CHAPTER 5: DISCUSSION

5.1 DISCUSSION

5.1.1 Description of selected indicators

- *Vegetation indicator mapping for relatively large areas.*

  The Multispectral data with band width 0.52 to 0.90 μm is of great importance and it should have a ground resolution of 1.8 m or better. It was possible to map the differences between wetland vegetation and other land cover classes with all the sensors. If detailed vegetation data were available it would be possible to map the different wetland vegetation zones with the data (resolution of 1.8 m – 0.5 m). This would make it easer to report on the status of the wetland rehabilitation.

- *Wetland zone vegetation mapping.*

  The season in which the image was acquired is very important. Wetlands in predominantly grassland biomes were very difficult to map because the images were not recorded at the optimum time. Spectrally the wetland and grassland vegetation were not adequately different.

- *Disturbance indicators.*

  The mapping and monitoring of disturbance indicators for land cover and land use practices around the wetland should be part of the rehabilitation and monitoring process. At the Kromme River and Mbongolwane wetlands, agricultural activities were clearly detected by the remotely sensed data.

- *The wet surface area indicator.*

  Could be detected as a result of the vegetation response to the hydrological conditions in the wetland. If the increase in flooding and increase in duration of the floods is sufficient, the changes in the hydrological regime of the wetland will imply a change in the plant communities (from terrestrial dominated species to more aquatic species). It is extremely difficult to monitor the functional value of stream flow regulation (flood attenuation, water storage,

base flow maintenance and ground water recharge and discharge) because it is influenced by external events such as rainfall, land use in the catchment area and the wetness of the wetland. In order to monitor the success of re-wetting and stream flow regulation, it is reasonable to assume that when the channels flood more frequently, the objective has been achieved.

- *Rehabilitation structures.*

  To map and monitor the status of the physical rehabilitation structure, data should be of a resolution of 1 m or better. The best results were from the Kodac DCS 420 (Near infrared), and DuncanTech CIR images. This would make it possible to detect structural damage, *erosion* activity, *open water* behind the structure and the movement of headcuts and gully erosion. If a sediment deposit is covered with water, the area will display dark and if sediment banks are colonized with vegetation, the vegetation will display red. In the last two examples the *sediment* deposit as such would not be evident.

- *Water quality*

  Open water areas were very small and the remote sensing images did thus not possess a blue band necessary to detect water quality. The water quality indicator was therefore not included in the classification scheme.

5.2 RECOMMENDATIONS

- In South Africa, there are few monitored wetland rehabilitation projects. Target objectives must be set for each wetland type or a process established whereby the quality of wetlands overall is managed.

- Close cooperation should be established between implementing agencies (such as LandCare, Working for Water and Working for Wetlands), Department of Water Affairs and Forestry, Department of Environmental Affairs and Tourism, National Department of Agriculture and the Mondi

Wetlands Project to compile a database with spatial rehabilitated wetland indicator data, and to ensure that information / data are not duplicated or lost.

- It is important to have adequate field points for the classification and verification of vegetation data.

- An indicator must be monitored over time. It is recommended that future possible studies include the following:
  - Determine the link between climate and spatial patterns of hydrology and ecological processes.
  - Analyses of the vegetation dynamics linked with the hydrology to investigate the change in wetland vegetation after rehabilitation. Recommended study areas and remote sensors for a possible study would be DuncanTech CIR imagery for Mbongolwane, Rietvlei and Seekoeivlei wetlands and Kodak DCS 420 for the Kromme River wetland.
  - Determining the ideal season to provide the optimum contrast between the classes to be mapped. Possibly two or more image acquisition dates might be required to separate all the classes of significance.

- A workshop with appropriate parties to compile an action plan to integrate the remote sensing data into wetland rehabilitation management. The results of the workshop should be used as a basis to select the most appropriate sensor for specific rehabilitated wetland areas as a practical comprehensive monitoring case study.

- Wetland rehabilitated indicators can only gain significance when changes in the wetland condition are indicative of how people manage the wetland with consequent detrimental or beneficial results. Disturbance indicators for land use and land cover practices in the catchment area of each wetland need to be investigated in the monitoring process of the rehabilitated wetlands.

- It is absolutely vital that the data are sufficiently retrospective, collected at the right time intervals, readily available and sufficiently up-to-date to provide the time series for trend analysis (Nell *et al.*, 2001).

5.3 CONCLUSION

It became evident during the evaluation of the different sensors that the resolution of the data would play a vital role in the mapping process, depending on the objective of the mapping. The choice between the different remote sensing sensors will largely depend on the application of the sensor; state of the rehabilitation structure or the vegetation response to the rehabilitation measures.

Selected indicators for rehabilitated wetlands, except water quality, were represented in all the wetland study areas. It can be concluded that the indicators tested on all six of the different wetland study sites do represent rehabilitated wetlands in general.

This report can be regarded as the first phase in the investigation of remote sensing sensors with regard to rehabilitated wetlands. It gives a general overview of the different sensors, their capabilities, limitations as well as associated costs. However, it is important to carefully consider the different needs of assessment for each rehabilitated wetland, before any of the high resolution remote sensing sensors can be recommended as the ideal option for the monitoring and auditing of rehabilitated wetlands.

Indication of the status of a rehabilitated wetland by the use of remote sensing techniques will only be meaningful if the aims of a project have been met with affordable and available data and if the monitoring process is done more efficiently than on-ground techniques. However, ground truthing will always be a requisite with the use of remote sensing techniques.