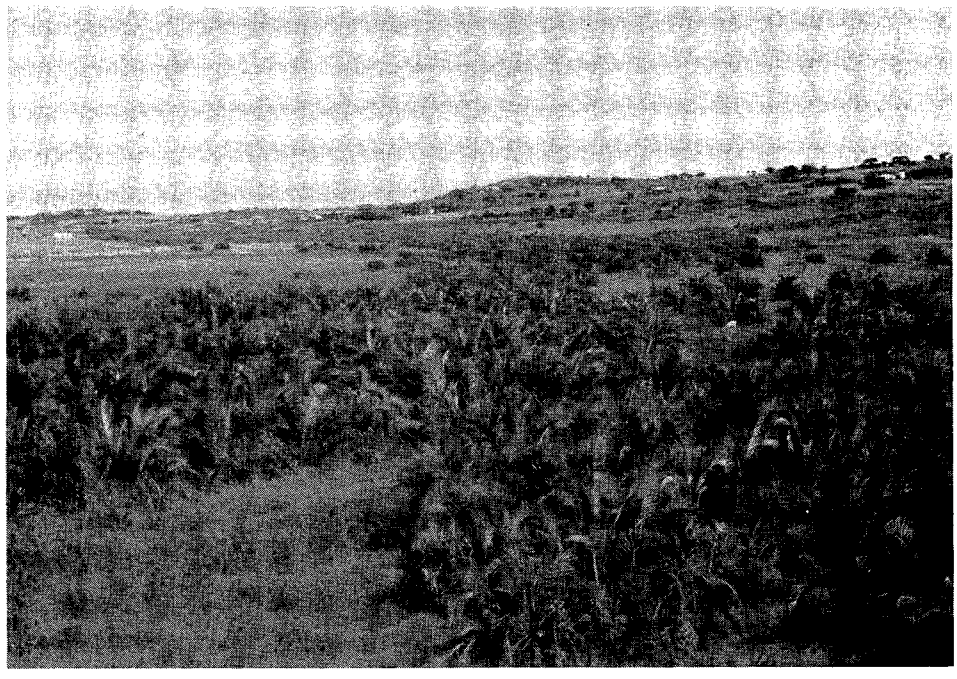


Plate 1: Wetlands fringing the course of a river perform the important function of controlling the movement of water within a catchment. Even a 3 m wide wetland alongside a river can significantly reduce erosion, increase sedimentation and purify water passing through it.

There is general agreement that wetland basins which are not already filled to capacity with water will perform a flood attenuating function. In other words, wetlands associated with streams and rivers will slow floodwaters and reduce flood peaks (Verry and Boelter, 1978).

- *Flood storage and streamflow regulation*

  It has been shown that inland wetlands store water during floods and slowly release it to downstream areas, thereby regulating the duration of streamflow (Schulze, 1979).

- *Groundwater recharge and discharge*

  The groundwater recharge function of wetlands is by no means clear, but there is good evidence to show that many wetlands serve as groundwater discharge areas (Linder and Hubbard, 1982).

- *Dissipation of erosive forces*

  It has been recognized for a long time that the vegetation associated with wetlands reduces the velocity of floodwaters, and thereby controls erosion (Dean, 1978) (Plate 2).

3.1.2 Water quality functions

Wetlands contribute substantially to improving water quality by removing excess nutrients, various toxic substances, many chemical contaminants and sediment.

- *Nutrient removal*

  Wetlands function in varying degrees as "*nutrient traps*" (Adamus, 1983; Rogers *et al.*, 1985). In other words, wetlands receiving water laden with an excess of substances such as nitrogen and phosphorus (nutrients) usually demonstrate high removal efficiencies.

Plate 2: Wetlands play a crucial role in the alteration of surface run-off because of the extent to which they influence the infiltration and interception of rainfall.

- *Toxic substances*

  Through chemical and/or biological processes of various kinds, toxic substances such as some heavy metals and pesticides that are introduced into wetlands, can be changed to a harmless, non-toxic state (Snyder and Snyder, 1982), or at least detained in the wetland.

- *Sediment removal*

  The reduction in the velocity of flowing water as it enters or passes through a wetland causes the release of sediment being transported by the water (Alexander, 1978) (Plate 3).

3.1.3 Habitat functions

It is well known that wetlands provide habitat for a wide variety of plants and animals (Weller and Spatcher, 1965). Certain animals are completely dependent on wetlands for their life requirements, whilst others use wetlands for only part of their lives. Today, the maintenance of genetic diversity is also an internationally accepted principle (IUCN, 1980).

- *Wetland dependent species*

  In Natal approximately 144 wildlife species are regarded as wetland dependent (Bourquin, pers. comm.*).

- *Rare and endangered species*

  Many of the animal species that are listed in the South African "Red Data" book series as endangered are wetland-associated (Siegfried *et al.*, 1976; Skinner *et al.*, 1977; McLachlan, 1978; Skelton, 1987).

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* Dr O. Bourquin: Natal Parks Board, P.O. Box 662, Pietermaritzburg, 3200.

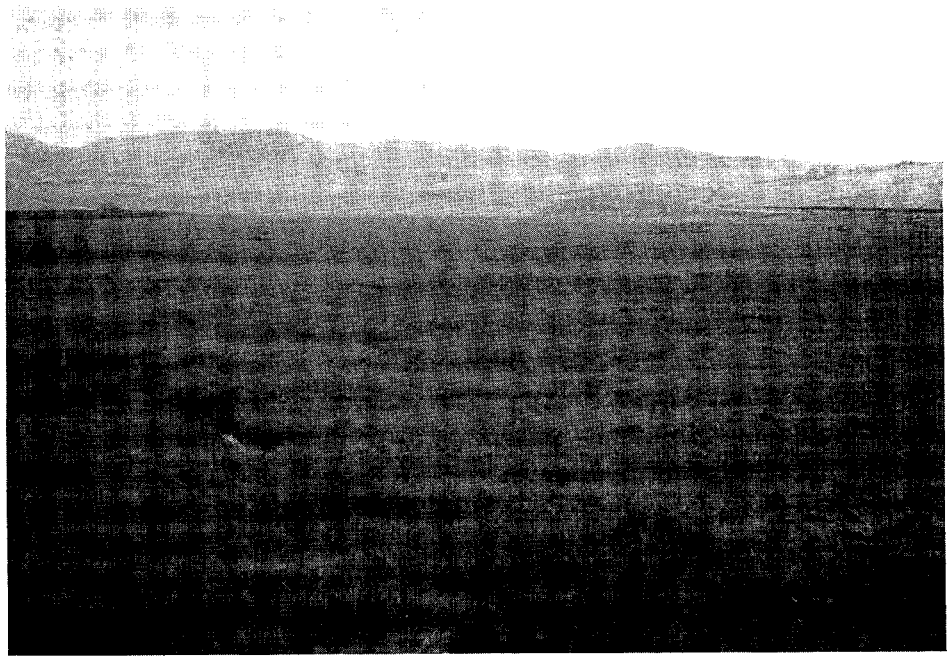

Plate 3: Wetlands are ecosystems where the dominant factor is a regular or seasonal abundance of water. The retardation of run-off by dense vegetation and low gradients enables flood peak and sediment loads to be dramatically reduced.

- *Food chain support*

  Because of their high natural productivity, both tidal and inland wetlands provide sources of nutrients which support many forms of wildlife.

3.1.4 Socio-economic functions

It is known that a variety of harvestable resources are produced in association with wetlands in Natal and KwaZulu (e.g. from the Muzi swamp, Cunningham, 1985). It is also known that wetlands serve as *recreation* sites for fishing, hunting and observing wildlife; that wetlands provide *educational* opportunities for nature observation and scientific study; and that wetlands provide *open space* for recreational and aesthetic enjoyment (Plate 4).

3.2 Wetland alteration

The wetland inventory of the Mfolozi catchment provides the only information available at present on which to judge the extent of wetland alteration in Natal. It was estimated that 58% of the original wetland area (502 km^2) has been altered or destroyed, and that only 2% of this 10 000 km^2 catchment is presently occupied by functional wetlands. Elsewhere, in parts of the Tugela basin (Scotney, 1978) and the Siyaya catchment (Begg, 1986) for example, it has been shown that over 90% of the original wetland resources have been lost.

The Mfolozi inventory (Begg, 1988) provided some information on the causes of wetland losses in Natal and KwaZulu, and of the likely consequences downstream. The causes ranged from factors such as excessive human and livestock population pressures and inappropriate forms of land use in the catchment area surrounding wetlands, to destabilizing factors associated with direct interference with wetlands.

Plate 4: Wetlands are integral parts of river systems. When altered indiscriminately, the results are serious and predictable. Natal and KwaZulu therefore have an international responsibility to maintain resources whose importance transcends political boundaries.

The downstream consequences were listed as follows:

- an increased incidence of and severity of downstream flooding and river flow cessation;
- reduced winter flows;
- lowering of the water table;
- higher sediment loads;
- poorer water quality;
- increased bank erosion;
- further habitat deterioration;
- threatened wildlife resources;
- lower agricultural productivity; and
- a lower quality of life for rural communities.

Although there is still much to be learnt about the question of wetland conversion and alteration, there are many indications that wetland alteration is continuing. Therefore, the challenge before us firstly, is to reverse the trend in wetland loss, but to do so in a way that supports a healthy economy. Secondly, it is to develop a wetland management strategy which will ensure that the important functions and values of wetlands are maintained, even in the face of development.

Chapter 4

Overall Goal

4.1 Background

For the purpose of formulating a coherent wetland policy the first requirement is a clear, unequivocal *overall goal.*

Ideally the goal must be specific enough to ensure that the relevancy of each step taken during policy formulation can be tested for consistency, and to ensure that society's needs at a local and regional level, are met. The goal must also be able to endure political change and to accommodate sustainable development. Finally, the overall goal should be equitable and implementable with the least disruption to established social and economic norms.

4.2 Recommendation

The Steering Committee *recommends* that the *overall goal* of the wetland policy statement is:

> ***"To develop and to ensure the implementation of sound, broadly supported recommendations on how the existing wetland resources of Natal and KwaZulu could best be conserved and managed and, where appropriate, to establish how the functions and values of degraded wetlands could be restored."***

One of the advantages of adopting the above-mentioned goal will stem from the resulting dialogue between all the parties interested in wetland conservation. It implies that a balanced approach to decision-making will be adopted by weighing all the costs and benefits to society, and that the optimal allocation of wetlands needed to maximize society's welfare, will be identified.

Finally, it is further recommended that as a means of achieving the *overall goal,* the Steering Committee consider adopting the following *policy objectives,* drawn from the "Convention on Wetlands of International Importance, especially as Waterfowl Habitats" (Ramsar Bureau, 1971) which came into force on 21 December 1975 (Braakhekke and Marchand, 1987). South Africa is one of the 52 contracting parties currently registered. These *policy objectives* of the Ramsar Convention are:

- *"to stem the progressive encroachment on and loss of wetlands now, and in the future."*
- *"to formulate and implement management plans which promote as far as possible the conservation of all wetlands."*
- *"to designate and conserve wetlands which have priority status."*

Chapter 5

Wetland Definition

5.1 Background

Wetlands found in different regions of Natal and KwaZulu vary widely, according to different climatic, hydrologic and topographic influences. The word "*wetland*" is, therefore, a generic term which is used to group those features of the landscape that are commonly referred to as "marshes, swamps, bogs, floodplains, vleis and pans," as a single type of ecosystem (Breen and Begg, 1989).

A variety of wetland definitions are currently used in Natal in regulatory, research and inventory programmes. The differences reflect the different purposes for which the definitions are used, the different perspectives of the individuals or organizations concerned, as well as the different regions of the country. Further opportunities for inconsistency arise in the field where different individuals have been known to apply and interpret given definitions differently.

The confusion, delay and frustration caused by the use of inconsistent definitions therefore needs to be eliminated before any attempt to formulate a policy statement can be made. Clearly, *there must be agreement on what portion of the Natal landscape is to be included, or excluded, as wetland.* For regulatory purposes this becomes especially important because, even under ideal conditions, defining the boundaries of certain wetland types can be extremely difficult. To complicate matters further, the word wetland does not appear in any of the legislation currently in use in South Africa, and even the terms "vlei, marsh and water sponge", as used in the **Conservation of Agricultural Resources Act, No. 43 of 1983**, are undefined.

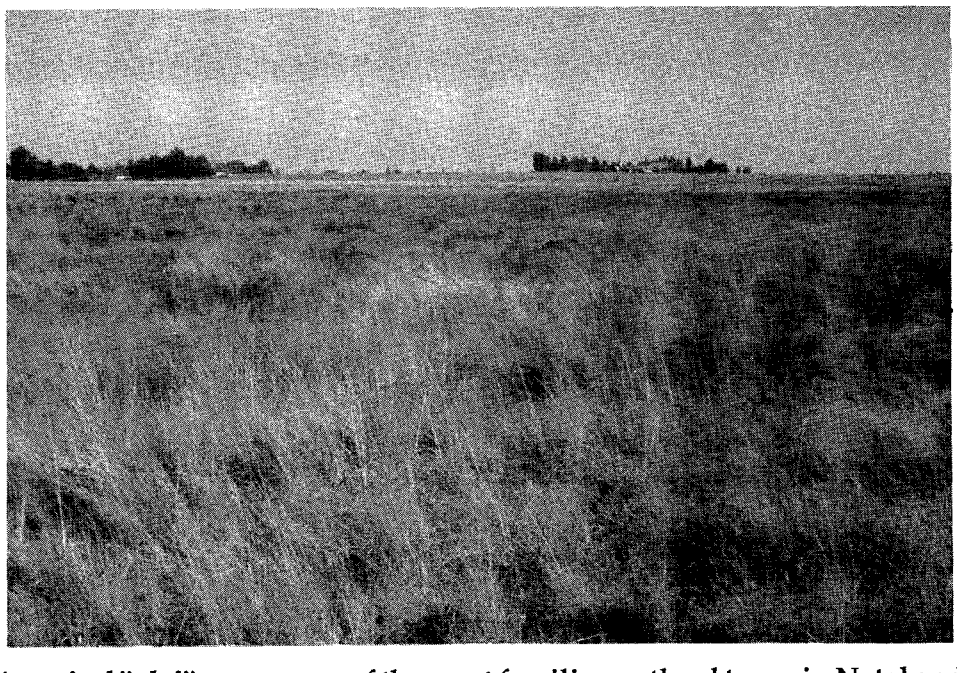

Plate 5: A typical "vlei" area as one of the most familiar wetland types in Natal and KwaZulu.

The question of wetland definition and delineation has received more attention in the United States of America than anywhere else in the world (Cowardin *et al.*, 1979; Sipple, 1988 (a) and (b)). In the USA a distinction has even been drawn between **wetlands** (one word), meaning areas falling within the United States Fish and Wildlife Service definition (see Section 5.2), and **wet lands** (two words) meaning non-wetland areas which nevertheless periodically become wet, and require drainage.

Agreement has been reached that *three factors* determine whether or not a site is a wetland. There must be evidence of:

- a high water table (hydrological indicator);
- hydric soils (pedological indicator); and
- hydrophytic vegetation (botanical indicator).

Of the three factors mentioned, soil indicators are the most persistent although, in the case of floodplains, which are characterized by soils laid down under a fluvial regime, non-hydric soils can be encountered. The hydrology parameter exhibits substantial spatial and temporal variation, and the vegetation parameter can become masked by land use through drainage, burning, ploughing or overgrazing.

5.2 Recommendations

Wetlands have been loosely defined by the United States Fish and Wildlife Service as "*lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water*" (Cowardin *et al.*, 1979). However, for regulatory purposes this definition has been found to be insufficient.

Therefore, in the USA government agencies such as the Corps of Engineers and the Environmental Protection Agency (EPA) which are responsible for administering the legislation which controls the use of wetlands have adopted the following definition for regulatory purposes. Wetlands are regarded as:

> *"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions".*

It is recognized that the internationally accepted definition of a wetland includes "*areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres,*" (Ramsar Bureau, 1971). However, for the purposes of this policy statement the Steering Committee deliberately wishes to focus attention solely upon a particular group of wetlands which in Natal and KwaZulu, generally include vleis (Plate 5), pans, swamps (Plate 6), marshes (Plate 7), bogs, and floodplains (Plate 8).

The Steering Committee *recommends* adoption of the EPA's definition, because all three of the determinative factors mentioned in Section 5.1 are incorporated. The definition also serves as a tool that not only stands alone in terms of field application and as a guide to decision-making, but also reinforces the proposals that were submitted in 1988 by the "*Wetland Advisory Committee*" to the Department of Agricultural Development for regulatory purposes in Natal.*

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* A modified version of these proposals appear in Table 2 (see Chapter 9).

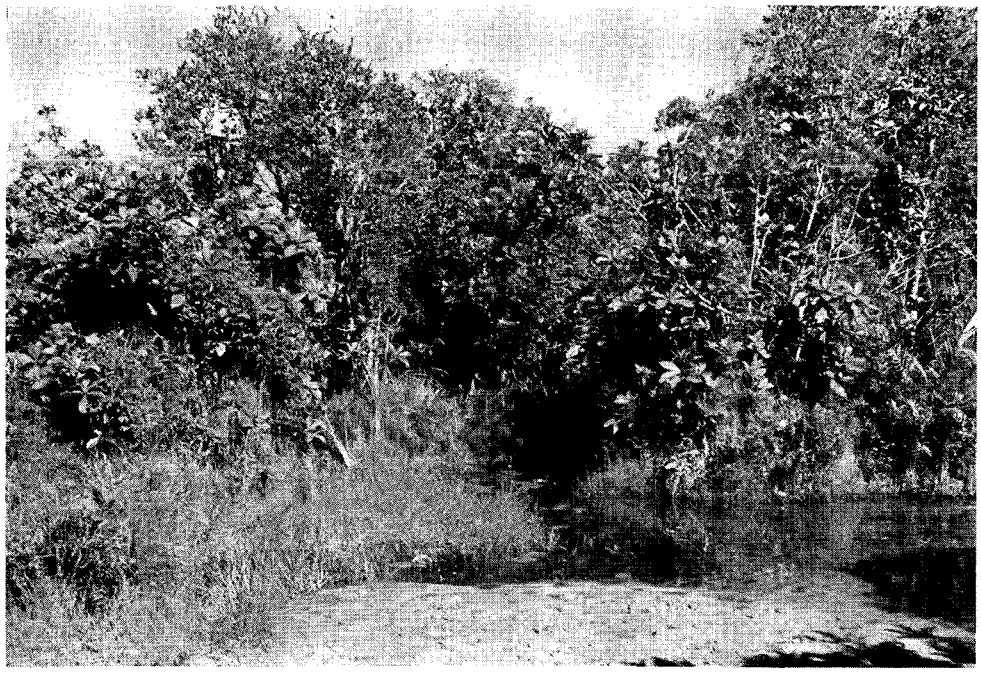
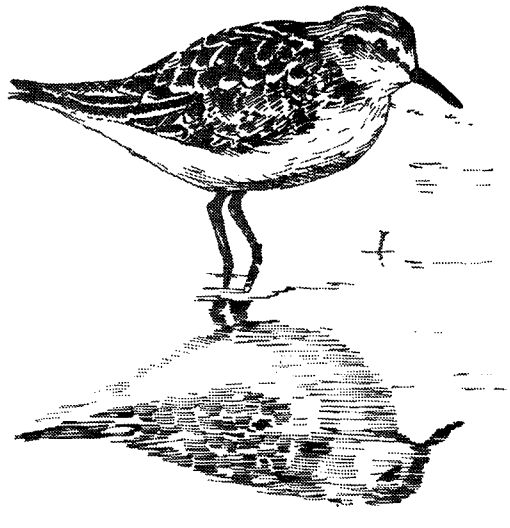


Plate 6: An example of a wetland type found in the coastal lowlands which is commonly referred to as a "swamp".

Plate 7: A typical reed-dominated "marsh" characteristic of many wetlands in the midlands of Natal and KwaZulu.

Plate 8: An example of a "floodplain" type of wetland system. Floodplains typically comprise a mosaic of different wetland communities.



Chapter 6

Policy Options

"There is nothing to be gained by economic development projects which produce only short term advantages at the risk of long term shortages" (Duke of Edinburgh, 1986).

From the preceding chapters, it should be apparent that wetlands are heterogeneous resources differing in their physical and biological characteristics, and that the trend in wetland alteration is continuing despite social and legal pressures to protect wetlands.

Conservatively speaking it appears that over 50% of the wetland resource base of Natal has been altered or lost within the last 100 years due to the perfectly rational behaviour of individuals seeking to maximize their own welfare. Unfortunately however, what is in the best interests of individuals is not always in the best interests of society, and it is possible that the quantity of wetlands lost in Natal and KwaZulu to date, exceeds the optimum from society's point of view.

A survey of undisturbed wetland in the USA concluded that the public value of 1 ha of wetland could be as much as six times higher than the value for a developer wishing to drain it. The figures quoted* were as follows:

	Rand/ha
Flood prevention value	30 000
Water purification value	20 000
Water supply value	80 000
Recreational value	2 500
Total public value	132 500
Value if drained for crops	20 000

If public agencies accept that ultimately they have the responsibility of providing and maintaining the socially important functions and values of wetlands, there are four *policy options* from which to choose if the resource is to be managed in a more effective and efficient manner. These are:

- direct control;
- government acquisition;
- fiscal measures; and
- public awareness.

6.1 Direct control

At present there are seven major **Acts** and two **Ordinances** relevant to the control of wetlands in Natal (Begg, 1986). This situation would appear to suggest that the government presently recognizes wetlands as a multiple-use resource, and is firmly committed to their conservation.

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* Source: SANF Annual Report, 1985/86.

In practice however, difficulties over the interpretation of the legislation exist, control is fragmented between several different departments administering different parts of the legislation, and the effectiveness of the legislation is severely reduced by the inherently high administrative costs associated with implementation (i.e. "policing") of the existing legislation.

Unlike the situation in KwaZulu where, generally speaking, South African legislation passed after 1976 on matters given over to KwaZulu to control is not applicable, the primary legislation enacted to protect wetlands in Natal is the **Conservation of Agricultural Resources Act, No. 43 of 1983.** This Act which is administered by the Directorate of Resource Conservation within the Department of Agriculture, came into operation on 26 May 1984. The Act specifically provides for the "*utilization and protection of vleis, marshes, water sponges and water courses.*" **Section 7(3)** reads that:

> *"Except on authority of a written permission by the executive officer, no land user shall:*
>
> *a) drain or cultivate any vlei, marsh or water sponge or portion thereof on his farm unit, or*
>
> *b) cultivate any land on his farm unit within the flood area (i.e. 1 : 10 year flood line) of a water course or within 10 m horizontally outside the flood area of a water course."*

Numerous other public agencies such as the Department of Environment Affairs (authorized to administer the **Forest Act, No. 122 of 1984**, the **Mountain Catchment Areas Act, No. 63 of 1970,** and the **Environment Conservation Act, No. 73 of 1989**); the Department of Water Affairs (administering the **Water Act, No. 54 of 1956** and its amendments); the KwaZulu Department of Economic Affairs (administering the KwaZulu **Nature Conservation Act, No. 8 of 1975**); the Natal Parks Board (authorized to administer the **Nature Conservation Ordinance, No. 15 of 1974**); and the Natal Provincial Administration (administering the **Town Planning Ordinance, No. 27 of 1949**), all in their own way, exercise varying degrees of control on the regulation of wetlands.

However, blatant disregard of the legislation controlling wetlands has frequently been referred to (Begg, 1986; Goodman, 1987; Ward, 1987; Cook, pers. comm.*), and several organizations such as the Wildlife Society of Southern Africa (Zaloumis, 1987) and the South African Ornithological Society (Summers, 1977), have repeatedly called for a strengthening of State legislation. In short, the government is often accused of having had the foresight to enact legislation to control the destruction of wetlands, but of lacking the courage to apply it.

6.2 Government acquisition

Resources of broad social and economic significance, such as national parks for example, are traditionally regulated and protected by the government. Locally, the large tracts of land in the Drakensberg that are in public ownership in the interests of water source protection, is evidence of the viability of state acquisition for conservation purposes.

It can be argued therefore, that where wetlands suspected of providing considerable benefit to society occur, government acquisition is necessary. Portions of certain of the priority wetlands in Natal such as the Mkuze swamps, the Mfolozi swamps, and Mvoti vlei for example, have long been under State ownership, and as recently as 1987 systems such as Mgeni vlei have been purchased by the Natal Parks Board (Begg, 1989). The total or partial acquisition of wetlands such as Mgeni vlei and Mvoti vlei is an attractive option for public agencies such as the Natal

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* Mr D.J. Cook: Assistant Director (West), Natal Parks Board, P.O. Box 662, Pietermaritzburg, 3200.

Parks Board, who amongst other things, are charged with the responsibility of protecting wildlife resources that are dependent on wetlands.

6.3 Fiscal measures

It is widely recognized that landowners usually exclude from their decision-making the social value of wetlands (Leitch, 1988). This is perfectly understandable, because landowners derive no payment for the public value of wetlands on their property, and so free market incentives, aggravated by high land costs and crop prices, make the case for wetland alteration a lot stronger than the case for wetland conservation.

Fiscal measures are intended to provide a monetary incentive to protect wetlands, and to bring about an equitable distribution of the societal costs and benefits accrued from wetland conservation. Fiscal measures, such as paying private parties directly for the public services that their land provides, have proved to be a highly successful *policy option* in the USA (Kusler, 1983). Hence the subject is treated more fully in Chapter 7, and only a review of the measures available is discussed below.

6.3.1 Tax incentive programmes

Income tax is one of the most irksome charges imposed by the government on private individuals. To encourage wetland protection therefore, the tax laws in the USA have been amended in terms of the **Tax Reform Act of 1986** to benefit landowners who do not convert wetlands to cropland (Leitch, 1988). Naturally, persons that volunteer wetland areas for conservation also benefit economically from preferential tax treatment, and the scheme frequently encourages the private donation of wetland areas, particularly amongst large corporate owners of land. Tax incentive schemes also work particularly well where the profitability of farming is marginal.

Finally, there are various ways by which the estate tax payable on an individual's death can be reduced if wetlands, owned by the descendent and his heirs, are afforded long term protection from alteration.

*6.3.2 Servitudes**

In this case the State elects to charter a particular wetland of interest from the owner. The owner retains title to the property, but signs an agreement restricting his right to use the wetland in ways which may alter the functions that it naturally performs. The term of the agreement can vary from short to long term, and the protection afforded to the wetland ends upon termination of the servitude agreement.

6.3.3 Subsidies

Under the subsidy programme for wetland protection, government and private organizations pay landowners for setting aside a portion of their land for conservation purposes. Locally, the Department of Agricultural Development operate a similar scheme to induce farmers to convert marginal lands used for annual cropping to permanent pasture, by subsidizing the costs involved (Russell, pers. comm.**). Therefore, a potential mechanism for incorporating wetlands into the programme already exists.

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* Servitude agreements would equate to what are known as easement contracts in the USA (Prof. Milton, pers. comm.).

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In the USA, what is known as the "Swampbuster" regulations (Anon, 1985), were also introduced as a means of deterring farmers from converting wetlands to agriculture. In this case government subsidies on the price of agricultural machinery used for the drainage of wetlands, or on the price of crops produced on wetland soils, are withdrawn.

6.3.4 Loan suspension

Because most farming operations depend on loan finance from banks, funding agencies can be drawn into the wetland conservation issue (Hollis, 1988). In this case, money for development is loaned on the condition that appropriate steps will be taken to safeguard wetland areas, and the banks suspend finance should the individual not comply.

In Europe, this has proved to be an extremely effective means of persuasion, and it is firmly recommended that all financial institutions, including the Land Bank, be approached to adopt this policy in Natal (Section 7.3.9 refers).

6.3.5 Crop insurance claims

Another economic incentive adopted in the USA to prevent the conversion of wetlands, has been the disallowance of insurance claims for crop losses on wetland areas. In other words, unlike the situation locally (Goodman, 1987; Vergnani, 1987), a policy decision not to pay compensation for flood damage to cropland in wetland areas, has been adopted in the USA.

6.4 Public awareness

Wetland conservation can be viewed as a shared responsibility of government and private landowners. Therefore, it can be argued that the ideal way of achieving the conservation of wetlands is to appeal for public and private sector support *without* the enforcement of regulations, penalties or economic incentives, and to base conservation efforts on understanding and co-operation.

Examples of existing joint public-private fora which have increased the public awareness of wetlands include the *Southern African Plan for Nature Conservation* under which working groups are identifying, assessing and rating areas which warrant protection; the *South African Natural Heritage Programme* (Soutter, 1986); the *Sites of Conservation Significance Programme;* and the conservancy movement in Natal (Markham, 1984). All are aimed at participation by landowners in the conservation of the country's natural resources.

In reality, however, environmental ethics are instilled in people through education. The obvious long term, and costly, implications of education means that, whilst never foreclosing this option, the adoption of a wetland conservation policy dependent on public education is not entirely feasible.

6.5 Recommendations

6.5.1 Direct control

In the interest of public health, safety and welfare it is *recommended* that *wetland management planning* be tested as a potentially legitimate, and more rational, way of achieving the goal statement appearing in Section 4.2.

It is further *recommended* that as a safety valve, a "*Wetland Appeals Board*" becomes legally constituted so as to protect the rights of the individual against whatever decisions are made regarding the management of privately owned wetlands.

6.5.2 Government acquisition

It is *recommended* firstly that the government explore public-private partnerships, including cost sharing arrangements for wetland acquisition and management. Secondly, it is *recommended* that government increases funding available for wetland acquisition and, in conjunction with agencies such as the Natal Parks Board and Bureau of Natural Resources, prepares a plan which sets priorities for wetland acquisition.

6.5.3 Fiscal measures

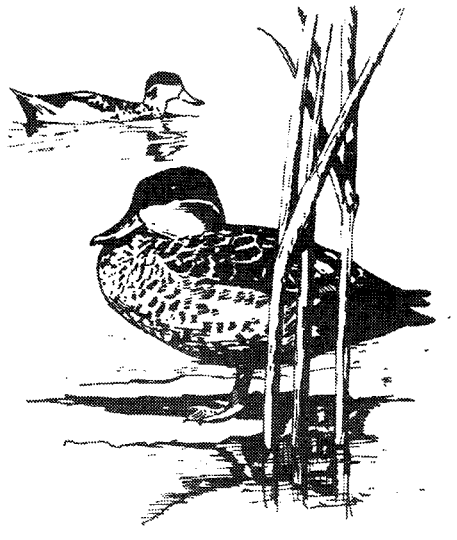
In principle, the Steering Committee finds that the concept that society has a vested interest in wetlands and must therefore be prepared to compensate wetland owners the full cost for conserving wetlands, is acceptable. However, because tax law and in particular, property rights, are complex issues, it is *recommended* that a tax expert, a lawyer and a resource economist be consulted to explore Section 6.3 further.

In the interim, sight should not be lost of the fact that a *major advantage* of public investment in the conservation of wetlands, is the common interest in the resource that the above policy will generate. The public awareness of wetlands is likely to be greatly improved, and once public interest is at stake, politicians are likely to become involved.

6.5.4 Public awareness

The Steering Committee recognizes that wetland protection is basically a political process which requires an educated public to succeed.

Therefore, in order to stimulate interest in the protection of wetlands, the Natal and KwaZulu Administrations should diligently expand their education and outreach programmes concerning wetland conservation. It is *recommended* that wetland conservation efforts based on public education are concentrated first in those geographical areas of Natal and KwaZulu where attitudes are known to be pro-conservation.



Chapter 7

Incentives for Private Protection of Wetlands (non-regulatory approach)

7.1 Background

One of the earliest findings of the *Natal Wetland Study* was that the vast majority of wetlands are privately owned by individual farmers, corporations or various other types of organizations within the private sector. Wetlands in KwaZulu, on the other hand, are communal assets and fall under the jurisdiction of the local tribal authority. It is understandable that government agencies cannot be expected to effectively manage and protect all these resources without causing social and political discontent, or incurring vast expenses. An effective wetland management strategy therefore requires that private landowners adopt a positive attitude to exercising the social responsibility of protecting wetlands, and particularly as such initiatives would complement the regulatory approach (Chapter 8 refers), reduce the government's overall burden of responsibility and reduce the need for costly law enforcement.

Non-regulatory wetland protection programmes *encourage rather than require protection efforts*, and the only meaningful way by which the private sector can be expected to respond strongly to the call, is through reward for conservation effort (Conservation Foundation, 1988; Tainton, 1988). To gain some insight into the underlying reasons for this statement, the conclusions reached by resource economists are useful. The first conclusion is that wetland conservation must pay for itself and that free market forces should be allowed to determine the value of wetlands (Leitch and Scott, 1984). The second conclusion reached is that where the utilization of resources which result in substantial economic benefit to the public is involved, society as a whole must be prepared to pay for the benefits accruing from conservation (Kusler, 1983).

A wide range of non-regulatory approaches to wetland conservation has been adopted in the USA, but the successes (and failings) of each generally depend upon local socio-economic circumstances. All of the approaches adopted are based on the premise that "*conservation is essentially a financial matter, and depends upon what people are prepared to pay for it*" (Johnson and Wannenburgh, 1985). Non- regulatory approaches to wetland protection are also exercised at every decision-making level in society, i.e. at all three tiers of government (central, provincial and local), and at the level of both non-profit and profit-orientated organizations. *Economic survival* is a matter of far greater, and more tangible, concern to individuals than the conservation of public resources (Tainton, 1988). Therefore, there are six *basic options* upon which to found a non-regulatory approach to wetland conservation.

7.2 Options

7.2.1 Complete or partial acquisition

Providing the water sources supplying wetlands can be assured, acquisition by a public agency usually provides the most permanent protection of a wetland. Acquisition can be *complete*, including the land and all the rights on it, or *partial*, as in a conservation servitude.

In the latter case the buyer purchases the right to restrict the use of the land for conservation purposes, thereby controlling use of the land, rather than owning it. For granting conservation *servitudes* the landowner can also become eligible to receive property tax reductions (Section 7.2.2 refers). The acquisition of whole or partial interests in wetlands, on either a temporary or permanent basis, can be exercised by a government agency, by the private sector, or jointly by the government and the private sector. However, since acquisition can be costly, innovative funding approaches need to be developed (see Section 11.3).

7.2.2 Tax incentives

Tax exemptions can encourage wetland protection by granting economic advantages to individuals who sell or donate wetlands to the government or to a recognized conservation organization. In some cases, landowners who have been denied permits to develop wetlands, or undertake not to alter wetlands, are offered a reduction in property tax. "*Tax breaks*", as they are known, can take the form of abatements affecting:

- personal or corporate income tax;
- capital gains tax;
- property tax;
- gift tax; or
- inheritance tax.

The tax laws in the USA allow landowners who donate or sell (at less than market value) land or easements, to deduct the value of the land, or difference between the sale price and the market value, as a charitable contribution.

Other tax incentives for land or easement transfers are *tax deferments* by exchanging wetland for upland of equivalent value rather than selling it, and *tax deductions* based on the difference between the market value and the purchase value of the land in question.

The incentives provided by tax exemptions, of course, depend on the market value of the land, and this can vary enormously depending on whether the wetland is in an isolated rural area, or in a highly accessible, urban setting. It should also be born in mind that in certain areas where the profitability of farming is marginal, or landowners have insufficient taxable income, tax deductions provide little incentive for wetland protection.

In KwaZulu, where wetlands are communally owned, economic incentives for the people utilizing wetlands, alternative to tax incentives, will have to be found. For example, the people disadvantaged by having to reduce the number of cattle grazing on a wetland, may have to be compensated by a cash subsidy paid for by the society (or societies) which stand to gain from the protection afforded by such a measure to the wetland in question.

7.2.3 Subsidies

In the USA the government provides subsidies or payment to farmers for keeping their wetlands out of production as part of an income maintenance effort. Where wetlands on private lands are set aside for more than 50 years to serve this purpose, negotiations with the Land Bank also entitle the farmer concerned to be eligible for debt relief.

Locally, a scheme designed to promote the conversion of marginal ploughed land to permanent pastures by sharing the cost of the agricultural practices involved is in existence (Department of Agriculture and Water Supply, 1987). Marginal land qualifying for the purposes of the scheme

includes wetlands, but providing "*the land was under dryland cash crops in 1986/87*". The annual lease value for a total period of four years is given as R50 per ha.

Private organizations with an interest in hunting or bird-watching for example, should also be encouraged to subsidize (i.e. make rental payments) landowners willing to set aside wetlands for conservation purposes. This differs from a conservation easement (Section 7.2.1) in that the landowner maintains full title to the land and all rights on it.

7.2.4 Public education

There is little doubt that the majority of landowners in Natal and KwaZulu lack information and understanding of the functions and values of the wetlands on their property. Furthermore, they are unaware of the options available for managing wetlands, and of the economic and other advantages for society of protecting wetlands. Thus, an important element of a more effective non-regulatory wetlands protection programme is to provide better information to the wetlands' owner (see Section 6.5.4).

The need for "*effective education and training programmes for all those who take responsibility for stewardship of the land*" (Tainton, 1988) is common to every field of conservation effort. Agreement in principle to providing an *ad hoc* Wetlands Management Course at Cedara has been obtained from the Director of the Department of Agricultural Development (Russell, pers. comm.), but far more needs to be done. For example:

- As part of an advanced regional planning and information dissemination exercise, organizations such as the Joint Services Board and the Natal Town and Regional Planning Commission should inform local authorities and landowners of the existence and status of wetlands on their property, and of the values these wetlands provide.
- A government agency, such as the Directorate of Resource Conservation (Department of Agriculture), should ensure that it is in a position to implement a structured system of decision-making. Individuals wishing to know what to do with wetlands on their property should be informed by the Department of the organizations available to assist them in protecting wetlands; of the management options available to them; about monitoring techniques; and the regulations governing the modification of wetlands.
- Non-profit organizations such as the South African Nature Foundation and the Wildlife Society of Southern Africa can also assist by publishing books and articles alerting the public to the values of wetlands and the importance of their protection to the nation.

7.2.5 The removal of regulations and incentives which induce wetland alteration

In the course of meeting other public obligations certain government activities can inadvertently create conditions that encourage wetland alteration. For example, the government-assisted construction of farm dams, irrigation schemes, solid waste disposal facilities, flood protection works, agricultural price supports, subsurface drainage and compensation for flood damage, all create economic incentives which encourage private individuals to take actions that alter wetlands.

Large lot zoning at a local planning level has encouraged developers to build in wetland areas in the coastal zone of Natal, and in some cases the construction of roads and sewers through wetland areas has encouraged urban development along their path.

The only action available to the government to reduce economic incentives for wetland conversion is to withdraw or remove support for the above-mentioned activities in wetland areas.

However, without the completion of a comprehensive inventory of wetlands in Natal and KwaZulu, it is recognized that the designation of wetland areas will remain unknown, and the unintentional conversion of wetlands is likely to continue.

7.2.6 Developing markets for wetlands and wetland products

There is increasing evidence throughout the world that wetlands are important contributors to the economy. On account of economics, therefore, the functions and products of wetlands can form the basis of commercially viable business opportunities. For example, the considerable interest now being shown in South Africa in the use of natural and artificial wetlands for the treatment of waste water (Wood and Hensman, 1988), stems from the water purifying potential of wetlands. However, as natural wetlands greatly reduce the costs of flood protection, erosion control and water storage, markets for wetland services of this sort should also be identified and developed.

Wetlands can also supply specialized products such as reeds for thatching and hut construction (Plate 9), rice for food consumption and waterfowl for viewing by wildlife enthusiasts. Therefore, in an area such as KwaZulu there should be grounds to promote a programme of economic incentives for wetland conservation based on the harvestable resources that wetlands are known to provide (see Section 3.1.4).

7.3 Recommendations

The Wetland Steering Committee strongly endorses the use of non-regulatory programmes for wetland conservation, and *recommends* specifically:

7.3.1 Programme of incentives (Natal Provincial Administration)

That the Natal Provincial Administration promotes a coherent programme of incentives which encourages and assists the private sector to exercise its social responsibility towards wetland conservation, whilst preserving a reasonable return on its investment.

Plate 9: The harvesting of reeds is one of the tangible benefits derived from wetlands in KwaZulu.

7.3.2 *Programme of incentives (KwaZulu Administration)*

That the KwaZulu Administration establishes an innovative programme of incentives which encourages and assists tribal authorities and individuals to exercise their responsibility towards wetland conservation.

7.3.3 *Market values*

That market values for different types of wetlands be established for the purpose of negotiating subsidies and servitude agreements.

7.3.4 *Compensation*

That the Government should recompense landowners who enter into long term and permanent wetland servitude agreements. The lands affected should satisfy the following conditions:

- they should currently be classified as wetland;
- be deemed to have a high potential for alteration; and
- be deemed as valuable for resource conservation purposes.

The conditions for servitude agreements should be negotiable with the owner, but in general should:

- allow for a continuation of agricultural uses where these do not significantly degrade the functioning of wetlands;
- regulate the owner's actions which would impair the functioning of the wetland;
- allow for public access at the discretion of the owner; and
- provide the original owner the opportunity to repurchase the easement(s) or other ownership rights.

7.3.5 *Wetlands Protection Trust*

That a *Wetlands Protection Trust* (similar to the *South African Natural Heritage Programme**, but narrower in its objectives) be established, and registered members of the Trust who make an investment in wetland conservation (either through donations of property or money), become eligible for tax relief. The Trust should offer a prestigious annual award to individuals and organizations outstanding in their efforts to conserve wetlands.

7.3.6 *Modification of development controls*

That all government agencies should examine their full range of development controls to identify and modify those that unintentionally promote wetland alteration. Among other things, improved planning at the scale of farm development is implied.

7.3.7 *Government subsidy*

That in order to protect regional water supplies, to reduce non-point source pollution and to trap sediment transported from adjacent uplands, the value of the existing government subsidy

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* A programme launched by the Department of Environment Affairs in co-operation with the four provincial nature conservation bodies and the private sector, through the South African Nature Foundation, and in partnership with the individual landowner.

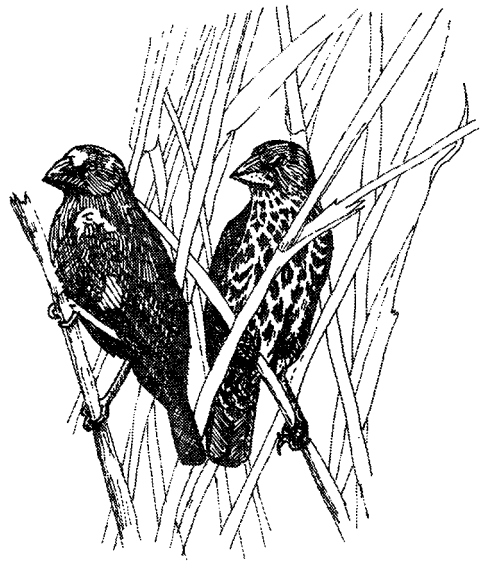
available to convert *marginal ploughed lands* to perennial pasture be substantially increased by the Department of Agricultural Development.

7.3.8 Education programmes

That in order to stimulate increased public interest in the private and communal conservation of wetlands, the Natal and KwaZulu Administrations should diligently expand their education and public outreach programmes concerning the ways and means of optimising resource values.

7.3.9 Financial assistance

That financial institutions such as the Land Bank and the Development Bank of Southern Africa be requested to consider making loans available for farmers conditional upon the conservation of wetlands.



Chapter 8

Improving Government Protection (regulatory approach)

8.1 Background

Providing economic incentives for optimising resource values (Chapter 7) will certainly help towards achieving the *overall goal* of the Natal Wetland Policy Statement (Chapter 4). However, a regulatory approach to wetland protection will still be necessary, and in spite of the fact that for the last seventy years the South African government has exhibited an ambivalent attitude towards the conservation of wetlands.

Many socio-political factors have accounted for the present day conservation status of wetlands in Natal and KwaZulu, but the earliest evidence presented to the government of wetland abuse and its downstream consequences was led by an irrigation engineer, Mr F.E. Kanthack, during the 1910 - 1915 drought cycle (Robertson, 1968). The Select Committee appointed went no further than recommending as a way of overcoming the problem the "*education of public opinion*" through meetings with farmers and lectures at agricultural shows.

Prevarication of the government over wetland conservation can also be judged from the intensive (but unsuccessful) efforts made in the late 1940's to rehabilitate wetlands in the Blaaukrantz River catchment (Higgs, 1967), and the contrasting efforts being made simultaneously (to assist soldiers returning from the Second World War) by draining the Mfolozi swamps (Department of Irrigation, 1948).

Official moves to discourage wetland conversion were not forthcoming until 1969 when the **Soil Conservation Act, No. 76**, was promulgated. Even then the only provisions made for the protection of "vleis, marshes or water sponges" were contained as *guidelines* which, being appended to the Act, had no legal status whatsoever.

In practice, the so-called guidelines in the Act had little or no effect since farmers were either unaware of their presence, or resented government interference in their activities. The government openly declared that it was not its intention to adopt the heavy-handed imposition of conservation measures, and admitted that it had neither the finance, nor the personnel, to influence the situation positively (Hildyard, pers. comm.*).

Indeed, throughout the 1960's and 1970's there was widespread expansion of wetland cultivation, particularly in the coastal lowlands of Natal where wetland soils were favoured for sugarcane (Beater, 1962). Notwithstanding guidelines advising against certain activities within wetlands, the government also gave support to a programme aimed at converting wetlands to alternative uses (Hill *et al.*, 1981).

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* Dr P. Hildyard: Former Director, Department of Agriculture and Water Supply (Natal Region).

In KwaZulu, the legislation restricting the use of wetlands, is technically the same as that in South Africa, but factors other than wetland use account for the present day degraded condition of wetlands in many parts of the KwaZulu nation. One of the most obvious is the **Bantu Trust and Land Act, No. 18 of 1936**, which resulted in the progressive confinement of the Zulu people to Bantu Reserves. This legislation was followed by the **Bantu Authorities Act (Act No. 68 of 1951)** and the **Bantu Homelands Constitution Act (Act No. 21 of 1971)** and as shown to be the case in Zimbabwe (Whitlow, 1988; Whitlow, *in press*), the main changes affecting wetlands as a result of these Acts, were induced by rapidly growing human and livestock populations. Both the incidence of wetland cultivation (a traditional practice) and the more prolonged, intensive grazing by cattle within wetlands, increased. The net result in wetland areas of KwaZulu was locally severe erosion, including gullying, a lowering of the water table and the cessation of wetland functions such as flood storage, water storage and water purification (Begg, 1988).

Official moves to remedy weaknesses in some of the legislation were finally made in 1982. The **Soil Conservation Act, No. 76 of 1969**, was superceded by the **Conservation of Agricultural Resources Act, No. 43 of 1983**, and what were formerly "*guidelines for wetland protection*" became modified and embodied into the text of the new Act (Section 6.1 refers). Heavier penalties of up to R10 000 (or four years imprisonment) were also to be applied for contraventions of the Act (Scotney and Wilby, 1983).

Fuelled by growing public and official concern over wetland management, the Department of Environment Affairs and the Natal Town and Regional Planning Commission made funds available to initiate the *Natal Wetland Study* in 1984. In addition, the Directorate of Resource Conservation (within the Department of Agriculture) was given the sole responsibility of administering the **Conservation of Agricultural Resources Act, No. 43 of 1983**.

Further positive measures taken in recent years are the formation in Natal of an interdepartmental "*Wetland Advisory Committee*" and in KwaZulu a "*Swamp Forest Committee*", the functions of which are to assess the status of wetlands affected by development applications, and to assess options for more effective use.

Although encouraging, the above-mentioned developments still provide little room for complacency. Flagrant *transgression* of the law continues to be reported both in Natal (Begg, 1986; Goodman, 1987; Vergnani, 1987) and within KwaZulu (Ward, 1987); the word "***wetland***" has yet to be defined or appear in any legislation within the country; and *parliamentary recognition* of wetlands as an issue of national importance is far from fully realized.

The degree of wetland regulation by government agencies in Natal and KwaZulu varies widely. The land use controls over inland wetlands exercised by the Directorate of Resource Conservation (Department of Agriculture) in Natal, and the Department of Agriculture and Forestry in KwaZulu, potentially give these agencies the most extensive and direct authority over wetland alteration. However, no single regulatory agency has complete authority over decisions affecting wetlands, and no two agencies appear to view the value and functions of wetlands (e.g. water storage potential versus wildlife value) in the same light.

8.2 Options

There are four ways by which the government's existing land use controls affecting wetlands can be improved. These are:

- by clearly defining the responsibilities of the various regulatory agencies involved;
- by adopting a consistent regulatory definition of wetland;

- by dealing with types of wetland alterations that are not adequately addressed at present by the legislation; and
- by preparing legislation which relates specifically to wetland protection.

8.2.1 *The responsibility of the government agencies involved in wetland regulation*

Under the circumstances mentioned in the last paragraph of Section 8.1, there is only one form of action required, and that is to "*stand up and be counted*". The *appendix* to this policy statement therefore contains a list of the government agencies directly and indirectly responsible for the implementation of regulatory programmes affecting wetlands, as well as a clear definition of the responsibilities of each of the agencies concerned.

8.2.2 *A consistent definition of wetland*

An important step in improving wetland regulatory programmes is to get clear agreement on what portion of the landscape is to be included, or excluded, as wetland.

This subject has already been dealt with in Chapter 5, and the recommendation made was that the following definition was to be adopted in Natal and KwaZulu by the agencies responsible for administering legislation which controls the use of wetlands. Wetlands are to be regarded as:

> *"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."*

For wetland delineation purposes the criteria contained in Table 2 and Figures 3 and 4 in Chapter 9 can be used as a guide to decision-making. This is seen to be necessary because many landowners may not even realize that a particular piece of land under their control is considered to be a wetland, and therefore, subject to wetland regulations.

8.2.3 *Types of wetland alterations that are not adequately addressed*

Water resource development programmes

Examination of the policies and views of the government relating to water resource management in South Africa (Department of Water Affairs, 1986) reveals that natural resources such as wetlands are regarded as one of the major *competing water demand sectors* (Conley *et al.*, 1987). By the year 2000, for example, it is recognized that 13% of the annual regional run-off may need to be set aside for environmental management. Although this represents a very large volume of water (2 954 million m^3), more recognition is needed at a strategic level of the fact that rather than competing for water, *most wetlands are storing and cleansing water*. Generally the benefits to be derived from the retention of water in wetlands can more than adequately compensate all user sectors of the nation's freshwater resources.

One of the most important indirect causes of wetland alteration is changes in the regime of water sources supplying wetlands. The major agencies involved in water resource development programmes are the Department of Water Affairs, and the Department of Agricultural Development, and although the actions of these departments are designed to provide social benefit, unintentional damage to wetland resources arises. For example, when engineering works (such as levees, river diversions, canals and causeways) are constructed during the period of panic that follows floods, little thought is given to the downstream consequences or to wetland protection and the legislation pertaining thereto (Anon, 1978; Enright, 1979). At such times the need to comply with existing legislation is, in fact, overruled.

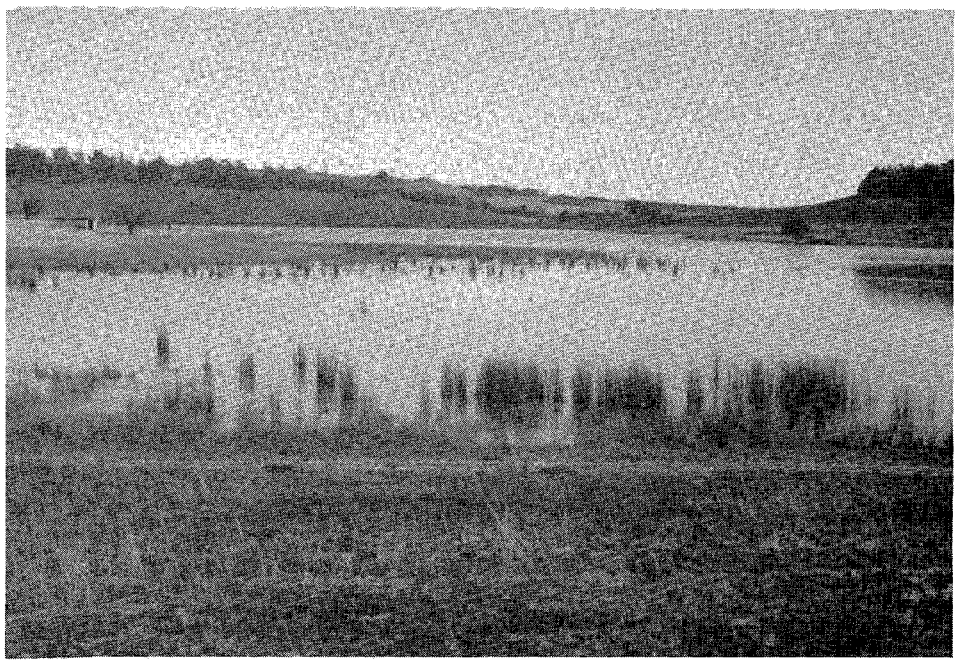

Plate 10: Dam construction is a major contributor to the loss of wetland habitats in Natal.

Wetland losses caused by the development of farm dams is of major concern to the Natal Parks Board, for example, due to the loss of habitat caused through flooding of the wetland basin (Plate 10).

The construction of large dams such as the Pongolapoort Dam in northern Natal, also has profound effects on the function and value of wetlands downstream (Breen and Heeg, 1986).

Artificial flood releases become the only way by which the productivity of such systems can be sustained and, as successfully demonstrated by the Department of Water Affairs, the timing, volume and duration of the releases involved therefore become crucial issues.

Soil conservation programmes

The construction of drainage channels, the channelization of natural streams, surface water diversions and excessive groundwater abstraction are thought to have dried up an unknown, but substantial amount of wetland in Natal (Begg, 1986).

At present, it could be interpreted that the act of digging a trench through a wetland is not a contravention of the **Conservation of Agricultural Resources Act, No. 43 of 1983**. Technically, the only activities prohibited by the Act relate to mechanical disturbance (given as the meaning of the term "cultivation") or the act of draining (which is undefined). Even in terms of **Section 170** of the **Water Act (Act No. 100 of 1956)**, a trench-digging proprietor of a wetland would not be *"interfering with or altering the flow of a public stream"*, because the channel is artificial and the water in the wetland is, in any event, private water (Ramsden, 1987).

Confusion can also arise over interpretation of the **Conservation of Agricultural Resources Act (Act No. 43 of 1983)**. For example, although aimed specifically at the removal of alien vegetation which, by the blockage of flood flows, can cause stream diversion and erosion, **Section 7 (2)** makes the removal of vegetation along water courses and flood prone areas obligatory. Clearly, the type of vegetation should be stipulated so as to prevent the removal of indigenous, bank-binding forms of riparian vegetation, amongst which are wetland communities (Plate 11). The Act's definition of the *"flood area of a water course"* as the 1 : 10 year

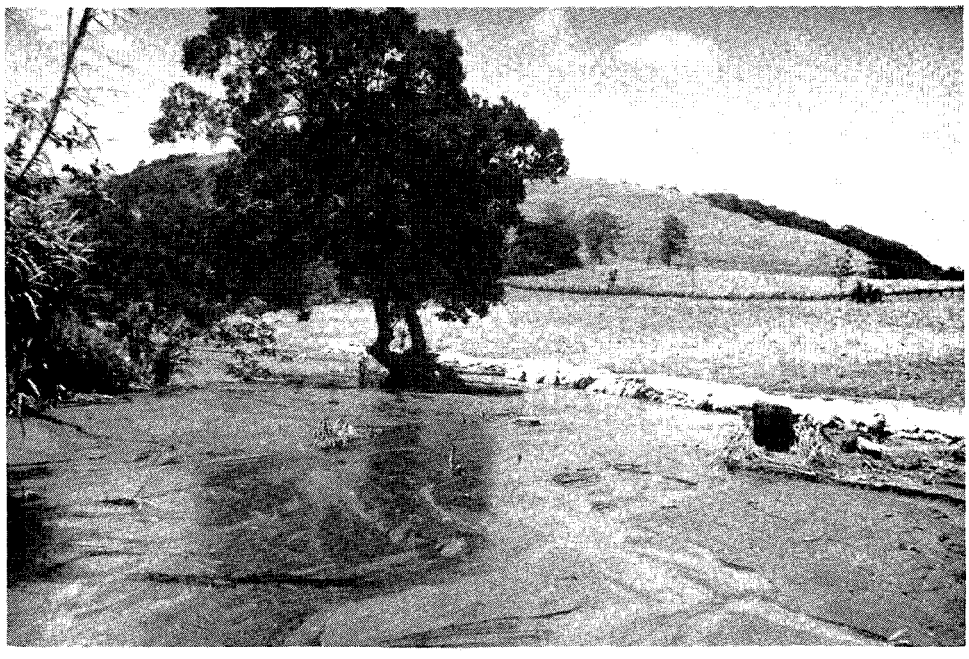

Plate 11: For the benefit of little more production, agricultural enterprise, particularly in the coastal lowlands, has destabilized the banks of many perennial streams.

flood line is also unhelpful. It is impractical to expect landowners to locate the 1 : 10 year flood line accurately, and particularly as the position of the 1 : 10 year flood line changes seasonally.

The infilling of a wetland for road construction, or for the purpose of building a dam wall are also activities which the law has not been designed to cater for. There is no specific legislative provision for the burning of wetlands (Plate 12) which is a traditional veld management practice on many farms, and yet there is evidence to suggest that the indiscriminate burning of wetlands can be harmful to the water storage functions of wetlands in the long term (Downing, 1966; Whitlow, 1985; Thompson and Shay, 1985).

Plate 12: Wetlands can be gradually degraded by localized burning to the extent that their water storage function no longer benefits society.

There is no specific legislative provision to control grazing in wetlands, and yet overgrazing has also been shown to be a major reason for the degradation of wetlands (Jacot-Guillarmod, 1962; Downing, 1966; Whitlow, 1988). Most of the deeply incised relict wetlands in KwaZulu and in the Drakensberg region for example, have been damaged by the uncontrolled movement and grazing of livestock. Furthermore, the damage done is irreparable, or at best recovery is very slow (Higgs, 1967).

Afforestation development programmes

As long ago as the *Report of the Interdepartmental Committee on Afforestation and Water Supplies* (Malherbe, 1968), criticism has been levelled at the government policy of allowing the planting of commercial timber trees in areas where the water table is high. Pine trees (*Pinus* spp.) planted in wetlands on the eastern shores of St. Lucia, gum trees (*Eucalyptus* spp.) planted in wetlands adjoining the Mfolozi swamp and Lake Mzingazi, and poplar trees (*Populus* spp.) extending far into the body of Mvoti vlei are evidence of past afforestation activities that have directly affected these wetlands (Plate 13).

Until recently, afforestation permits issued by the Department of Environment Affairs (Branch of Forestry and Environmental Conservation) used to be subject to the condition that:

"No trees may be planted within a 20 metre margin measured from the edge, as determined by an authorized forest officer, of any stream, spring or vlei on the property concerned."

This condition has recently been supplanted by specifying varying distances on recommendation of the inspecting forest officer, in consultation with local representatives of the Department of Water Affairs and the Department of Agricultural Development. These distances are indicated on a farm map which is made part of the permit. An expert choice computer programme, based on 40 years of forest hydrological research, and virtually complete for application throughout South Africa, is available to facilitate uniform application of this crucial decision-making process. Where afforestation within wetlands can be proved to have taken place illegally, prosecution is possible in terms of **Section 75** of the **Forest Act, No. 122 of 1984**. A concern expressed by many of the government agencies responsible for the

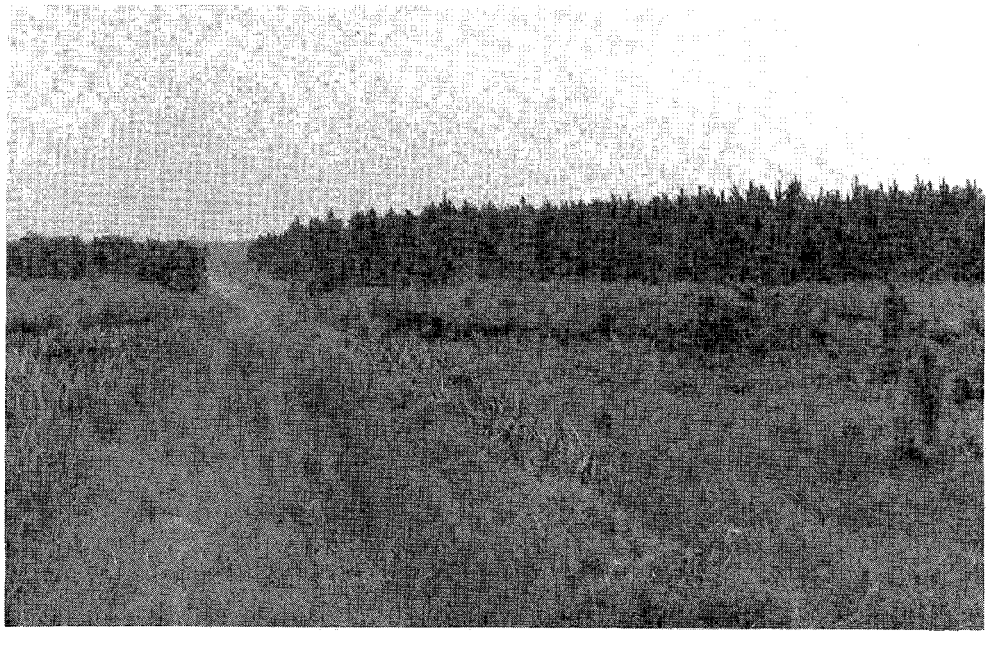

Plate 13: Afforestation can drastically alter the hydrology and functioning of wetland ecosystems by lowering of the water table.

management of soil, water and wildlife resources in Natal and KwaZulu relates to the *area of afforestation* presently permitted in the catchment areas of Natal's rivers.

A *Central Committee for the Allocation of Afforestation Permits,* consisting of an equal number of senior officers of the Departments of Environment Affairs and of Water Affairs, was established in Pretoria in 1972. The basis for fixing the maximum afforestable area per catchment or sub-catchment is the effect of such afforestation on a catchment's water resources. Catchments are divided according to the national and regional importance of the river concerned in terms of water. Depending on its effect on a catchment's water resources no new afforestation has been allowed in certain catchments since 1972; in others (such as the Mgeni River catchment), new afforestation has been restricted to using 5% of a catchment's mean annual run-off; whilst in others only as much afforestation is allowed as would bring about a 10% reduction in the mean annual run-off as of 1973 (van der Zel, 1982).

At the moment only water conservation, mean annual run-off and large catchments are used to determine allowable afforestation. However, the system is under revision. Sub-division of catchments on a quaternary basis has been accepted in principle and other factors besides mean annual run-off are being investigated (van der Zel, pers. comm.*).

In the interest of avoiding a deterioration in water quality, forestry should give careful consideration to road making and logging, and preferably not allow these activities within wetlands. The Council for the Environment, the Department of Environment Affairs and the South African Institute of Forestry are collaborating on compiling environmental guidelines for the forestry industry.

Water use and pollution control programmes

The **Water Act, No. 54 of 1956** (plus its various amendments) is designed to regulate the use of and to prevent the pollution of public water. However, a major shortcoming of the **Water Act (Act No. 54 of 1956)** lies in its failure to recognize the water purifying value of wetlands, particularly as far as people who do not have access to piped supplies of potable water is concerned.

One would expect that, as in the USA, where **Section 404** of the **Clean Water Act of 1987** was designed specifically "*to clean up the public water supply*" by affording greater protection to wetlands, government officials responsible for preventing the contamination of surface water resources in South Africa would seize upon the opportunity to protect wetlands.

To date, the official response to such suggestions has been that since wetlands are meant to be protected by the **Conservation of Agricultural Resource Act (Act No. 43 of 1983),** no new or additional legislation is required (Roberts, pers. comm.**).

The **Water Act (Act No. 54 of 1956)** also differentiates between the matter of "*public water*" and "*private water*". Where a stream has a definite channel for some considerable portion of its course, it falls within the definition of a *public stream.* However, where the channel ends, and the same stream disappears into a wetland, the water is no longer regarded as a public resource. Instead, the water becomes a *private* resource, even though when it leaves the wetland, the same water re-enters the same public stream (Milton, 1978; Ramsden, 1987).

This is probably the most serious failing of the **Water Act (Act No. 54 of 1956)** as far as wetlands are concerned because the sources of many rivers are wetlands, and the re-entry of

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water from a public stream into a wetland represents the very opportunity needed for natural processes which purify water to become operative.

It should be noted that the **Water Act (Act No. 41 of 1976)** of Zimbabwe reads as follows:

*"public water means all water found on or below the bed of a public stream, **including marshes, springs, swamps or vleis**, forming the source of, or found on the course of, the public stream."*

The adoption of a similar definition of public water by the South African government would go a long way towards affording considerably greater protection for wetlands for people who do not "own" resources such as land and water, and the nation's limited supplies of freshwater.

Waste disposal legislation

Waste disposal is another form of land use in Natal and KwaZulu which impacts wetlands on certain occasions (Plate 14). The regulations relating to waste disposal site licensing and assessment is provided by **Section 24** of the **Environment Conservation Act (Act No. 73 of 1989).**

This legislation, which still has to be promulgated, will be administered by the Department of Water Affairs. Amongst other things this legislation is designed to safeguard human health, water quality and amenities from adverse effects due to landfill development.

However, the common occurrence of wetlands being infilled with inert materials, such as builder's rubble and garden refuse, indicates that wetlands have yet to be singled out as sites totally unsuited to all forms of solid waste disposal.

Through **Section 24** of the **Environment Conservation Act (Act No. 73 of 1989)** when promulgated, **Section 23** of the **Water Act (Act No. 54 of 1956)** and the **Health Act (Act No. 63 of 1977)**, the Department of Water Affairs will seek to ensure that waste disposal activities do not adversely affect water quality.

Each disposal site is classified according to certain geological and hydrological characteristics, and yet leachate derived from the biochemical and physical breakdown of wastes has been

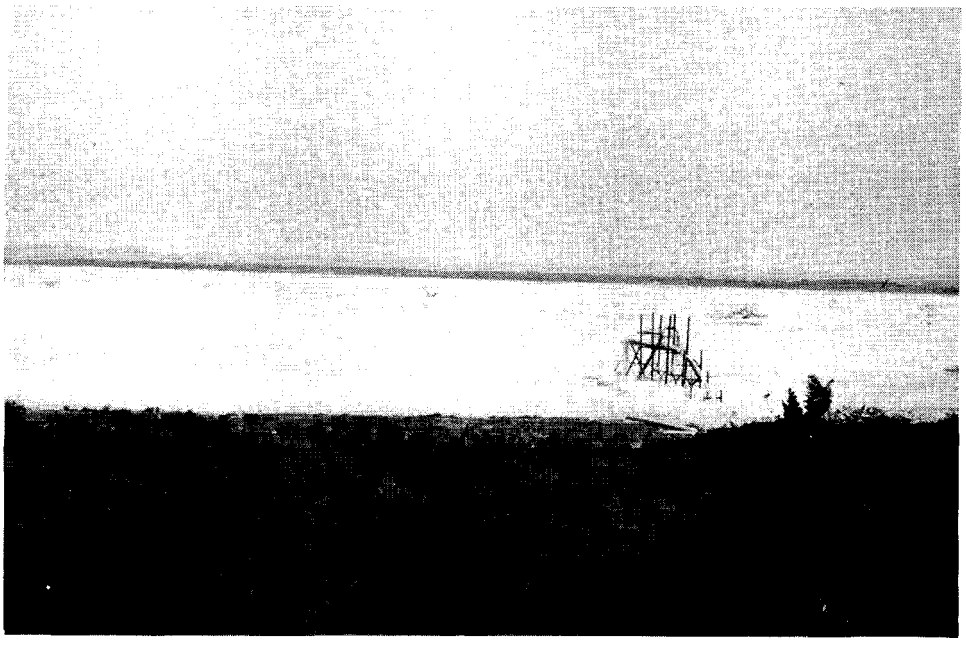

Plate 14: The disposal of gypsum in the Mhlatuze swamp at Richards Bay.

known to pollute and alter a number of wetlands located in the coastal zone (Begg, 1978). These waste disposal sites have, however, since been closed down. This unacceptable situation arose before proper controls and expertise for the siting of waste disposal sites were instituted, and no waste disposal site may now be sited on a wetland.

To date, no organization has given the subject of waste disposal legislation more attention than the Institute for Waste Management of Southern Africa (IWM), and for this reason an examination of certain of the policies recently formulated by the IWM are useful (Lombard, pers. comm.*). The conclusions reached were:

- that "waste disposal cannot be supported in Class 3 and Class 4 sites (i.e. wetlands**) because the areas concerned would be destroyed in the process of establishing drainage, landfilling waste, the excavation of cover material and the general running of landfill operations. In addition, leachates would be in direct hydraulic continuity with the water table."
- that "in the case of soundly engineered and well managed landfill sites the discharge of leachates to wetlands may be acceptable under closely monitored circumstances, as there is clear evidence to support the use of wetlands in the treatment of landfill leachates. Biologically damaging shock loadings must be avoided at all costs."

Land use controls in urban areas

The extent of protection to wetlands afforded by land use controls (such as zoning, sub-division controls, development guidelines, etc.) which are commonly imposed by local government authorities is difficult to assess. However, it seems clear that where wetland alteration is condoned in an urban environment, the same sort of damaging activities in a rural area would be regarded as unauthorized, if not illegal (Plate 15).

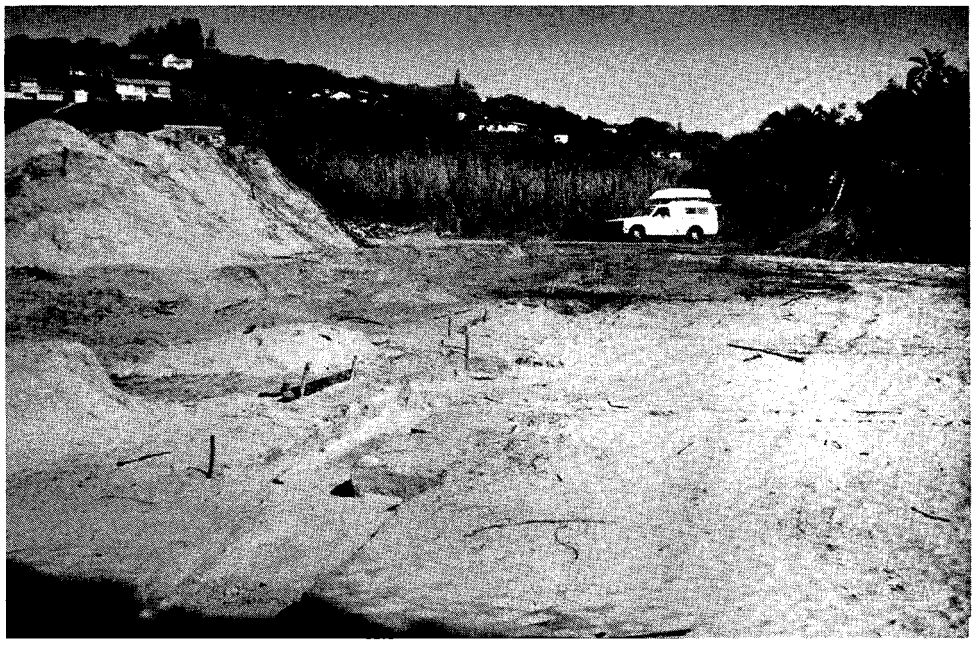

Plate 15: The foundations for a duplex development being excavated in wetlands surrounding the Mbizana lagoon (Ramsgate).

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* Mr R. Lombard: P.O. Box 115, Linkhills, 3652.

** "Class 3 sites" are where groundwater mounding occurs in the wet season (e.g. pans, vleis, bogs, marshes). "Class 4 sites" are where the groundwater is permanently above the soil surface (e.g. lakes, rivers, dams).

The continued alteration of wetlands in urban areas therefore sets a dangerous precedent which has been used on a number of occasions in the past, where the actions (or lack of such actions) taken by one government agency is criticized by another. Within the Metropolitan area of Durban, for example, extensive amounts of wetland have been altered, and in many cases completely eradicated. In the course of developing the infrastructure of the City (the communications, harbour, industrial parks, recreation areas and sewage works), the amount of wetland remaining in the area has been reduced to a few tiny fragments.

All government authorities can tighten control over wetland uses in urban areas through the implementation of:

- floodplain regulations which disallow structural development below the 1 : 50 year flood level;
- sub-division regulations which require the maintenance of open space in wet areas; and
- performance standards, building codes and development codes which:

  encourage cluster development,
  stipulate density zoning, and
  provide for transferable development rights.

In most informal settlement areas, as in the Inanda Mission Reserve for example, shack development is basically uncontrolled (Plate 16). Where encroachment into wetland areas has occurred, the adverse effects on run-off, and water quality in particular, have been considerable (Nicolson, 1989), and to date no remedy to prevent further encroachment has been formulated.

Unintentional damage

Unintentional damage to wetlands by government departments otherwise intent on bringing about relief for unemployment can also occur. The *"Baynes Spruit Project"* outside Pietermaritzburg which cost R1,35 million, serves as an example (Anon, 1986 (b)). In this case, 1 700 people from Sobantu Village were employed for a short while to construct a 10 m wide canal through an extensive swamp on Baynes Spruit. The land thus reclaimed was to be used

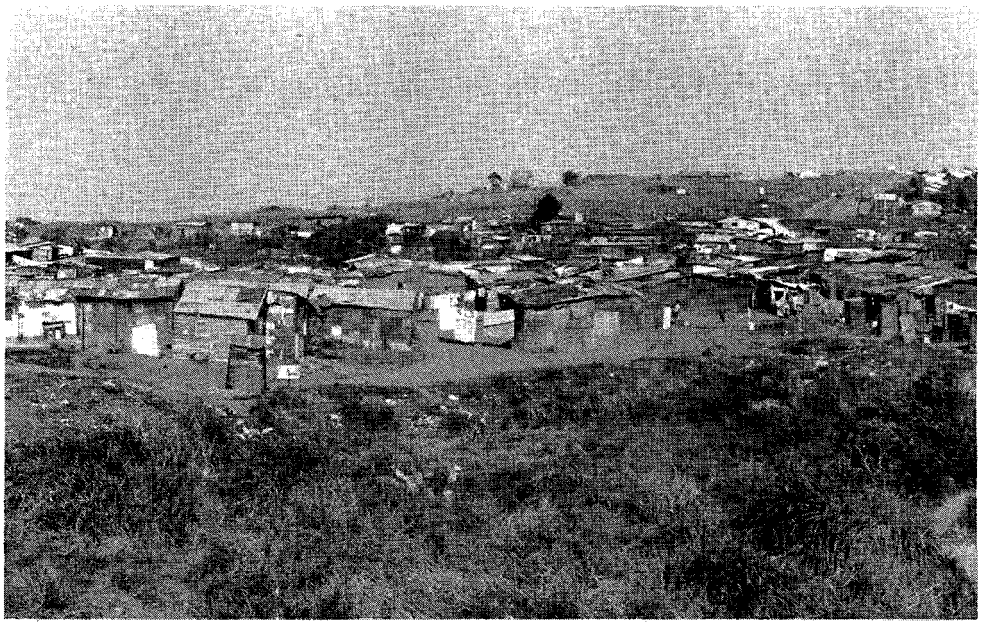


Plate 16: Shack development in wetlands of the Piesang River (Mgeni catchment) on the outskirts of Durban.

for a sporting and housing complex, but at the time no consideration was given to the possible societal benefits, particularly downstream, of the wetland concerned.

8.2.4 Specific wetland protection laws

At present no legislation exists in South Africa which is specifically focused on the protection of wetlands.

Some would argue that with seven major **Acts** and two **Ordinances**, which already have the potential to deter wetland alterations (see Section 6.1), further legislation is unnecessary. However, although the existing laws may be sufficient in principle, because of incomplete implementation or inconsistent enforcement, they do not adequately protect wetlands.

As already mentioned, the **Conservation of Agricultural Resources Act, No. 43 of 1983,** is the only legislation in existence which makes specific reference to "*vleis, marshes, water sponges and water courses*". However, controversy surrounds interpretation and implementation of the Act because none of the above-mentioned terms are defined, and the full range of alteration causing activities (e.g. infilling, draining, excavation, clearing, flooding, water diversion, grazing, burning, disruption of biota, chemical contamination, etc.) is not covered.

As weaknesses in the existing legislation occur, a method for eliminating them must be found. This can be done either through:

- expansion of the existing legislation to address certain types of alteration more explicitly;
- increasing the regulation of specific activities that cause the most severe wetland alteration, or
- drafting a *Wetland Protection Act* to serve as a comprehensive statutory basis for maximizing the ecological, social and economic value of wetlands in Natal and KwaZulu.

Adoption of the latter measure is favoured by the Steering Committee.

Through a careful assessment and balancing of the most important functional values of wetlands, it is suggested that the proposed *Wetland Protection Act* might focus directly on protecting functions, rather than simply preventing physical alteration of the resource. Finally, the proposed Act should attempt to modify and integrate existing regulatory programmes, extend protection to types of alteration that may not be adequately protected at present, and provide the basis for wetland protection through the financial incentives advocated in Chapter 7.

8.3 Recommendations

The Wetlands Steering Committee strongly endorses the need for improving wetland regulation at all three levels of government, and urges that central government take the lead by developing a more coherent and consistent wetlands management effort.

More specifically, it is *recommended* that:

8.3.1 Minimize degradation

In the interests of society, a joint statement by the Administrator of Natal and the Chief Minister of KwaZulu be issued which urges each agency within the Natal and KwaZulu Administrations to take the necessary action to minimize the injudicious destruction, loss or degradation of wetlands within its area of jurisdiction.

8.3.2 Clarification of roles and responsibilities

The Directorate of Resource Conservation (Department of Agriculture) clarify and co-ordinate the roles and responsibilities of all government agencies responsible for wetland management in Natal.

8.3.3 Wetland definition

All agencies involved in wetland regulation adopt the definition of wetland given in Chapter 4, and the delineation method in Table 2 (see Chapter 9).

8.3.4 Revision of Conservation of Agricultural Resources Act

The **Conservation of Agricultural Resources Act (Act No. 43 of 1983)** be revised to eliminate existing inconsistencies and to reduce the chance of misinterpretation. Above all else, provision should be made to ensure that unless authorized, all forms of wetland alteration be planned in accordance with the Integrated Environmental Management (IEM) procedure advocated by the Council for the Habitat (Anon, 1989).

8.3.5 Wetland management plans

In developing wetland management plans the Department of Agricultural Development consult with the full range of agencies with an interest in or responsibility for the maintenance of wetland functions.

8.3.6 Interdepartmental Conservation Liaison Committee (KwaZulu)

With the view to improving the co-ordination between the activities of agencies involved in development programmes which could directly or indirectly affect wetlands, the KwaZulu government formally constitutes an *Interdepartmental Conservation Liaison Committee.*

8.3.7 Alteration of hydrology

The Department of Water Affairs and the Branch of Forestry and Environmental Conservation (Department of Environment Affairs) adopt a comprehensive set of policies to control the impacts of altering the *hydrology* of wetlands. It is strongly *recommended* that the *Central Committee for the Allocation of Afforestation Permits* be expanded to include representation from all agencies with a responsibility towards the conservation of soil, water and wildlife resources in Natal and KwaZulu. The present grounds for refusal to issue an *Afforestation Permit* must be expanded to take into account issues other than just a reduction in mean annual run-off.

8.3.8 Revision of Water Act

The State should recognize wetlands as a beneficial use of water. To ensure that the water cleansing function of wetlands is fully utilized, for example, the **Water Act, No. 54 of 1956** (and the planned **Water Resources Management Act**) needs to be revised to ensure that all wetlands are regarded as "*public water*" instead of "*private water*".

8.3.9 Acquisition of priority wetlands

The Department of Environment Affairs consider acquiring priority wetlands which comply with the objectives of the *Southern African Plan for Nature Conservation* and the *South African Natural Heritage Programme.*

8.3.10 Revision of wetland inventory

In order to protect key wetland types and values, the Natal Parks Board and the Bureau of Natural Resources (KwaZulu) review its inventory of wetlands in order to identify current holdings and gaps where additional wetlands should be acquired. Serious consideration should be given to the introduction of legislation (similar to the **Endangered Species Act** in the USA) which is specifically designed to prevent the alteration of habitats known to be critical to the survival of certain species of wildlife.

8.3.11 Public awareness

Due to high cost of law enforcement, the government should mount a publicity campaign that deliberately draws attention to the rights of private citizens and public interest groups to notify the government agencies responsible for wetland management of wetland abuse.

8.3.12 Waste disposal

All government agencies and private contractors recognize that wetlands are areas totally unsuited to unplanned solid waste disposal.

8.3.13 Comprehensive legislation

Far more explicit and comprehensive legislation needs to be drafted which is specific to wetlands (see Section 11.2). As in the USA's **Emergency Wetland Resources Act of 1986** (Anon, 1986 (a)), provision must be made for the authorization of a *Priority Wetland Conservation Plan* to guide acquisition efforts, and the completion of a countrywide wetland inventory. Care must also be taken to ensure all physical and non-physical forms of alteration are addressed.

8.3.14 Protected environments

That, in areas other than KwaZulu, **Section 16** of the **Environment Conservation Act, No. 73 of 1989**, is used, if need be, to declare priority wetlands as "*protected natural environments*".

8.3.15 Environment Conservation Act

That, for the sake of clarity and greater emphasis, the word "wetland", as used in **Schedule 2** of the (now repealed) **Environment Conservation Act, No. 100 of 1982**, be properly defined.

8.3.16 IEM procedure in urban areas

That the local authorities of all urban areas be requested to impose far stricter controls on the use of wetlands. To facilitate this process, an inventory of wetlands in urban areas should be compiled, and the IEM procedure utilized to minimize the likelihood of urban development impacting adversely on the wetlands identified.

8.3.17 Benefits of wetland conservation

That, in their own interests, a concerted effort be made to convince urban communities of the hydrological and societal benefits of wetland conservation.

Chapter 9

The Sustainable Use of Wetlands

9.1 Background

The sustainable use of wetlands is regarded as one of the prime objectives of the *Natal Wetland Study*, but the matter is complicated by landownership and the wide variety of wetland types in Natal and KwaZulu.

To determine the best form of utilization, each type of wetland needs to be treated on its own merits (Scotney, 1970). For example, certain types of wetland may require total protection (for hydrological, wildlife, recreation or scientific reasons), whereas others may lend themselves to grazing, to the establishment of permanent pastures, water storage, fishing, reed harvesting, specialized cropping or trees. Irrespective of the final form of utilization:

- land management of the highest order is required;
- the basis for utilization must be rationally determined; and
- the regionally important functions and values of the wetland concerned should be conserved.

If the rationale underlying the recommendations contained in Chapter 7 (i.e. that wetland conservation must be made to work by making it pay) is acceptable, there should be no inherent conflict between landowners and wetland conservation. Basically, a key notion behind the above viewpoint is that if private landowners can profit from wetland conservation, then society's profit, in the form of a sustainable yield of good quality water from the catchments of Natal's rivers, will be ensured.

The sustainable use of wetlands currently requires advances in two major directions. Both relate to the science of "*land capability analysis*", which is a form of land use planning that originated in the USA (Ivy, 1977). Land capability analysis divides the landscape on the basis of slope and erosion potential into seven classes, and the limitations imposed upon agriculture increase from Class 1 to 7 (Table 1). Class 1 areas for example, allow very intensive cultivation, whereas in Class 7 areas all forms of agricultural use, other than managing the area for wildlife, are precluded. Classes 1, 5 and 7 incorporate wetlands in bottomland situations, but insufficient provision is made (as is attempted in Fig. 3) for the variety of wetlands distinguished between in Table 2.

Another limitation of land capability analysis, from the wetland point of view is its failure to incorporate environmental variables other than slope and erosion potential into the capability analysis process. For the sustainable use of wetlands at least nine variables (above ground) and seven variables (below ground) need to be taken into consideration (Fig. 2).

9.2 Options

There is really only one option available for the sustainable use of wetlands, and that is to *tailor wetland utilization to suit the functions and values of the wetland concerned.* The fact that this land use strategy was identified as necessary 20 years ago (Scotney, 1970) says little for official action taken since that date, or for the importance attributed to wetlands by land use authorities over

Table 1: A land capability classification to guide farm planning in Natal.

(Source: Department of Agriculture and Water Supply, 1987)

CLASS			USE SUITABILITY
UPLANDS	ARABLE	I	Very high potential for intensive arable use with low limitations and very low erosion hazard.
		II	High potential for arable use, slight limitation and low erosion hazard.
		III	Moderate potential for arable use, moderate limitations and hazard of erosion.
		IV	Low potential for arable use, severe limitations and high erosion hazard.
	NON ARABLE	V	Suitable for established perennial vegetation with adequate protection. Limitations preclude arable use.
		VI	Land with very severe limitations and suitable only for natural vegetation.
		VII	Land of little or no value for arable use, grazing or afforestation. Because of very severe limitations or special needs, requires total protection.
BOTTOMLANDS	ARABLE	Ib	Land comprising deep alluvial soils of high potential for many uses but subject to occasional flooding.
	NON ARABLE	Vb	Land comprising hydromorphic "vlei" soils with unique management needs. With adequate drainage and protection against erosion, may be intensified.
		VIIb	Bottomlands. Because of severe limitations or special needs require to be left in their natural state.

Table 2: A provisional basis for differentiation between the main types of wetlands, other than floodplains (see Fig. 3) in Natal and KwaZulu.

	Type 1 Wetland	Type 2 Wetland	Type 3 Wetland
Hydrological indicators			
Duration of inundation*	short	long	very long
Depth to water table**	> 500 mm	150 – 500 mm	< 150 mm
Pedological indicators			
Colour/texture	light grey	dark grey, clayey	black heavy clay
Mottling of A horizon	none	slight	present, plus rust like stains in root channels
Subsoil/gley	slight mottling	distinct mottling	heavy mottling
Botanical indicators* **			
Dominant plants	hygrophilous grasses	sedges	reeds, bulrushes and/or woody plants

* short duration = saturated for 7 days to 1 month
long duration = saturated for 1 month to 6 months
very long duration = saturated and frequently inundated, for more than 6 months

** For the major part of an average rainfall season.

*** Frequently, vegetation alone, which is a reflection of hydrologic and soil conditions, will suffice in determining the presence and boundaries of a wetland.

> = greater than
< = less than

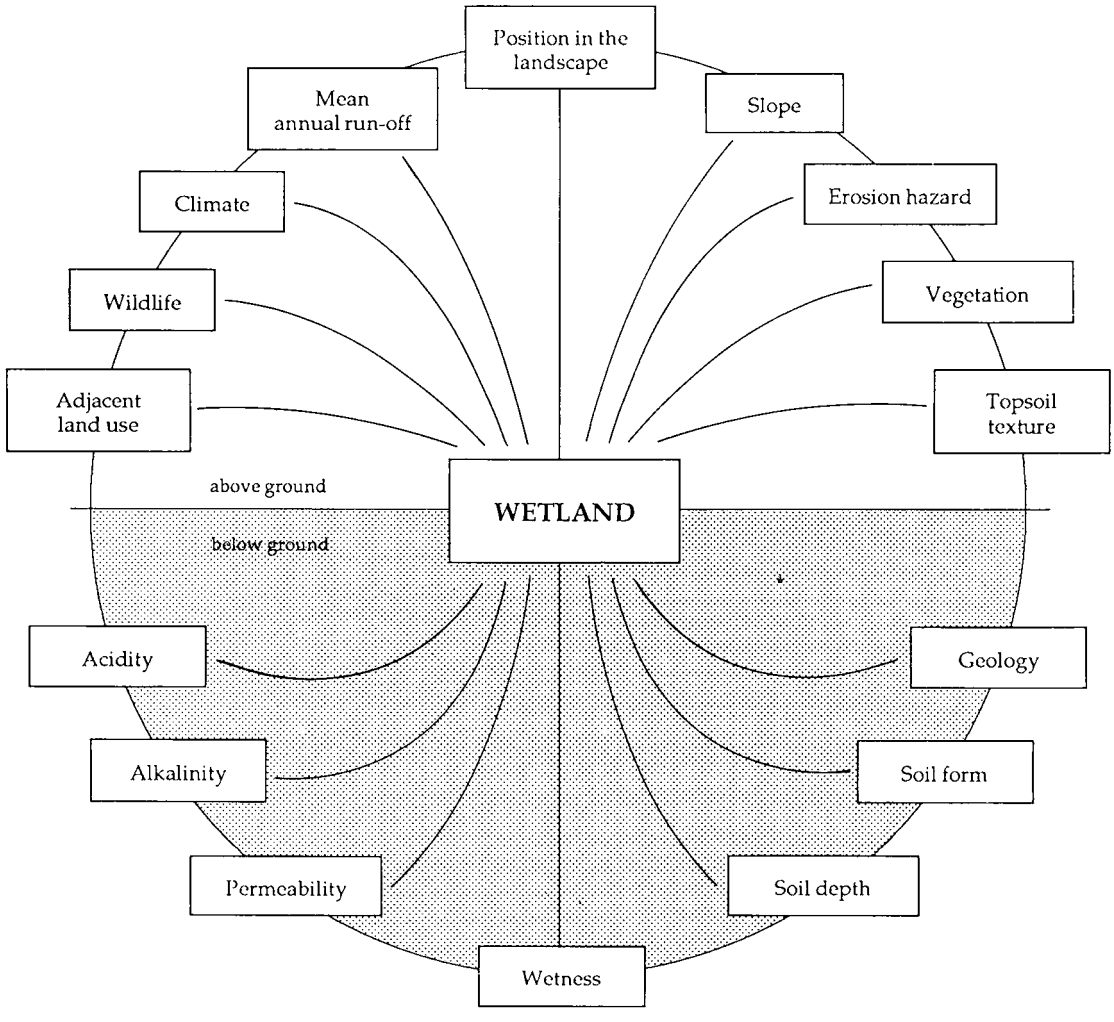


Fig. 2: The range of environmental variables which have to be taken into account when determining the safe use of a wetland.

the past two decades. A proper classification of wetlands therefore remains as one of the most important wetland-related research topics currently in need of attention in Natal and KwaZulu (see Chapter 11).

In formulating the guidelines presented in Figs. 3 and 4, both of which demonstrate the principle of tailoring wetland type to wetland function, extensive use has been made of past attempts to define the management needs of wetlands in Natal and KwaZulu. Data have been drawn from the work of Downing (1966), Scotney (1970), MacVicar (1970), Hill (1970) and Scotney and Wilby (1983).

It is encouraging to note that potentially there is a considerable knowledge available locally on which suitable measures to improve wetland management could be based. Thus, the difficulties do not appear to be technical, but socio-economic. In short, the inference is that much more effort, finance and manpower is currently needed in integrating technical solutions into the socio-economic circumstances of the individuals that currently own the wetland resources of Natal and KwaZulu.

Type	Major characteristics	Management needs
Type 1 Wetland	Hydrology – water table below 500 mm – subject to periodic inundation Soil form – Rensburg / Willowbrook Vegetation – Gramineae (grasses)	High erosion hazard demands these sites remain under permanent pasture. • avoid compaction • graze in winter • block burn High conservation practice required.
Type 2 Wetland	Hydrology – water table above 500 mm – saturated in summer – subject to occasional overflow (drainage channel frequently incised) Soil form – Katspruit Vegetation – Cyperaceae (sedges)	Suitable for specialized cropping, but use as permanent pasture preferred. Mow for silage, avoid grazing under wet conditions, graze on a rotational basis. If cropped, timeous tillage, surface drainage and controlled irrigation needed. High conservation practice required.
Type 3 Wetland	Hydrology – water table above 150 mm – saturated for most of the year, subject to overflow Soil form – Champagne Vegetation – aquatic, bulrushes, reeds	Unsuitable for arable use. Site to remain in a natural state to safeguard societal functions and values. Total protection required.
Neither of the above Types	Hydrology – subject to periodic flooding – water table unimpeded or controlled by the river regime Soil form – Oakleaf / Dundee (well drained) Vegetation – various herbaceous and woody forms	Suitable for: • poplar production • intensive cropping • intensive irrigation Streambank protection required is 10 m horizontally beyond 1 : 10 year flood line.

Fig. 3: **General interpretive guide to the sustainable use of wetlands in bottomland situations. For an explanation of Type 1, 2 and 3 Wetlands, see Table 2.**
(modified from Scotney (1970); Downing (1970); Scotney and Wilby (1983))

9.3 Recommendations

9.3.1 Agricultural management policies

The high potential of wetlands for a wide range of agricultural uses has long been recognized (Scotney and Wilby, 1983). Wetland soils are inherently more fertile than associated upland soils, and generally lie close to sources of water. Wetlands are thus favoured for irrigation, offer favourable sites for water storage, and help to even out crop and livestock production by ameliorating the effects of the dry winter conditions which characterize most of Natal and KwaZulu.

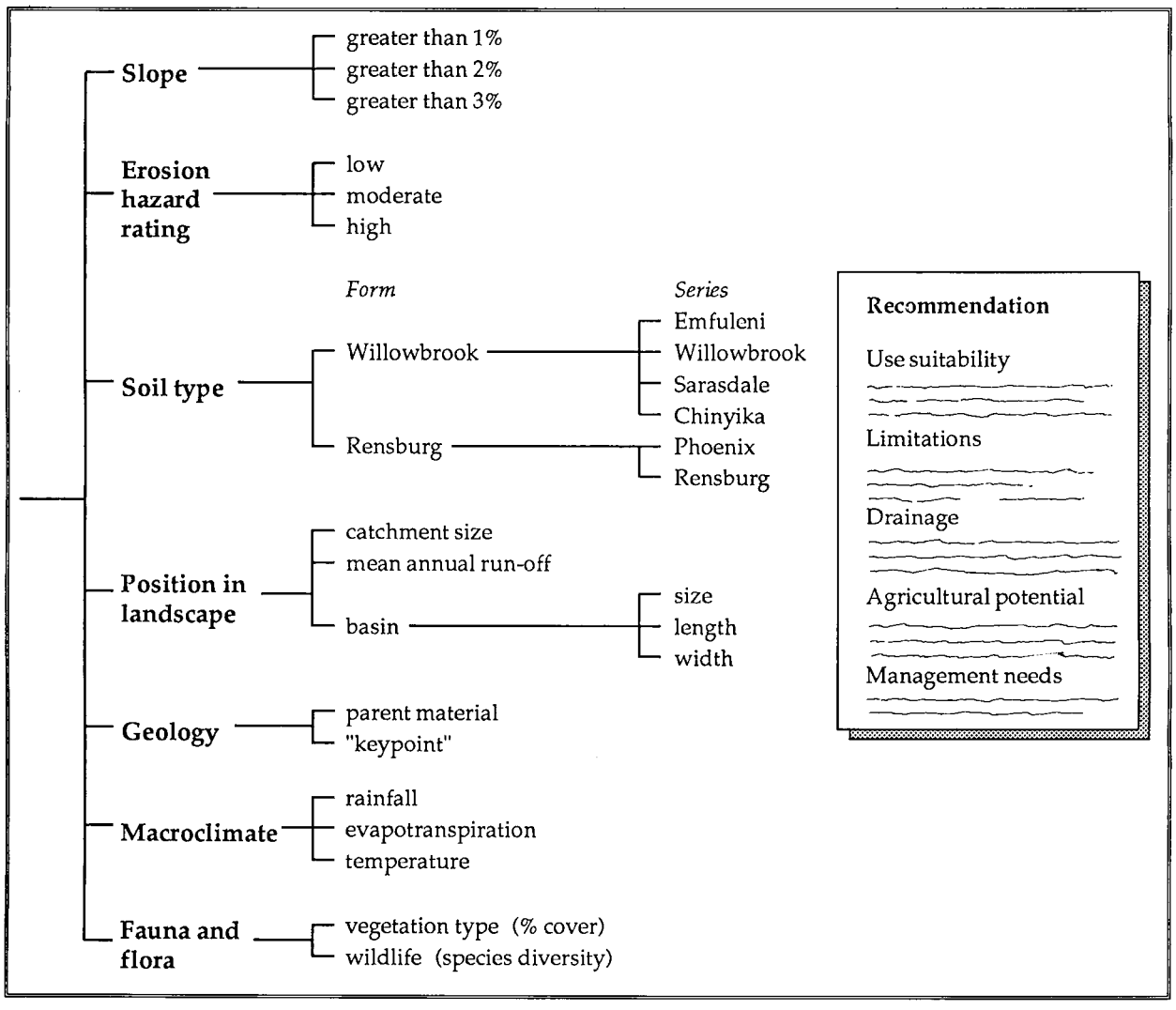


Fig. 4: Specific interpretive guide to the sustainable use of a "Type 1" Wetland. For an explanation, see Table 2.

Most agriculturalists appear to agree that because of the special management and conservation techniques needed to protect wetlands (Fig. 3) the establishment of pastures has much to offer in this respect. Pastures provide greater consistence with many of the functions and values of wetlands. Pastures provide greater soil protection, prevent a reduction in organic matter content, are more tolerant of impeded drainage, and lessen the need to radically lower the water table.

Under the above-mentioned circumstances, the Steering Committee *recommends* that as a matter of policy:

- wetland utilization should meet all the requirements of the **Conservation of Agricultural Resources Act, No. 43 of 1983.** Where necessary, greater attention should be given to enforcement of the Act;
- agricultural use is planned so as to ensure that at least the minimum water requirements of wetland are met. This includes the volume, rate, timing, direction and quality of water flow;
- wetland areas representing important habitats are managed to maintain and enhance their natural values;

- construction of flood protection works such as levees are discouraged. If built, their construction should be subjected to application of the IEM procedure;
- a review process for wetland alteration based on the IEM procedure advocated by the Council for the Environment (Anon, 1989) be established. This should be achieved through group consultation among specialists and economic analysis of both the on-site and off-site consequences of wetland alteration should be undertaken to evaluate all of the implications. Finally, land use decisions should not be made without a thorough survey of the site and analysis of the variables contained in Fig. 2;
- depending on soil type, alteration should be restricted to wetlands with a slope gradient of less than 1,5%. Furthermore, should the surface drainage of wetlands be undertaken, plans for re-instatement of the original moisture regime (if known or required) must be provided; and
- where cultivation of wetlands is permitted, provision should be made for protective strips of vegetation to remain along drainage lines. Where possible, ploughing should always be undertaken at right angles to the direction of streamflow.

9.3.2 Silvicultural management policies

Until recently, the revenue generated through the planting of trees in wetland areas has been one of the recognized and legitimate benefits of vlei usage (Nanni, 1970). For example, the poplar industry is almost entirely dependent on production from well-drained wetland sites, and in Zululand many wetlands are drained and planted to eucalyptus and pine trees.

Afforestation radically alters the natural environment and generally impacts negatively on other life forms. The Steering Committee therefore *recommends* that the guidelines recently formulated by the Forest Industry be adopted, i.e. "*that trees should not be planted or allowed to grow where they cannot be adequately managed and harvested without negative environmental impacts*" (Forest Industry, 1989).

The inferred policy is that:

- all wetland areas should be demarcated, defined and identified;
- management practices which ensure the proper functioning of wetlands must be introduced; and
- the Industry should abide by the provisions and conditions of the **Forest Act, No. 122 of 1984**, and give particular emphasis to defining the margin around wetlands which should remain unplanted.

9.3.3 Wildlife management policies

Wildlife protection is recognized as one of the major beneficial uses of wetlands in Natal and KwaZulu. Consequently, the Steering Committee *recommends* that wherever practicable:

- wetlands should be protected to maintain their value as wildlife production areas;
- selected areas representative of each type of wetland in Natal and KwaZulu be designated by conservation agencies as nature reserves and witness areas;
- management strategies are designed to conserve the diversity of plant and animal species occurring in wetland areas;
- professional advice be sought before the alteration of any wetland is undertaken; and

- the deliberate introduction of alien plant and animal species into wetlands be avoided or, at least, preceded by an environmental impact study. Where already established, steps necessary to control or eliminate undesirable alien species should be taken.

9.3.4 Water resource management policies

It is generally accepted that wetland functions are closely linked to hydrology (flood attenuation, flood storage, streamflow regulation) and that wetlands contribute to improving water quality by removing pollutants and sediment.

Consequently the Steering Committee *recommends* that:

- wetland managers come to regard the maintenance of hydrological processes as a critical element of the wetland conservation effort in Natal and KwaZulu;
- all activities which could result in a major reduction or increase in the flow regime of rivers delivering water to wetlands be investigated and assessed. If found to be potentially damaging, the activities in question should be regulated as far as possible;
- only under exceptional circumstances should the "keypoint" controlling the exit of water from functional wetland areas be interfered with;
- waste water should not be discharged in wetland areas unless it complies with the latest gazetted standards laid down by the **Water Act, No. 54 of 1956**, unless the implications are understood and acceptable, and unless proper waste load studies had been undertaken;
- wetland protection should be seen as an essential component of integrated catchment planning, and that the conservation of soil and water in the catchment is just as important, if not more so, than the management of wetlands *per se*;
- the modification of wetland areas, by dam construction for example, is not permitted without application of the IEM procedure; and
- where permits for dams are being considered (in terms of **Section 9B** of the **Water Act, No. 54 of 1956**) wetland functions and values are taken into account in the planning, location, construction and operation thereof.

9.3.5 Development planning policies

In order to maintain the regionally important functions and values of wetlands specified in Section 3.1, the Steering Committee *recommends* that all branches of the Natal and KwaZulu Administrations accept that where demonstrated to be in society's best interest:

- wetlands should be protected from conditions that reduce wildlife habitat, water-holding capacity and water quality;
- land management systems are needed (such as protective zoning) that demonstrate and encourage wetland protection;
- drainage filling and interference with wetlands, as well as with the sources of water supplying them, be avoided to the greatest practicable extent;
- approval for developments in wetlands are subject to application of the IEM screening procedure (Anon, 1989);
- an inventory of areas designated as wetlands should be compiled and distributed to all branches of the Natal and KwaZulu Administrations. In the case of priority wetlands, the appropriate landowners should also be notified;

Plate 17a: Wetlands in the catchment of the Sweetwaters River prior to construction of route MR96 to Umdloti Beach.
(Date of photo: 22 October 1988)

- wetlands be taken into consideration in the location, design and construction of all roads (Plate 17 a and b). If feasible, transport systems must be either located in such a way as to avoid wetlands, or designed and constructed to minimize the alteration of wetlands;
- for the sake of safeguarding resources of direct value to less affluent societies, the principle of river corridor protection (*wetlands* included) be strictly adhered to in the planning and development of black urban and informal settlement areas; and

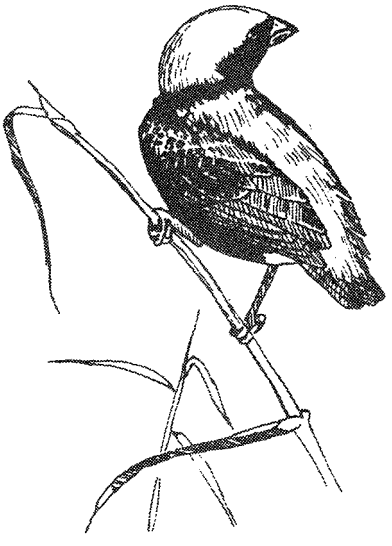
Plate 17b: The remains of the wetlands depicted in Plate 17a after commencing the construction of route MR96 and canalization of the Sweetwaters River.
(Date of photo: 8 February 1989)

- greater effort and expenditure should be made with respect to policing and monitoring of the activities associated with development that are specified in **Part 5** of the **Environmental Conservation Act, No. 73 of 1989**.

9.3.6 Waste disposal policies

In order to control the physical and chemical alteration of wetlands, the Steering Committee *recommends* that the views of the Institute of Waste Management of Southern Africa be adopted. These are that:

- wetlands are not used for the disposal of solid waste of any form;
- in the case of soundly engineered and well managed landfill sites the discharge of leachates into wetlands may be acceptable under closely monitored circumstances. At the first significant sign of pollution the site should be closed down; and
- biologically damaging shock loadings of landfill leachates are avoided at all costs.



Chapter 10

Wetland Restoration and Creation

10.1 Background

Restoration involves after-the-fact rehabilitation of damaged resources. The fact that the subject has to be addressed in a policy statement is therefore an admission that wetland resources have been allowed to become so degraded in Natal and KwaZulu that an investment in wetland restoration and creation is now required.

The earliest efforts made by the government to restore the functions of damaged wetlands in Natal date back to the period 1945 – 1955, when intensive efforts were made to re-instate the flow regime of the Blaaukrantz River (Higgs, 1967), and the height of the water table in Mvoti vlei (le Roux, 1968; Scotcher, 1987) after canals had been dug through the system by the Lion Match Co. in 1949. More recently, joint efforts have been made by the government and the private sector aimed at restoring wetlands and improving land use in certain of the catchments of Natal's coastal rivers and, where such efforts have been sustained, remarkable success has been achieved over a period of 5 years (Garland, 1989). The efforts of the Division of Agricultural Engineering (Department of Agriculture) in the reclamation of eroded water courses has also met with commendable success in other parts of South Africa (Pienaar, 1980). Approximately six million rand is already spent annually in this connection (Russell, pers. comm.).

Evidence from the USA indicates that with good information about the characteristics of a damaged wetland (especially its hydrology), careful design and sufficient attention to monitoring and maintenance, some types of wetlands can be restored to provide many of their original functions (Maltby, 1987). Failures in the field of wetland restoration stem mainly from a lack of reliable guidance, insufficient financial resources, a poor understanding of general wetland parameters, poor planning and design, and inadequate monitoring and maintenance.

Some types of wetland (e.g. high-lying bogs in the Drakensberg) could require a long time to regenerate, whereas others such as freshwater reedswamps may be restored to functional status within 7 – 8 years (de Villiers, 1980). It is also known that certain functional properties such as flood and sediment control, and waterfowl habitat, are easier to restore than others. Nutrient retention and removal, groundwater discharge and food chain support on the other hand are wetland functions that are notoriously difficult to re-instate (Larson, 1987).

10.2 Options

The case for establishing or maintaining wetlands hinges upon the extent to which wetland function can be sustained. It is of paramount importance, therefore, that restored wetlands sustain the hydrological, biological and chemical processes which characterize a wetland's ability to function (Maltby, 1987).

For the purpose of making an informed decision about future investment in wetland restoration and enhancement projects, the Steering Committee should focus its attention on one or other of the following options:

- *Wetland restoration*

  Wetland restoration involves improving the condition of existing degraded wetlands so that certain of the functions which the ecosystem formerly provided become replaced.

- *Wetland creation*

  Wetland creation involves creating new wetlands where none exist or have existed in the past.

- *Integrating wetland conservation and rural development*

  In this case, attention is directed neither at wetland restoration or wetland creation, but towards maintaining existing wetlands as functional units in the landscape.

The scientific uncertainty surrounding wetland restoration and creation is a major impediment to decision-making in this regard, because the success of both options has not been well documented. Under certain circumstances, wetland creation has proved to be a cost-effective and viable management strategy. Generally speaking however, wetland restoration appears to present less risk of failure than does creation, particularly with regard to the replacement of acceptable hydrologic functions.

It is clear, however, that in developing countries such as Natal and KwaZulu, very little wetland restoration has taken place because of the technical difficulties and costs involved.

Depending on the type, position and size of the wetland, it also appears to be inherently more likely that *creating and restoring wetlands costs more than maintaining existing systems* (Dugan, 1987). It is argued, therefore, that in order to make optimal usage of the limited human and monetary resources available for wetland policy implementation, attention should be directed at a type of development that integrates production with resource conservation and makes provision for the equitable utilization of resources.

In conclusion, it is *recommended* that the Steering Committee should attach the greatest importance to the last option (*integration*); should continue to pursue the first option (*restoration*) providing the scientific basis of such efforts is sound; and should ignore the last option (*creation*).

10.3 Recommendations

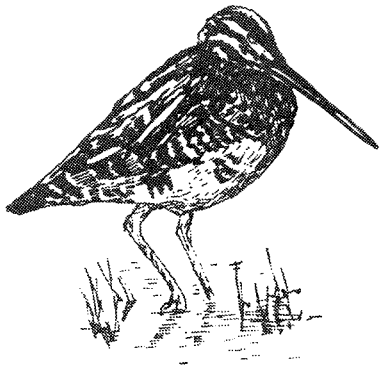
The Steering Committee *recommends* that if the protection, and functional maintenance of wetlands is to be translated into practical methods for the enhancement and management of wetlands on a sustainable basis, then the multiple goals of integrating wetland conservation and rural development through co-operation planning (Chapter 6) and wetland restoration should be adopted.

In order to promote the concept of re-establishing wetlands in areas where they formerly existed before being eroded or otherwise converted, the Steering Committee *recommends* specifically that:

- the Department of Agriculture should provide the technical and financial support to encourage restoration of wetlands on private land;
- the Department of Agriculture and Forestry (KwaZulu) should provide the technical and financial support to encourage and restore wetlands on communal land;

- the Department of Agricultural Development should actively promote the rehabilitation of degraded wetlands through the existing soil conservation subsidy scheme;
- guidance materials and a training programme should be prepared for individuals wishing to implement wetland restoration projects;
- after construction is complete, all restoration projects are monitored to evaluate the ability of the restored wetland to provide the functions intended;
- a research programme co-ordinated by the Department of Environment Affairs should be initiated to improve the scientific understanding of wetland restoration; and
- the government should consider acquiring the damaged portions of priority wetlands (e.g. Lenjane vlei) that have the potential for restoration and enhancement (Plate 18).

Plate 18: Active gully erosion in the body of Lenjane vlei, a priority wetland in the Mfolozi catchment.
(Date of photo: 17 September 1987)



Chapter 11

Policy Implementation

Until recently, government agencies in Natal and KwaZulu have been inclined to ignore the field of *"wetland management"*. In the process, a resource of unparalleled value for flood control, water storage, streamflow regulation, drought relief, soil erosion protection, water purification and wildlife protection has been damaged and untold economic opportunities have been harmed.

For the past six years the *Natal Wetland Study* has been conducted in a step-wise fashion designed to ensure that eventually, the above-mentioned sentiment would be translated into public policy. The first step taken (NTRPC Report, Vol. 68) was intended to reveal the considerable public value of wetlands, and that state programmes designed to protect and enhance wetland values were ineffective, inadequate or non-existent. The second step taken (NTRPC Report, Vol. 71) showed the extent and causes of wetland loss in a 10 000 km^2 portion of Natal and KwaZulu, whereas the third step (NTRPC Report, Vol. 73) was directed at trying to secure the future of Natal and KwaZulu's priority wetlands.

During the course of the last year, the fourth, and final step of the *Natal Wetland Study* has been undertaken. Its purpose has been to establish a unified, determined and consistent policy to conserve what wetlands remain in Natal and KwaZulu, to halt any further destruction of wetlands, and to encourage the restoration of degraded wetlands.

All that now remains to be done, is to implement the aforegoing *Policy Statement*, party to which are 13 different government agencies and 9 different organizations representing the private sector (see Chapter 2 and Appendix).

11.1 Administrative implications

The administrative implications of pursuing the four *policy options* stated in Chapter 6 are as follows:

11.1.1 Direct control (Recommendation 6.5.1)

- To protect the wetlands of Natal and KwaZulu without regard to what or where they are, by *"blanket type"* legislation is irrational. Whatever regulations are adopted must be tailored to wetland type and take into account socio-economic conditions prevailing within the region and the most appropriate level of control.
- Without completion of a wetland classification in Natal and KwaZulu, no basis currently exists for tailoring regulations to wetland type.
- Decentralizing the development of management schemes (to Conservation Committees?) would allow landowners to choose and develop schemes which reflect their own preferences, confine the costs and benefits of wetland conservation to a local level, and allow administrators the flexibility to tailor wetland policies to individual situations.
- Enforcement criteria must also be tailored to wetland type for the programme to be effective and equitable.

- In a democratic, capitalistic society, freedom from interference by government is a recognized civil liberty. At the same time however, no-one has the liberty to create a nuisance, and therefore in the case of wetland destruction by an individual landowner the "*law of nuisance*" can be exercised to protect the welfare, or well being, of others.*
- "***Planning** is a legitimate government activity that does not affect the civil liberty involved in the rights of ownership*" (Milton, 1989). Therefore, whether in Natal or KwaZulu, the preparation of plans indicating *community recommendations* for land and water use within wetland areas is currently regarded as the best direct mechanism for developing a co-operative wetland conservation partnership (see Section 11.1.4).
- Advanced planning exercises are particularly valuable where threats to strategically important wetlands or areas known to be rich in wetlands are known to occur.
- A directive (in terms of the **Conservation of Agricultural Resources Act, No. 43 of 1983**) to prevent development *without* prior authority is essential as a first step to the protection of priority wetlands, and to the formulation of a management plan.

11.1.2 Government acquisition (Recommendation 6.5.2)

Many of the implications associated with the direct control of wetlands (Section 11.1.1) also apply to the acquisition of wetlands.

- Outright government purchase is likely to be unpopular, especially in rural areas where land use decisions have traditionally been regarded as a private right.
- Due to the widespread ignorance about wetlands in South Africa, the proper management of wetlands, particularly priority wetlands, has remained undeveloped. Having many other priorities in mind, even the Department of Agricultural Development and the Natal Parks Board for example, openly admit that at present they are unable to advise on the proper management of wetlands. In short therefore, until such time as these skills are available, the acquisition of wetlands by the State is no guarantee of their conservation.
- Most State programmes are handicapped by small budgets and limited staff. This is of major importance because the public ownership of wetlands can be a costly exercise, both in terms of acquisition (in the short term) and maintenance (in the long term). Furthermore, numerous management problems on adjoining land, which are equally demanding of time and money, can arise. For example, wetlands can be regarded as a fire hazard, or to harbour wildlife which can ravage adjacent cropland, and to harbour weeds that invade adjoining pastures.
- Without the completion of a comprehensive wetland inventory and classification in Natal and KwaZulu, no proper data exist for justifiable decisions to be made regarding wetland acquisition.

11.1.3 Fiscal measures (Recommendation 6.5.3)

The drawbacks associated with providing economic incentives for landowners to protect wetlands include the following:

- In Natal there is no yardstick available at present by which to determine a fair price for the conservation of wetland. The individual products (referred to overseas as "*goods and services*") provided by wetlands must first be identified and reliably evaluated.

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* The case sited by Ramsden (1987) of the Benoni Town Council versus Meyer, over the intended infilling of a vlei valued by the local community, serves as a good example.

- If landowners are to be induced to conserve wetlands, the payment must not only be rationally determined, but also be sufficient to compensate for non-productive use of the land.
- Monetary incentives for wetland conservation change each year due to variation in the profitability of farming. Therefore when commodity prices are depressed farmers are receptive to the idea, but once commodity prices are high they change their minds.
- Tax incentives for conserving wetlands are ineffective for small farm operators.
- The costs of surveillance and management of wetland servitudes (Section 6.3.2 refers) are high. Frequently the public agencies responsible for wetland servitudes have not the manpower or the funds to administer the contracts. Arguments can arise over delineation, stock losses, fire, weed and wildlife control.
- Without completion of the wetland inventory in Natal and KwaZulu, no basis exists as yet for negotiations over wetland servitudes or preferential tax treatment.

11.1.4 Public awareness (Recommendation 6.5.4)

The prospect of trying to instill a sense of moral responsibility to protect wetlands through education of the public, particularly within farming communities, involves the following realities:

- Experience has shown that it takes an extremely long time to arouse public consciousness to the stage that there is strong national support for any issue.
- Farmers' attitudes, having been formed over entire lifetimes, cannot be changed overnight. What is more, farmers' attitudes are frequently influenced by short term economic pressures and by pressure from their neighbours.
- Negotiated agreements and financial incentives will still need to be the basis upon which co-operative wetland conservation partnerships are based.
- Management plans indicating community recommendations for land and water use should identify the most important functions and values of the wetland, describe the ways in which they can be maintained, and assign responsibility for their future protection and use. The planning *process* is more important than the plan itself.

11.2 Legislative implications

Adoption of the recommendation which calls for the preparation of legislation which explicitly protects wetlands (i.e. a *Wetland Protection Bill*) requires an instruction to be issued by the Minister of the Environment for the legislation envisaged to be drafted.

The Minister should consider modelling the envisaged *Wetland Protection Bill* along the lines suggested by the Environmental Law Institute (Kusler, 1978). The proposed wetland regulatory statute should contain the following elements, or types of provisions:

- Title of legislation
- Statement of legislative findings of fact concerning wetland loss and the need for wetland conservation.
- Statement of statutory purposes and policy.
- Wetland definition.
- A statement of wetland management functions.
- Establishment of a *Wetland Protection Programme.*

- Authorization for a National Wetland Inventory.
- National regulations pertaining to wetlands.
- Local wetland regulations.
- Regulated activities.
- Criteria for evaluating permits and permitting procedures.
- Protective orders (e.g. directives for priority wetlands).
- Appeals procedures (administrative and judicial).
- Penalties for violating regulatory standards.

11.3 Financing wetland protection

The Steering Committee recognizes that the adoption of a law (as suggested in Section 11.2) in itself is not sufficient to achieve wetland conservation, and that many of the initiatives proposed in this policy statement will require increased government funding. At a time when all levels of government are facing tight budget constraints, any recommendation for increased expenditure must, therefore, be cautiously and clearly justified.

By the same token, the Steering Committee recognizes that the cost of *not* making these expenditures is substantial. The Committee's request for increased government funding is justified by the fact that:

- wetlands are resources of direct value to society;
- society needs to conserve wetlands; and
- the costs for this conservation should be met by the appropriate user.

It is argued that Natal and KwaZulu can ill afford to lose what few wetlands remain, and that the future costs of restoring wetland functions will be many times larger than the cost of preventing the continued disappearance of existing wetlands.

The Steering Committee therefore *recommends* that a dual approach to financing wetland conservation be adopted.

Making more effective use of existing flows of government money

> Where "*protected natural environments*" are declared, **Section 16(5) of the Environment Conservation Act, No. 73 of 1989** should be used, "*with the concurrence of the Minister of Finance out of money appropriated by Parliament*", for the conservation of priority wetlands.

It is proposed that the central government provides grants-in-aid to the agencies controlling Natal and KwaZulu to assist them in carrying out their increased responsibility towards wetland conservation. Existing funds such as the government subsidies available for flood damage, soil conservation practices, farm dam construction and flood protection, particularly where these programmes impinge upon wetland resources, could be used more effectively to conserve wetlands.

It is further proposed that an economist be employed to explore the opportunities for increasing sources of revenue, particularly those tied to activities that use, degrade or destroy wetlands. For example, all fines imposed on violators of wetland regulations should be earmarked for the development of a wetland conservation programme. The programme could be administered by a *Wetlands Protection Trust*. A surcharge on flood insurance and grants by the State for the water

pollution control exercised by wetlands are additional examples of prospective funding opportunities which need to be explored.

Innovative funding sources

A variety of innovative funding sources will need to be developed, particularly where wetland acquisition and servitude agreements involving the private and communal owners of wetlands are involved (Chapter 7). Specific funding opportunities to be explored include:

- matching grants by the State for donations made by the private sector for wetland acquisition;
- the issue of *Wetland Obligation Bonds*, the revenues from the sale of which would provide a permanent endowment, with interest paid by the State;
- the introduction of a local excise tax (or tariff) on the sale of water*;
- the introduction of a "*tourist impact tax*" to be added to the entrance fees charged at Nature Reserves and holiday resorts throughout Natal and KwaZulu; and
- the sale of wetland stamps, similar to the "*flood disaster*" stamps issued after the Natal floods in September 1987.

11.4 Research and information gathering

Wetlands are ecological systems involving complex biological, chemical and physical relationships. The Steering Committee recognizes that the current information base on wetlands in Natal and KwaZulu is inadequate, and that without accurate scientific information concerning wetlands there is little prospect of adopting technically efficient and cost-effective management programmes.

The research needs outlined during the first phase of the *Natal Wetland Study* (Begg, 1986),although since expanded upon and adopted as the basis of a *National Research Programme* (Walmsley, 1988), remain as valid today as they were four years ago. However, for the purpose of policy implementation certain elements of the research programme identified warrant priority attention.

The Steering Committee *recommends* that in general terms, the government agencies responsible for wetland regulation attempt to learn more about the effectiveness of the techniques they have available for wetland management.

To achieve this, the government should increase the resources required for the continuation of research in six principal areas:

- an improved *wetland mapping*/inventory effort;
- a *wetland classification* for the purpose of tailoring wetland regulations to wetland type;
- a study of the *water requirements of wetlands* to determine their resilience to alterations in water supply;
- wetland *trends analysis***, with emphasis on the rate at which wetlands are being altered and the types and the causes of the alterations involved;

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* That is, the "*consumer must pay*" principle. This would be particularly desirable where the benefits of water purification by wetlands to the consumer can be quantified.

** Ideally, a report on wetland trends should be prepared every 10 years.

- calculation of the *public value of wetlands*, by accurately determining the cost-benefits of both developed and undeveloped wetlands, in a local and regional context; and
- the *legal and economic implications* of public investment in wetland conservation (Recommendation 6.5.3 refers).

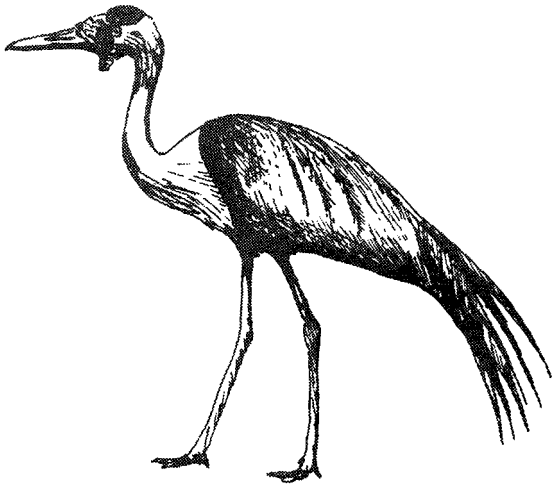
Finally, as a method of providing for a more efficient use of resources a **Regional Wetland Research Centre** should be established. Heavy emphasis should be given to multi-disciplinary, applied research.

11.5 Information management

The need to improve the dissemination of information concerning wetlands, particularly the function and value of wetlands, is considered to be more important than the need for information gathering (Section 11.4 refers).

The Steering Committee *recommends* therefore, that:

- In view of the fact the Directorate of Surveys and Mapping has been charged with the creation and implementation of a national land-orientated information system (Grundlingh, 1987), the Department of Agriculture should work towards developing a computerized communication system which makes information about wetlands more widely available.
- Information containing the results of the wetland inventory and trends analysis should receive priority, providing the utility of the maps generated and the criteria upon which the mapping is based, is clearly explained.
- As a service to private landowners and regulatory agencies, the Department of Environment Affairs should, for jurisdictional purposes, support the establishment of a programme aimed at producing persons specifically trained to establish the boundaries of wetlands in the field.
- Wetland regulatory agencies should adopt a system for the monitoring of wetlands where alterations have been permitted.



Chapter 12

Glossary of Terms

ACQUISITION
: The act of acquiring wetlands, if need be by State expropriation.

BOG
: A type of wetland generally characterized by peat deposits (i.e. dead plant material) and acidic water. Bogs often owe their existence to springs in headwater situations. Dominant plants include mosses and sedges.

CATCHMENT AREA
: A basin-shaped area from which rainfall is collected and concentrated into streamflow.

CLASSIFICATION
: The grouping of objects, such as wetlands, on the basis of their similarities (e.g. geomorphological origin, form, hydrology, biota, etc.).

CONSERVATION
: The act of planning and managing natural or man-made resources (e.g. wetlands) with the object of securing their optimal use without degrading their quality, value and diversity.

CONSERVATION STATUS
: The extent to which resources, such as wetlands, have been modified by man, and the degree to which the functions and values of the wetlands concerned might be expected to be maintained in the medium term (i.e. 10 – 100 years).

CREATION (OF WETLAND)
: The act of creating new wetlands in areas where none existed in the past.

ECOLOGY
: The science which deals with the relationship between plants and animals (including man), and their environment.

ECOSYSTEM
: The system of inter-relationships within and between a biological community and its physical environment.

ENDANGERED
: Nearing extinction, i.e. existence of the organism and its environment are in immediate jeopardy.

ENVIRONMENT
: The sum of all the external conditions and influences which affect the development and life of organisms.

FAUNA

The animal life characteristic of a particular region or environment.

FLOOD ATTENUATION

The capacity of a wetland to slow run-off velocity and thus reduce downstream flooding.

FLORA

A collective term for the plant life characteristic of a particular region or environment.

FLOODPLAIN

An area adjacent to rivers and streams which is periodically inundated by flood flows. Floodplain ecosystems develop in response to the flooding patterns generated.

FLUVIAL REGIME

The pattern of changes in magnitude, frequency and duration of flow in rivers and streams.

FISCAL MEASURES

The spectrum of mechanisms available whereby public revenue is used as payment to landowners for the public services that their land provides.

GENETIC DIVERSITY

The variation of genetic material within and between species and sub-species of plants and animals.

HABITAT

The locality, or niche (i.e. living place) of a plant or animal, and normally within a particular kind of environment.

HYDROLOGY

The science that underlies the development and control of water resources. Hydrology is a very broad science, involving the study of water and especially the factors governing its movement on land.

HYDRIC SOIL

Soils in which waterlogging becomes the dominant factor determining its physico-chemical characteristics.

HYDROPHYTIC VEGETATION

Water-loving plants.

INTEGRATED ENVIRONMENTAL MANAGEMENT

A planning process designed to ensure that environmental considerations are taken into account from the early planning stages of a proposal through to the final stages of implementing the approved action.

INVENTORY (OF WETLANDS)

A countrywide "*stock-taking*"/mapping exercise designed to generate information on the location and characteristics of all areas designated as wetlands.

"KEYPOINT"

A natural obstruction that resists downward erosion of the river channel. Frequently,

the "keypoint" is a hard stratum of rock (such as a dolerite dyke or sill), but can also occur laterally in the form of alluvial ridges.

LEACHATE

A toxic solution produced by the movement of groundwater or infiltrating surface water through landfill sites containing solid waste.

LEVEES

Man-made ridges of soil (technically "dykes") that are formed on either side of a river channel to protect the surrounding land from flooding. Levee formation is also a natural phenomenon.

MANAGEMENT PLANS

Recommendations for managing a wetland for the long term sustainability of socio-economically important functions such as streamflow regulation, flood damage protection, water purification, wildlife and soil erosion protection, and agricultural production.

MARSH

A particularly moist form of wetland dominated by herbaceous plants (such as reeds (*Phragmites*) and rushes (*Typha* and various *Juncaceae*)) which often develop in shallow depressions or along river margins.

MOTTLING

A mottled or variegated pattern of colours is common in many soil horizons. Where hydromorphy is responsible, the colour pattern is formed by the reduction of iron compounds. The colour of the mottles normally varies from red to yellowish brown, on a grey matrix.

NATURAL RESOURCE

Any raw material, either living or non-living, renewable or non-renewable, obtained from nature.

ORDINANCE

Locally adopted regulation.

PAN

A permanent or semi-permanent lake that is fringed by wetland-associated plants. The outlet is generally blocked by sediment.

POLICY

A statement upon which (wetland) management decisions can be based, and guiding principle for a course of action which will lead towards achieving the goal defined in Chapter 4.

PRIORITY WETLAND

Wetlands that have a high priority for attention as far as management and policy formulation is concerned.

REMOVAL EFFICIENCY

A measure (expressed as a percentage) of the natural ability of wetlands to remove suspended materials (such as silt, or pathogenic bacteria) or dissolved materials (such as nutrients) from water during its passage through the system.

REVIEW

The process by which the proposed development of or use of a wetland is evaluated to determine potential impacts.

RIPARIAN

Occurring on the banks of rivers or streams.

RESTORATION (OF WETLANDS)

The act of enhancing the condition of degraded wetlands to a level whereby certain of the functions which the system formerly provided become replaced. Successful restoration means the replacement of lost functional values.

SERVITUDE AGREEMENTS

Contracts that make provision for the transfer of certain rights and privileges concerning the use of land to specified individuals or bodies, without transferring title to the land.

SHOCK LOADING

The sudden contamination of an environment to the extent that heavy mortality of the organisms present may be induced.

SIGNIFICANT

A characteristic that has been assessed and determined to be important, if not essential.

SUBSIDY

A parliamentary grant of money for the cost of undertakings held to be in the best interests of public utility.

STATUTE

A legislative act adopted by a State legislature.

SWAMP

Wooded wetlands with standing, or gently flowing water. Typical species include *Barringtonia racemosa, Syzygium cordatum* and *Ficus hippopotami.*

VLEI

Wetlands of a slightly drier form than marshes, but also occurring in depressions dominated by non-woody plants. Instead of reeds, these include sedges (such as *Carex, Leersia* and *Cyperus* spp.) and terrestrial grasses (Gramineae such as *Hemarthria, Aristida, Andropogon* and *Monocymbium* spp.)

WATER SPONGE

An area of impeded drainage due to the obstruction of the lateral movement of perched groundwater, which causes it to well upwards.

WATER TABLE

The upper surface of groundwater, or that level below which the soil is saturated.

WETLAND

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Wetland is therefore a generic term for the bogs, pans, marshes, swamps, floodplains and vleis (water saturated areas) that occur throughout Natal and KwaZulu.

For regulatory purposes wetlands are defined as "*those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions*" (see Chapter 5).

WITNESS AREA

Areas such as wetlands which are deliberately set aside as "*bench marks*" representative of a particular type of natural resource. Witness areas are of educational, scientific and recreational value.

Chapter 13

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Appendix

A statement of the responsibilities, where pertaining to wetlands, of the government and non-government organizations party to formulation of the wetland *policy statement* for Natal and KwaZulu.

Administrator-in-Executive Committee of the Province of Natal

General responsibilities

The Provincial Executive Committee is the highest decision-making body at the provincial level of government in Natal.

The Administrator-in-Executive Committee has an inherent responsibility to set major policy guidelines for future planning and development of the Province as recommended to it by the Town and Regional Planning Commission.

Specific responsibilities

Certain powers are assigned to the Administrator-in-Executive Committee in terms of the **Environmental Conservation Act, No. 73 of 1989.** These powers are briefly the following:

- **Section 16**
  Administrator may declare Protected Natural Environments.
- **Section 17**
  Administrator may appoint Management Advisory Committees to advise him on control and management of Protected Natural Environments.
- **Section 31**
  Administrator may direct a local authority to carry out any function assigned to it under the Act if he is satisfied that such local authority is failing adequately to perform such function.
- **Section 42**
  Provides for the Administrator to continue to exercise his powers to issue permits (or to delegate such function to a local authority) in terms of the regulations under the **Environmental Conservation Act, No. 73 of 1989,** when promulgated.

Natal Town and Regional Planning Commisssion

General responsibilities

In order to assist the Administrator-in-Executive Committee, a statutory body known as the Town and Regional Planning Commission, was created by the **Town Planning Ordinance, No. 27 of 1949.**

The Commission meets every four weeks and consists of up to 11 members appointed by the Administrator. They are prominent laymen, selected from various walks of life and from as wide a geographical range over the Province as possible. The Commission's work is performed at the cost of the Natal Provincial Administration but under the direction and control of the Commission, by officers and servants appointed by the Administrator in terms of and subject to the laws governing the public service of the Republic. Apart from its running expenses, the Commission is provided with an annual grant by the Provincial Administration, which it spends mainly on sponsored research by outside agencies.

The Commission advises the Administrator on all questions of policy affecting physical planning and development within Natal. Staff of the Commission are responsible for advising local authorities on town planning, and may assist them with technical advice. The

Commission may order changes in a town planning scheme (subject to appeal to the Administrator). It may itself prepare town planning schemes for areas outside any local authority control, and it is responsible for conducting regional surveys and preparing regional plans. It may enter into contracts with any persons or organizations for the performance of any of its functions.

Specific responsibilities

- Preparing physical development plans at regional, metropolitan and urban scales.
- The carrying out of research into the fields of sociology, economics and environmental/ physical planning, and into the natural resources of the Province of Natal.

Regional Development Advisory Committee

General responsibilities

The Regional Development Advisory Committee (RDAC) holds no executive powers and therefore exercises no direct controls over any aspect of wetlands or of conservation. Nevertheless, a prime function of the RDAC is advising the government on policy and the implementation of policy regarding development. Accordingly the RDAC is committed to development.

It is however, a basic premise of the RDAC that the conservation of resources, both natural and man-made, is vital to any long term development commitment. The RDAC, therefore, fully supports the Natal/KwaZulu wetlands initiative and will assist in any way it can, any efforts to conserve, protect and manage wetlands within Region E.

Natal Parks Board

General responsibilities

The Natal Parks Board is responsible for implementing the provisions of the **Nature Conservation Ordinance, No. 15 of 1974**. This covers fish (both freshwater and marine), game birds and mammals, wild birds, and wild flowers. Subject to the provisions of the Ordinance, as well as other laws, actual control of exploitation or use of wetlands rests with the registered owner or local authority in charge of the area.

In meeting its overall responsibility in conservation of wetlands, the Board has to act in areas that do not lie under its direct control. Because it has no legislation that is directly pertinent, protection at any such site is usually achieved by referring to a particular species such as the Wattled Crane. However, opportunities for such action are rare and so the approach taken is one of public education and moral persuasion.

Specific responsibilities

It is recognized that the **Natal Conservation Ordinance** does not make any significant provision for the protection of wetlands. The Board does however act as custodians of areas

which are protected by other legislation. Examples of this may be drawn from the Natal Drakensberg and from the Mkuze swamp, portions of which lie in Sodwana State Forest.

In addition, the Board in recognizing the importance of wetlands, has endeavoured to acquire wetlands for nature reserves. Included in this category are the Mgeni Vlei, Mvoti Vlei and "The Swamp" Nature Reserves and portions of the Kamberg and Karkloof Nature Reserves. In the case of major wetland systems, such as the Greater St. Lucia system, the Board has one or more specialist scientists who conduct research and monitoring programmes in order to make management recommendations. The Board generally recognizes that it lacks knowledge on wetlands and is now endeavouring to gain more expertise on the subject. Included here are issues such as inventory, classification and management.

Natal Roads Department

General responsibilities

- The construction and maintenance of all main roads (declared under **Section 5** of **Ordinance No. 10 of 1968**).
- The maintenance and improvement, where necessary, of district roads (declared under **Section 37** of **Ordinance No. 10 of 1968**).
- The construction and maintenance of some national roads (declared in terms of **Act No. 54 of 1971**).
- Control (in terms of **Act No. 21 of 1940**, together with **Ordinance No. 10 of 1968**) of access to both main roads and district roads; permission to cross, erect or lay any services within such road reserves; and of development alongside these roads by means of a building restriction.

Specific responsibilities

- If feasible, transport systems are to be located in such a way as to avoid regionally important wetlands.
- The Department recognizes that design standards become increasingly important when routes have to traverse wetlands. Designs should provide for optimal water movement, minimal infilling, and the minimal disruption of habitat areas. To achieve this, provision should be made:
  - to elevate transport systems over wetlands; and
  - to encourage open span bridge designs instead of solid-fill embankments.
- The Department recognizes that construction and maintenance methods that do not alter wetlands, water quality and water flow, should be used wherever practicable.

Natal Municipal Association (NMA)

The Natal Municipal Association represents organized local government in Natal. Whilst not directly responsible for the promulgation or enforcement of regulatory measures, generally and as regards wetlands in particular, it is actively involved, together with other

agencies, in the promotion, review and drafting thereof insofar as local authorities are concerned. The Association plays a major role as a communicator and facilitator and to this end, provides a forum where local authorities may exchange views and information with the objective of forming local government opinion.

Natal Agricultural Union (NAU)

The Natal Agricultural Union does not have the power to enforce any regulations pertaining to the protection of wetlands or any other natural resource for that matter. The role of the NAU is to make farmers aware of the responsibility they have to conserve wetlands, and of the value of wetlands to the nation as a whole.

Department of Agriculture and Forestry (KwaZulu)

General responsibilities

Agriculture, soil and veld conservation, the eradication and control of noxious weeds, stock improvement, the combating of animal diseases, irrigation, forestry, veterinary services, the destruction of agricultural pests and environmental conservation.

Specific responsibilities

The RSA Acts which impact on wetland management are not applicable in KwaZulu, with the exception of certain provisions of the **Water Act (No. 54 of 1956)**. The Department has its own **Forestry Act** which does not make specific provision for wetland management. Agriculture in KwaZulu is still regulated under a number of **Proclamations** which were in effect prior to 1976. These **Proclamations** are now fairly dated and a number are being repealed with the introduction of the **KwaZulu Land Bill**.

The Department is about to initiate the formulation of legislation to deal with agricultural development and the conservation of natural resources which will also cater for the management of wetlands. While legislation is an important element in the management of wetlands, it will be appreciated that in the KwaZulu context with a high population density in the rural areas, most of whom are dependent in one way or the other on the natural resources for water, building materials, energy and food, there is considerable pressure on all the resources including the wetlands.

The Department sees resource management as a long term education process coupled with land tenure reform, and the creation of appropriate local authorities to manage and control development at district and ward level.

Bureau of Natural Resources (KwaZulu)

General responsibilities

The Bureau of Natural Resources is responsible for implementing the provisions of the **KwaZulu Nature Conservation Act (Act No. 8 of 1975** - currently being comprehensively

revised). While this covers all wildlife (including vegetation), in practice it is usually only feasible to use the provisions of the **Act** inside proclaimed areas, except in specific instances or with certain rare species such as cycads. Therefore, while in theory the **Act** allows the Bureau of Natural Resources to safeguard wetlands anywhere by enforcing various sections of the **Act**, in practice these wetlands are used by and are a very important resource to rural communities and enforcement is not practical.

At this time, recognizing that the rural communities neither destroy wetland functions deliberately nor are they fully aware of wetland values, education would seem the best option and the Bureau of Natural Resources has plans to expand its conservation activities to such areas in the near future.

Specific responsibilities

While in theory the **Nature Conservation Act** could be applied to protect any wetland in KwaZulu, to date it has been effectively implemented only inside proclaimed areas, or areas earmarked as significant conservation areas (such as Kosi). Therefore in such cases the specific responsibilities are:

- issue of permits for the use of natural resources from wetlands with sustained yield potential;
- conducting of monitoring and research in such areas;
- control of visitors and other uses of such areas; and
- management activities such as fire protection, game population control, etc.

Department of Environment Affairs

General responsibilities

The Department is responsible for the application of sound principles of environmental protection at a national level; for the co-ordinated gathering and dissemination of information on environmental aspects; and for the co-ordination of all action at national level aimed at environmental conservation.

The Department also administers the statutory Council for the Environment, in terms of the **Environmental Conservation Act, No. 73 of 1989**. Members are appointed by the Minister of Environmental Affairs on grounds of their expertise in the field of environmental management, and the purpose of the Council is to advise the Minister on aspects of environmental conservation and pollution.

It proposes general priorities for action, and advises on the co-ordination of steps to be taken by various bodies in this field. It reviews existing legislation on environmental conservation and advises interested bodies where necessary, on the investigations, studies and research that have to be undertaken. Committees have also been formed for the coastal zone, outdoor recreation, mountain areas, dam sites, etc. Reports are submitted and recommendations are made to the Minister.

The Department also provides research funding on all aspects related to the environment, including wetlands.

Specific responsibilities

Branch of Forestry and Environmental Conservation

- The management of indigenous forests on State forest land, with due regard to their scientific, protective and aesthetic value, in accordance with the best ecological principles so ensuring the perpetuation of the forests.
- The establishment and maintenance of exotic tree plantations and their management in accordance with sound economic business principles so as to ensure a sustained yield of timber products acceptable to the market.
- The management of mountain catchment areas on State forest land and on other State and private land entrusted to the Branch's care in accordance with the best hydrological, ecological and soil conservation principles so as to ensure the maximum sustained yield of water of the highest possible quality.
- The management of all unplantable areas of the forest estate outside of or adjoining mountain catchment areas (protection forests) in accordance with the principles of multiple use but always ensuring the conservation of natural flora and fauna by the application of strict ecological principles within such wilderness areas, nature reserves or protected areas.
- Within the four objectives set out above to provide for the maximum possible extensive outdoor recreational use of State forest land without endangering the natural and man-made communities entrusted to the care of the Branch.
- *Control of the Afforestation Permit System*

  In accordance with **Section 7-9** of the **Forest Act, No. 122 of 1989**, the Branch is responsible for control of afforestation permits by means of advice of an interdepartmental committee.

  The *Afforestation Permit System* is controlled in the field by forestry scientists, most of them being Forestry Extension Officers. The first, and most important condition of any given permit, is the set distance away from perennial streams and vleis, which can differ from 10 m to 100 m. Most of the time this information is indicated to the permit holder on a map of the to-be-afforested-property, and the map forms part of the permit.

Department of Water Affairs

General responsibilities

- The planning, design and execution of works for the supply, regulated by permits, of good quality water in bulk to national consumers such as water boards, cities, irrigation schemes, etc.
- The prevention of pollution by:
  - regulating the quantities of water which may be used for industrial purposes by large concerns;
  - requiring the purification of water used for industrial purposes, to given standards, and its discharge to the river or stream of origin (permits of exemption may be given, the standards may be set generally or for a specific area, a specific river, a specific catchment, or even a specific industry); and
  - making pollution of any water a criminal offence punishable by the courts.

- The Department is also involved in issuing permits which may reduce the available amount of water and also allow polluters to discharge an effluent.
- The Department also has powers to regulate abstraction of water and the means for abstraction of water proclaimed as *Government Water Control Areas*, where such control is in the public interest. The Department also lays down quotas for all State and Board controlled irrigation schemes.
- The Department maintains and operates its various works and provides advisory services.

The Department acknowledges that "*the objective of environmental management is not purely conservation of the environment but rather the optimal management of* ***all resources*** *in order to obtain the maximum net benefit (to society)*". The similarity of this philosophy to the *overall goal* of the Natal/KwaZulu wetland policy statement, implies that most of the recommendations flowing from the policy statement are endorsed by the Department.

The Department recognizes wetlands as essential components of river catchments because of the important hydrological and water cleansing functions which these ecosystems perform.

The Department considers, for example, that low flow water yields can be enhanced by the presence of upstream wetlands, and that wetlands can play a valuable role in reducing the impact of pollution.

Guidelines designed to maximize society's welfare through the conservation of wetlands are therefore very much in the Department's interest.

Specific responsibilities

Being responsible for administration of the **Water Act, No. 54 of 1956,** the Department becomes directly involved in decisions relating to wetland alteration, where permission to construct dams is sought. In Natal the permit application is referred to a *Wetland Advisory Committee*, comprising representatives from:

- Department of Water Affairs
- Department of Agricultural Development
- Natal Parks Board
- Department of Environment Affairs
- Natal Town and Regional Planning Commission.

Each permit application is judged on its own merits by the Committee in a spirit of co-operation, and recommendations regarding whether dam construction should proceed or not, are forwarded to the Directorate of Resource Conservation, Department of Agriculture.

Department of Agriculture (Directorate Resource Conservation)

General responsibilities

This Directorate has a direct function to perform as the Executive Officer, in respect of enforcement and administration of the **Conservation of Agricultural Resources Act, No. 43**

of 1983. This Act aims to conserve the resources of the Republic of South Africa for sustained economic agricultural production through the promotion of sound husbandry practices.

Specific responsibilities

Concerning the above, the following regulations and clauses of the **Act** are considered as statutory aspects related to wetlands.

- **Regulation 2**
  Cultivation of virgin soil.
- **Regulation 4**
  Protection of cultivated land against erosion through the action of water.
- **Regulation 7**
  Utilization and protection of vleis, marshes, water sponges and water courses.
- **Regulation 9**
  Utilization and protection of veld.
- **Regulation 11**
  Number of animals that may be kept on veld.
- **Regulation 12**
  Prevention and control of veld fires.
- **Regulation 13**
  Restoration and reclamation of eroded land.

Department of Agricultural Development

General responsibilities

This Department has a direct function to perform in respect of the protection of wetlands by virtue of its responsibility for assisting the Executive Officer, in implementing the **Conservation of Agricultural Resources Act, No. 43 of 1983.**

- The Department's responsibility includes the use of research, advisory and regulatory services coupled with a subsidy scheme to encourage better veld management and planned construction of anti-erosion measures for the protection of lands and the stabilizing of gulleys. This assists in reducing the impact of agricultural practices on wetlands.

  The Department is assisted in achieving its aims by members of Conservation Committees, appointed in terms of the **Act**, who advise their fellow farmers on the requirements of the **Act**.

- The Department also provides an advisory service to farmers which includes fertilizer, herbicide and pesticide use. Technical assistance is provided to the Department of Water Affairs in the planning of irrigation projects.

- The Department also advises and assists other government departments and provincial authorities in the implementation of the **Subdivision of Agricultural Land Act, No. 70 of 1970.** The later is aimed at the retention of good agricultural land for that purpose, and consequently affects for example, the selection of sites for new roads, industries and townships.

Specific responsibilities

The Department recognizes that, in terms of the new **Act**, far greater control over the cultivation of wetlands is a prerequisite, and that only under exceptional circumstances will development be permitted.

While the authority for the approval to drain or to cultivate a wetland rests with the Executive Officer, a procedure has been developed by which the Department of Agricultural Development is responsible for:

- inspection of the site;
- submission of a report to an Advisory Committee;
- convening an Advisory Committee to scrutinize applications; and
- making recommendations to the Executive Officer concerning the advisability (or inadvisability) of draining or cultivating a wetland.

- In terms of **Regulations 2 and 3** of the **Act**, and by authority delegated by the Executive Officer, certain officers can grant permits allowing landowners to cultivate new lands within the catchment area of wetlands. This would have an effect on the functioning of the wetland as it would result in a change in the hydrology of the catchment to a greater or lesser degree.
- In terms of **Regulation 7** of the **Act**, after consultation with the Wetlands Advisory Committee, the Department makes recommendations to the Executive Officer concerning an application by a landowner to drain a wetland.
- In terms of **Regulation 8** of the **Act**, officers of the Department help land users plan the utilization of their farmland, and prescribe both mechanical and biological measures in order to protect and enhance the utilization of the resources. In the wetland context this will include:
  - the *fencing* off of wetland sites in order to allow special grazing management of that site;
  - where the wetland has already been drained and is farmed under irrigation, prescribe *subsurface drainage* if waterlogging is causing a reduction in yields;
  - where the wetland has been destroyed by the action of gulley erosion, prescribe measures to either *stabilize or reclaim* the situation; and
  - where there is a need for *water storage* on the farm, prescribe the construction of a storage dam on the site.

  In all cases a subsidy is available to aid the landowner in the construction of the prescribed works.
- In terms of **Regulation 12** of the **Act**, officers of the Department grant permits for the burning and grazing of veld. For this purpose, *wetlands are considered as part and parcel of the veld* situation.

Department of Development Aid

The Department of Development Aid has a direct responsibility concerning the management and conservation of wetlands in Trust Areas by implementing measures such as the proclamation of conservation areas, applicable legislation as well as public awareness and community involvement programmes. The Department of Development Aid also provides

an advisory service concerning the management and utilization of wetlands to the various self-governing territories by appointing consultants upon request.

Department of National Health and Population Development

- The principle policy document of the Department is the **Health Act (No. 63 of 1977)**, which aims to provide for measures for the promotion of the health of the inhabitants of the Republic; to provide for the rendering of health services and to define the duties, powers and responsibilities of these service rendering authorities.
- **Section 14** of the **Act** specifies the duties of the Department and in particular **Section 14c** states "*to take steps for the promotion of a safe and healthy environment*".

  In terms of **Section 30(1)** of the **Act**, the Director-General of the Department is, for the purposes of the Act, the local authority for any area where there is no local authority.

  Section 20(1) lists the duties of a local authority to be: "*to take all lawful, necessary and reasonably practicable measures:*

  (a) to maintain its district at all times in a hygienic and clean condition;

  (b) to prevent the occurrence within its district of:

  (i) any nuisance;

  (ii) any unhygienic condition;

  (iii) any offensive condition; or

  (iv) any other condition which will or could be harmful or dangerous to the health of any person within its district or the district of any other local authority, and to abate such nuisance or remedy such conditions.

  (c) to prevent the pollution of any water intended for the use of the inhabitants of its district....."
- Within the definition of nuisance in the **Act** are included references to "*stream, marsh, pool, water course, accumulation of refuse, and areas of land which are offensive, injurious or dangerous to health*".
- The Department's Environmental Health Inspectorate subscribe to the World Health Organization definition of health, i.e.:

  "*Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.*"

South African Sugar Association

The South African Sugar Association is committed to the preservation of existing wetlands. This entails promoting the sound management of all the catchment resources including the control of run-off water from the fields, the stabilization of the drainage lines and the protection of stream banks and rivers.

The Association will assess the extent and utilization of wetlands under its sphere of influence. It is the intention of the industry to apply a holistic approach in attempting to protect all the elements within the catchments, to reduce soil losses and improve water quality.

To achieve this goal the industry will encourage cane growers to carry out recommended environmental protection practices for the production of sugar cane. This will be done within the industry by an infra-structure developed for this purpose. The industry is committed to continuing research on all aspects of resource conservation so that its recommendations can be based on sound scientific principles.

Institute of Waste Management of Southern Africa

The Institute of Waste Management (Southern Africa) has recently issued an environmental policy statement (see inset overleaf) which encompasses all areas of the environment including wetlands.

The Institute of Waste Management does not have any regulatory control over waste management but is assisting in the drafting of policy guidelines for the Council for the Environment which will enable that organization to formulate a *National Policy for Waste Management* for the consideration of the Minister of Environment Affairs.

It has also played a leading role in the development of legislation embodied in **Act No. 73 of 1989** and specifically contributed to the proposed regulations in **Section 24** of this **Act.** These regulations will govern the waste management industry through the licensing of waste disposal facilities.

The preservation of ground and surface water resources is of paramount importance in these regulations, consequently the preservation of wetlands is promoted.

The Wildlife Society of Southern Africa

General responsibilities

The Wildlife Society of Southern Africa is the largest non-governmental environmental conservation organization in South Africa and presently has a total membership of 300 000 individuals. Their major responsibility is to represent the interests of their members and campaign for an improvement in the quality of the total environment and to enhance the quality of life of all the people of southern Africa. The Society believes that MAN is dependent upon the quality of the environment and the proper conservation and management of our natural resources is essential for his survival.

Specific responsibilities

The Society has a particular interest in the conservation and wise management of wetlands and believes they can influence people by their awareness programmes and publications. In this way the better management of existing wetlands and the restoration of degraded wetlands could be greatly assisted by their work.

The Society is willing to restore to litigation in an attempt to halt the destruction or impairment of regionally important wetland systems.

They are also prepared to assist with surveys, in monitoring and to act as a "*watch-dog*" organization for the wetlands of Natal/KwaZulu.

Environmental Policy

The Institute of Waste Management of Southern Africa promotes **PROFESSIONAL WASTE MANAGEMENT** which implies a holistic approach to this developing discipline in order to ensure that wastes are dealt with in an environmentally responsible way from generation at source to ultimate disposal.

Professional waste management is a discipline which evaluates appropriate management alternatives for wastes, encourages the co-operation of involved sectors in an informed and responsible way in order to optimise the complexity of the problem so that the **BEST ENVIRONMENTALLY ACCEPTABLE** and **PRACTICAL OPTIONS** are selected.

The Institute of Waste Management supports **MINIMAL-WASTE TECHNOLOGY** so that waste avoidance is practiced wherever possible. Thus the import of obsolete and high pollution risk technology is discouraged. The Institute also strongly opposes the import of intractable, difficult, hazardous and toxic wastes because of the uncertain long term effects of the available management options.

The Institute of Waste Management encourages **RECYCLING and RESOURCE RECOVER**. Any activity has its associated wastes but at every opportunity and in any economically possible way the volume of the waste stream must be minimized, be it by recycling, resource recovery, incineration, biological pretreatment, or compaction on the landfill site. **VOLUME REDUCTION** is the basis for the choice of any safe disposal method and the underlying principle for any decisions made. The Institute of Waste Management therefore supports incentives aimed at encouraging recycling.

The Institute of Waste Management believes that waste management will always include some element of **SANITARY LANDFILL** as the ultimate method of disposal for virtually all wastes. It therefore associates itself with the need to specify the requirements for the selection of landfill sites, their **LICENSING** and the **GUIDELINES** for their safe operation. It supports the need for the **ENFORCEMENT** of these **STANDARDS** and is developing a **CODE OF PRACTICE** to be adhered to in order to minimize adverse environmental impacts.

Waste management has an associated **COLLECTION** and **TRANSPORT** element. This has evolved over the years to the diversity of options in logistics, containers, vehicles and machines available today. There are systems suitable for services run by the smallest operator through to those handling urban solid wastes for entire cities. A waste manager should be able to specify the most appropriate collection and transport system for any given situation.

The Institute of Waste Management **EDUCATES** people at all levels of control in the waste management industry. Both experience and formal education are essential in the training of the people actually involved in handling the wastes. The Institute keeps them informed on the latest techniques and thinking in waste management. The Institute **SHARES** the knowledge and expertise of its members with the developing areas within the **RSA** and the neighbouring states. It appreciates the fact that the global environment transcends the political affiliations of mankind.

The Institute of Waste Management promotes **RESEARCH** and **DEVELOPMENT** in the field and keeps abreast of developments in other countries through its **INTERNATIONAL AFFILIATIONS**.

The Institute of Waste Management endeavours to establish links with every level of government and with as many interest groups as possible. The more informed the various bodies are, the greater the chance of co-operation and tolerance amongst the various sectors of society. This is a vital requirement if the importance of waste management is to be recognized and accepted both in sociological and economic terms.

The Institute of Waste Management looks to the long term as well as to the short term future of the industry. It is encouraging the development of a **DATA BASE** that will yield statistics on waste types and quantities essential for the prediction of future trends and problem areas. It is especially aware of the long term deleterious **ENVIRONMENTAL** effects of **POLLUTION** and **INFERIOR WASTE MANAGEMENT**. The Institute is planning ahead to meet the challenge of the problems associated with the **INFORMAL WASTE STREAM** which is having an increasing impact on the environment as populations in informal settlements increase.

The Institute never ceases to stress that waste management is an essential element of our survival and pleads for the allocation of appropriate funding and the implementation of competent **LEGISLATION**. Professional waste management is increasingly recognized as performing an essential role in the hierarchy of organized environmental protection activities in that it assists to create the correct **ECONOMIC, FINANCIAL, LEGISLATIVE, SOCIOLOGICAL and POLITICAL** perspectives amongst generators, government agencies and the waste industry itself.

Umgeni Water Board

General responsibilities

The Board's prime concern and indeed purpose is to ensure the adequate supply of suitable quality potable water. At times, therefore, there could be conflict between this purpose and their general support of the principle of protecting wetlands. In such circumstances wetlands protection could become a secondary issue in relation to their prime purpose.

Specific responsibilities

Umgeni Water supports the principle of wetland conservation as it can play a vital role in water resource protection, nature conservation and the provision of public amenity. Wetlands management is an important component of River Basin Management, a management strategy that has been adopted by Umgeni Water as part of its long term plans to meet its purpose of "*providing purified water cost effectively to satisfy the needs of the community*". Accordingly wherever possible Umgeni Water will provide support for the protection, maintenance and management of wetlands within its operational area or in other areas where there are wetlands which affect Umgeni Water's water resources.

South African Timber Growers Association (Forest Industry)

General responsibilities

The Forest Industry recognizes the important role that wetlands play in the cycle of water in riverine systems, and therefore subscribes to management practices that ensure the proper functioning of wetlands.

The Forest Industry also recognizes the fact that wetlands are users of water and these wetlands are entitled to an allocation of water, as are other users.

Division of Water Technology (CSIR)

The Division of Water Technology of the CSIR endorses the policy proposals for the Wetlands of Natal and KwaZulu in its capacity as an active research organization committed to the promotion of the quality of human life.

Wetlands are an integral part of the water environment and, activities promoting preservation of these valuable resources through research, development and implementation are an essential part of the activities of the Division of Water Technology. The Division maintains contact with other research organizations internationally to promote rational utilization of wetlands.

South African Ornithological Society

The rich diversity of waterbirds found in southern Africa (totalling about 130 species) owes its existence to the array of wetlands that are spread across the subcontinent. They are of international importance being the southern termini of the migratory routes of many palearctic waders.

This Society recognizes the value of these wetlands as a vital resource for this assemblage of birds and associate themselves with every effort being made to conserve these habitats. The need for wetland conservation is clear when it is realized that more than a quarter of the subcontinent's aquatic bird species is listed in the current Red Data Book for South African birds. They therefore welcome the conservation initiatives proposed in this volume.

A list of the Commission's Publications relating to Wetlands

Main Series

- **Volume 68**
  An overview of the extent, role and present status of wetlands in Natal and KwaZulu, 1986 (R12,00 incl.).
- **Volume 71**
  The distribution, extent and status of wetlands in the Mfolozi catchment, 1988 (R35,00 incl.).
- **Volume 73**
  The location, status and function of the priority wetlands of Natal, 1989 (R37,00 incl.).

Supplementary Series (to Vol. 73)

Greater Mhlatuze Wetland System
Blood River Vlei
Paddavlei
Boschoffsvlei
Groenvlei
Wakkerstroom Vlei
Myamvubu Vlei System
Hlatikulu Vlei
Boschberg Vlei
Mvoti Vlei
Mgeni Vlei
Franklin Vlei
Kromrivier Vlei
Ntsikeni Vlei

Audio-visual Show

The Waterlogged Wealth of Natal and KwaZulu

Brochure

Care for Wetlands ... your future may depend on them.

Maps showing Priority Wetlands

1:500 000 – Composite (mono) or colour separations
1:750 000 – Composite (colour) or colour separations
1:100 000 – Composite (mono) or colour separations.