# CHAPTER 1: INTRODUCTION

## 1.1 INTRODUCTION

The protection and wise use of South Africa's wetlands will contribute to the sustainable management of South Africa's water resources. Wetlands are nature's way of purifying water from waterborne diseases, retaining and releasing precious water supplies during times of drought, preventing siltation of dams and slowing down severe flooding of river systems (Working for Water Programme Eastern Cape, July 2002). As a result of bad land utilization and practices the destruction of South Africa's wetlands is estimated at approximately 50% in some catchment areas. (Working for Water Programme Eastern Cape, July 2002). The Working for Water and Working for Wetlands (WfWetlands) initiatives set out not only to restore South Africa's precious water resources in terms of wetlands but also to help develop the country's human resources.

The WfWetlands programme is in fact a multi-departmental initiative between the Working for Water Programme, the Department of Water Affairs and Forestry, Department of Environmental Affairs and Tourism, Department of Agriculture and the Mondi Wetlands Project (an NGO). The core function of WfWetlands is to rehabilitate wetlands with the added benefits of poverty alleviation and creating wetland awareness. (P.L. Grundling, *pers. comm*). Wetland-related rehabilitation does not only imply the eradication of alien invasive trees from the sensitive areas but also focuses more on technical and structural rehabilitation work. (Working for Water Programme Eastern Cape, July 2002).

WfWetlands is the only major wetland initiative presently active in South Africa. Millions of Rands are spent every year on wetland-related projects and it is of great importance to measure their success. It is therefore crucial to determine the most cost-effective procedure to audit and monitor rehabilitated wetlands. This project is an ideal platform for the evaluation of various appropriate remote sensing sensors on biophysical conditions, wetland utilization and structural rehabilitation work to test whether they could be used as management tools in the auditing and monitoring processes.

## 1.2 NATIONAL AND INTERNATIONAL EFFORTS

The importance of wetlands are recognised on the national and international scene, motivating the reasons for the research objectives on page 7.

### 1.2.1 Ramsar Convention on Wetlands

It was highlighted in the Strategic Plan for Working for Wetlands (2003) that the growing concern over the extent of wetland loss around the world eventually reached sufficient magnitude to prompt the creation of an instrument of international law, the Ramsar Convention on Wetlands, in 1971.

The Ramsar Convention, to which South Africa is one of 136 contracting parties, has strongly and consistently emphasised the importance of wetland rehabilitation. Resolutions adopted by Conferences of the Parties on this subject have emphasised that wetland restoration programmes that are ecologically, economically and socially feasible, and that are coordinated with wetland protection, provide substantial benefits for both people and wildlife.

Recognising that efforts to restore wetlands are still sporadic, and that there is a lack of general planning at the national level, contracting parties are urged to establish national programmes and priorities for wetland restoration (Strategic Plan for Working for Wetlands, 2003). Wetland rehabilitation is sometimes a cheaper option than trying to restore the wetland and all it functions. Wetland rehabilitation works towards the ultimate goal of wetland restoration.

It is significant that, for many years, the most powerful legislation to protect wetlands was contained in the Conservation of Agricultural Resources Act (1983). Much of the expertise required for designing wetland rehabilitation interventions and monitoring their success is also

found within the Department of Agriculture (DoA). This is not surprising, since agriculture and wetlands are tightly intertwined in a number of respects. The importance of this multi-dimensional relationship was formally recognised by the Ramsar Convention, through the adoption of a resolution on agriculture, wetlands and water resources at its 8th Conference of Parties in 2002. The DoA thus has a clear mandate with respect to wetland conservation and rehabilitation, primarily from the perspective of ensuring the sustainable use of agricultural natural resources (Strategic Plan for Working for Wetlands, 2003).

Wetland conservation and sustainable use comprises one of the eight themes under the Environment Initiative of the New Partnership for Africa's Development (NEPAD). The draft strategy and action plan for giving effect to this theme contains a number of objectives that incorporate rehabilitation. Rehabilitation will be a core component of the actions taken to move towards the strategy's proposed vision that "African countries and their people have healthy and productive wetlands and watersheds that can support fundamental human needs (clean water, appropriate sanitation, food security and economic development) in a healthy and productive environment" (Strategic Plan for Working for Wetlands, 2003). Presently the Water Act of 1998 sets the trend in legislation dealing with wetlands.

### 1.2.2 Agenda 21.

Agenda 21 was adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Agenda 21 is the global environmental strategy for sustainable development, which resulted from the Conference and called for improved environmental information for decision making (Balance and King, 1999). South Africa, as a signatory of Agenda 21, is committed to follow this

approach, at national and local levels (Mzuri Consultants, 2002). Agenda 21 comments specifically on the need for indicators to be developed to provide a solid base for decision making at all levels as well as the need for countries to monitor water resources and water quality.

The support that the science can provide for the sustainable development process is firstly: to strengthen the scientific basis for sustainable management to be able to develop capacity for predicting the responses of terrestrial, freshwater, coastal and marine ecosystems and biodiversity to short-and long-term perturbations of the environment, and develop further restoration ecology. Secondly to improve long-term scientific assessment so that the knowledge acquired may be used to provide scientific assessments (audits) of the current status and the range of possible future conditions.

Countries have been requested to use Quality-of-life indicators (covering e.g. health, education, social welfare, state of the environment, and the economy) in their attempts to measure their progress in achieving sustainable development. This worldwide commitment was again confirmed at the Johannesburg Declaration on Sustainable Development, 2002:

*"We, the representatives of the people of the world... assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development - economic development, social development and environmental protection - at local, national, regional and global levels."*

The Plan of Implementation adopted by the World Summit on Sustainable Development (WSSD) provides a further perspective on the potential for wetland rehabilitation to provide benefits on a large scale. The plan emphasises that actions are required at all levels to "reduce the risks of

flooding and drought in vulnerable countries by, inter alia, promoting wetland and watershed protection and restoration".

The Working for Wetlands programme (WfWetlands) is actively involved and strives to fulfil obligations of South Africa's national policy and South Africa's commitment to international conventions and regional partnerships with conservation, rehabilitation and sustainable use of wetland ecosystems. WfWetlands is also training its workforce on a variety of wetland rehabilitation related aspects: wetland identification, delineation, rehabilitation techniques, wise-use, monitoring, etc. in terms of implementation of restoration measures. The vision of WfWetlands in order to monitor rehabilitated wetlands forms the basis of the research in this study to evaluate remote sensing sensors to determine whether they can be used in monitoring and auditing rehabilitated wetlands.

## 1.3 RESEARCH OBJECTIVES

1.3.1 To identify various indicators that can be used to audit and monitor the impacts of rehabilitation on wetlands.

1.3.2 To evaluate high resolution remotely-sensed image data, such as two airborne sensors (DuncanTech CIR and Kodak DCS 420) and four satellite recorded sensors (Landsat TM and Landsat ETM, EROS, SPOT 5), to detect the rehabilitation structures and the selected indicators for the monitoring of rehabilitated wetlands.

1.3.3 To make recommendations regarding the time of year for data acquisition, the bands required and the spatial resolution to produce accurate maps versus the most cost-effective procedure (cost of data and time to process the data) for the auditing and monitoring of rehabilitated wetlands.