Evaluation of remote sensing sensors for monitoring of rehabilitated wetlands

by

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Title: Evaluation of remote sensing sensors for auditing and monitoring of rehabilitated wetlands.

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This study contributed to the development of a procedure for monitoring rehabilitated wetlands. Eleven measurable indicators were identified that could be used with the application of remote sensing techniques to monitor the impacts of rehabilitation measures on selected wetlands, namely: erosion, sedimentation, open water, wet surface area, water quality, wetland vegetation, terrestrial vegetation, alien vegetation, bare soil, disturbances (e.g. cultivation) and rehabilitation structures. A general overview enlightens the use of different sensors, their capabilities, limitations as well as associated costs. The high resolution remote sensing sensors evaluated were:

- Airborne sensors (DuncanTech CIR and Kodak DCS 420 Near Infrared)
- Satellite recorded sensors (Landsat TM and Landsat ETM, EROS, SPOT 5).

A generalized land cover classification was done for all six study areas. The classification was recoded into seven classes by using image interpretation and the measurable indicators identified, namely:

Class 1: *Erosion / bare soil / harvesting wetland vegetation*,

Class 2: *sedimentation*,

Class 3: *open water*,

Class 4: *wetland vegetation* that reflects the hydrological conditions of the wetland,
Class 5: *terrestrial vegetation / burn scars*,
Class 6: *alien vegetation* and
Class 7: *cultivation*.
The exact location of the rehabilitation structures was recorded using a GPS.

Ten of the eleven selected indicators were represented in the wetland study areas, the exception being water quality. Issues related to mapping these indicators are the optimum time of year, the bands required and the spatial resolution to produce accurate maps versus the cost of data and time to process the data. The resolution of the data plays a vital role in the mapping process, depending on what the objective of the mapping is. The structures were visible on all the images, but the best results were from the Kodak DCS 420 Near Infrared and DuncanTech CIR images.

To map and monitor the status of the rehabilitation structures, the data should be of resolution 1 m or better. This would make it possible to detect structural damage, erosion activity, open water behind the structure and the movement of headcuts and gully erosion. For mapping vegetation, multispectral data with band width 0.52 to 0.90 μm is of great importance and should be of ground resolution 1.8 m or better. However, indicators must be monitored over time. In order to monitor rehabilitated wetland vegetation over a longterm period, the compatible images must represent the same season but from different years. It is recommended that future possible studies include the analysis of vegetation dynamics linked with the hydrology to investigate the change in wetland vegetation after rehabilitation. 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.