Wetland Action

STRIKING A BALANCE

Policy Briefing Notes

3. Ecological Assessment of Wetland Health to Guide Sustainable Use

KEY POINTS

- **Wetland health needs to be monitored to ensure sustainable use.**
- **The most critical indicator of wetland health is the maintenance of the natural hydrological regime in the wetland.**
- **Specific indicators can be identified for monitoring and simple responses identified to major changes in wetlands.**
- **Capacity to undertake this monitoring can be built up within Village Natural Resource Management Committees**

The sedge *Bulbostylis buchanani* is an indicator of a plentiful supply of groundwater in the acid *dambos* of northern Zambia

SUMMARY

Given the agricultural pressures on wetlands today in many parts of Africa, it is essential that a simple and widely applicable method is developed for monitoring the ecological health of wetlands where cultivation is occurring. Five key components of wetland health have been identified, namely: hydrology, sedimentation/erosion, soil organic matter, nutrient status and vegetation. The extent and intensity of changes in these components has to be assessed to make a judgement about the threat to wetland health and the sustaining of ecosystem services. A simplified version of the Wet Health and Wet Sustainable Use assessment systems, which have been tested in Zambia and Malawi, can be developed for use by rural communities and especially by Village Natural Resource Management Committees. Monitoring of specific physical features relating to the five components of wetland health can provide a widely applicable method for assessing wetland health and identifying remedial actions.

1. Introduction

The widely held view used to be that only a limited range of activities could be safely practised in wetlands. These should be ones involving no alteration of the wetland and only the harvesting of naturally produced products such as fish and plant materials. This view saw agriculture as damaging to wetlands and suggested that all cultivation should be banned from these areas.

The reality today in many parts of Africa is very different. Wetlands are a "new agricultural frontier" and they are vital for rural food security and feeding urban populations. However, wetlands are fragile ecosystems which can be seriously damaged and even permanently altered by agriculture. A lose-lose situation can occur where the agricultural potential in wetlands is undermined and the wetlands destroyed so that no ecosystem services, whether regulatory (environmental) or provisioning (for livelihoods), remain. To avoid this situation it is necessary to develop a simple and widely applicable method for monitoring the status of wetlands where agriculture is occurring. This system must provide guidance about how to manage these areas sustainably, and strike a balance between the different ecosystem services for livelihoods and the environment.

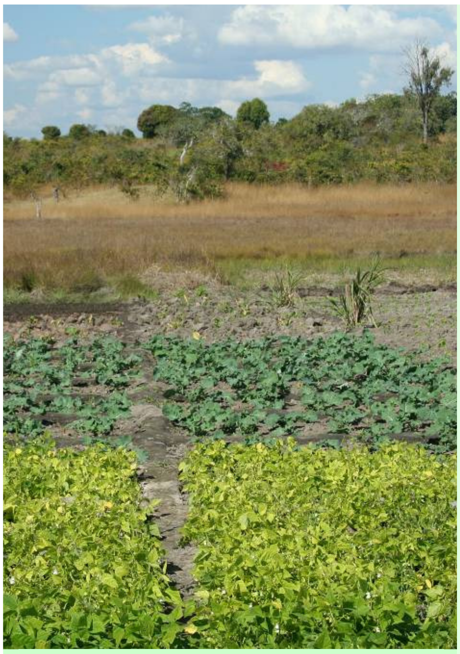
A step towards developing such as system was taken in the SAB project where the wetland sites in both Zambia and Malawi were studied using the WET-Health and the WET-SustainableUse procedures. These methods have been developed by a team of researchers in South Africa. This PBN explores the application of these methods, their findings and recommendations and suggests steps needed to make this a process which can be managed at the village level.

2. The Challenge of Sustaining Wetland Use and the SAB Approach

The table below shows the five key components of wetland health that were studied. They were chosen because of their importance in sustaining wetland functioning, is explained below.

WETLANDS INTERNATIONAL

The SAB project is a demonstration project of the Wetlands and Poverty Reduction Project of Wetlands International and it is carried out with financial support from Wetlands International under its Wetlands and Poverty Reduction Project financed by the Dutch Ministry of Foreign Affairs (DGIS).



Balancing the cultivation area and the natural vegetation is essential for sustaining wetland functioning, food production and other benefits, such as domestic water

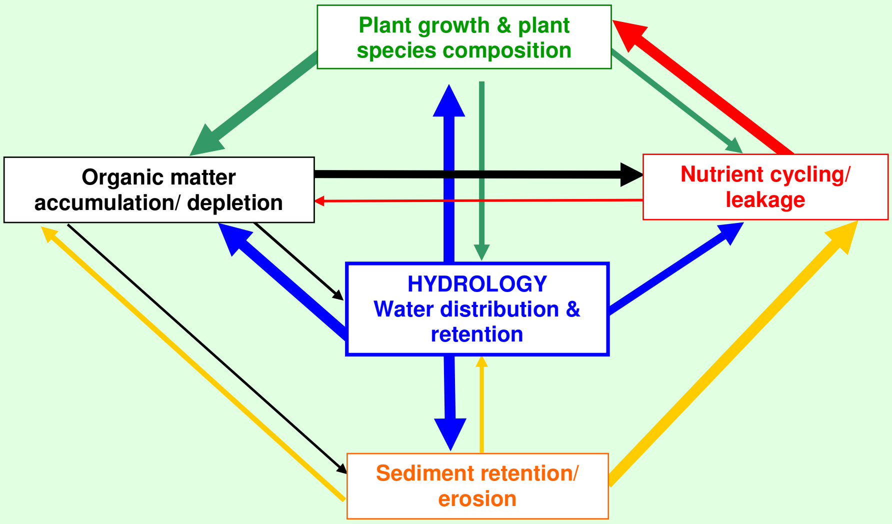
Orchids are one of several types of wild plants used for food or sold

Component	Rationale	Key impacts
Hydrology	The inflows, distribution and retention of water in the wetland is the primary influence on wetland functioning. Water affects nutrient availability, waterlogging, and sediment fluxes. These, in turn, affect the fauna and flora in a wetland.	1. Changes in volume and timing of water inputs due to human activities in the catchment upstream of the wetland. 2. Modifications within the wetland, especially artificial drains for agriculture.
Sediment - Accumulation or Erosion	Wetlands generally accumulate sediment, which affects the landform in the wetland and the hydrology. Sediment retention can help maintain the wetland's on-site agricultural productivity, as well as being potentially important for downstream water users by enhancing nutrient retention. Erosion can affect water storage in wetlands, especially when gullies develop.	Human activities that remove vegetation, (especially as occurs in cultivation), reduces the accumulation of sediment and exposes the soil to increased erosion. Impacts are often greatest when the erosion develops into gullies.
Soil Organic Matter (SOM) - Accumulation or Loss	SOM, which accumulates in the upper soil layers, makes a significant contribution to wetland functioning and productivity through enhanced water holding capacity and enhanced cation exchange capacity (CEC).	Cultivation and drainage lead to increased loss of SOM by reducing waterlogging, which slows down the rate of organic matter decomposition. Tillage of the soil also reduces SOM.
Nutrients - Retention and Internal Cycling	Wetlands are generally effective in retaining and cycling nutrients, which helps maintain on-site productivity of natural vegetation and crops. It can also be important for downstream water users by enhancing nutrient retention.	Activities causing increased loss of sediments reduce nutrient retention because many nutrients are bound to sediments. The more that plant cover is interrupted, the greater the opportunities for nutrient loss through leaching
Vegetation – growth & species composition	The composition of wetland vegetation is significant in terms of biodiversity and the habitat provided for fauna. Human use of particular plant species may also have direct economic importance (e.g. for use in craft production, thatching, livestock grazing, foods and medicines).	Cultivation and other means of land clearance have the greatest direct impacts on vegetation. Impacts may also be indirect by lowering the water table and loss of SOM and nutrients.

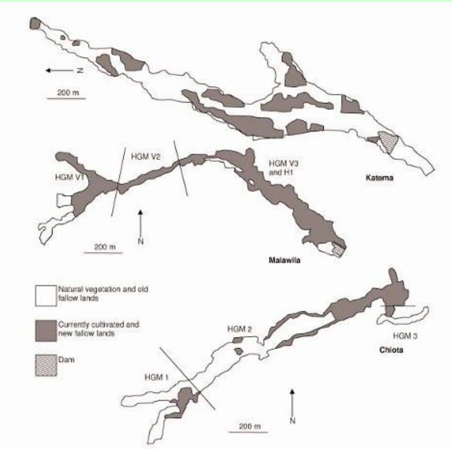
3.Linkages Between the Five Components

Although the components were assessed separately, they are closely interlinked (see Figure below). Hydrology has the most direct influence on the other factors, and is therefore the primary driving process. Conversely, nutrient cycling has the least direct influence on the other factors, but instead acts indirectly through plant growth and the organic matter accumulation that result from this growth. Plant growth also directly affects hydrology by influencing the amount of water lost to the atmosphere and by slowing down the flow of water over the wetland. This influence on flow, in turn, affects the deposition of sediment and control of erosion. Sediment retention and organic matter accumulation are intermediate between water retention and nutrient cycling in terms of their influence on wetland processes. Both influences affect water flow in the wetland through their effect on the shape of the land surface. Their influence on plant growth and species composition is mainly indirect through the influence that they have over nutrient cycling and hydrology.

The most important additional process not represented in the figure below is the removal of plant growth, either above-ground only (e.g. when harvesting thatch) which generally does not greatly alter the species composition, or above- and below-ground (e.g. when preparing an area for cultivation) which dramatically alters plant growth and plant species composition.



Inter-relationships amongst key drivers in a wetland



Land use mapping is integral to wetland health assessments

4. How to Assess the Components

It is necessary to ask how wetland use has altered the five components identified and their ability to ensure wetland functioning. This is done by examining a set of indicators and assessing the severity of the changes (intensity) and the area of the wetland affected (extent). These are then multiplied to get an overall score of the magnitude of the impact.

For instance, impacts from artificial drainage channels are scored in terms of the area of wetland affected by them (extent) and the degree of the drainage effect in the affected area of the wetland (intensity). Once this is done the figures can be compiled for the five components and an overall judgement made. For each of the five components of health assessed, recommendations designed to assist in minimizing the described impacts are then provided.

5. Analysis and Recommended Responses – the Experience from Malawi

When this method was applied by the team of South African researchers, project staff and community members in the three demonstration wetland sites in Malawi, the following were the major findings and recommendations:

Hydrology - drainage

- drains are too extensive in one site; the high density of deep drains is having a significant impact on the groundwater.
- the lowering of the water table as a result impacts on SOM.
- a disruption in hydrological functioning could lead to erosion and gulley formation.
- drainage should be controlled and the central part of the wetland maintained in its natural conditions to protect the hydrological core.

Vegetation – water hungry plants

- areas of sugar cane are too extensive in two wetlands and one site has eucalyptus trees in the wetland.
- these plants should be controlled where water is scarce as they can cause wetlands to dry out.

Natural vegetation

- cultivation is too extensive in one wetland, with cultivation up to the centre threatening the integrity of vegetation and creating erosion risks.
- the centre and head of the wetlands should be maintained under natural vegetation to ensure wetland integrity and to prevent erosion.

Sediment retention / erosion

- gulleying is occurring as a result of human disturbance; this may extend up the centre of the wetlands.
- rehabilitation measures are required to stabilize the eroding gully head and reduce the level of human disturbance.

Erosion risks

- erosion was seen around some shallow wells in the centre of the wetlands.
- wells should be relocated out of the areas of fast water flow to avoid becoming sources of erosion and gulley formation.

Soil organic matter and nutrient cycling

- extensive areas of cultivation allow SOM loss and make soil prone to erosion.
- use of compost, mulching and minimum till methods will help maintain SOM and improve soil structure and the ability of the soil to resist erosion.

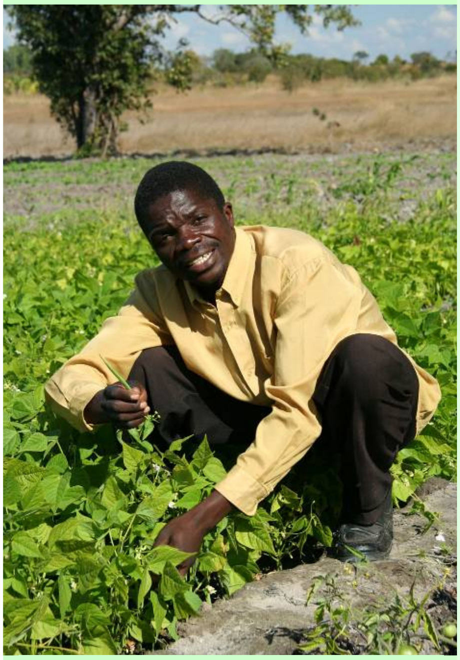
6. Community-Based Methods

While this method is usually presented in academic terms and with scoring calculations, it is also possible to simplify it, by identifying common indicators of the five major components, so that communities can use this method. Ideally such a monitoring system should be developed in a participatory manner, as part of the formation of a Village Natural Resource Committee and its training on wetland values and dynamics (see PBN 2).

In this training it is possible for communities to identify specific physical features relevant for their monitoring – such as gullies and the location and extent of cultivated areas, and to develop their own bylaws and guidance to address problems revealed by their analysis, such as excessive drainage, head cut gullies and the loss of soil organic matter.

As wetland use for agriculture increases, it is essential that communities develop their skills to monitor what is happening in their wetlands using appropriate indicators. In this way they can identify specific interventions to maintain the health of their wetlands, and so ensure the sustainable flow of benefits / ecosystem services from these areas.

Runoff from degraded catchments and removal of natural vegetation can lead to gulley formation in wetlands which lowers the water table



Community-based monitoring of wetland health can sustain livelihood and environmental benefits

FURTHER INFORMATION

Wetland Action is a not for profit NGO which provides technical support to field level organisations working on wetland and livelihoods. Its aim is to support the ecologically sound and socially sensitive use of wetlands for sustainable livelihoods. www.wetlandaction.org. For further details contact: **Adrian Wood,** Wetland Action & the Centre for Wetlands, Environment & Livelihoods at the University of Huddersfield. E mail: a.p.wood@hud.ac.uk

Other partners in the SAB Project are:

- **Self Help Africa**: www.selfhelpafrica.org
- **MALEZA:** Malawi Enterprise Zones Association. E mail: hmsusa@malezamw.org
- **NLWCCDP**: North Luangwa Wildlife Conservation and Community Development Programme. E mail: nlwccdp@zamnet.zm

The **SAB Project** seeks to reduce poverty among wetland-dependent communities in central Southern Africa. It achieves this by developing and testing strategies for the sustainable management of seasonal wetlands, including technical measures related to land husbandry and the maintenance of a functional landscape, and by influencing policies at the NGO, national and international levels, so that the role of wetlands in poverty reduction is better recognised.

This project is one of four Demonstration Projects of the **Wetlands and Poverty Reduction Project** of **Wetlands International** which has sought to influence national and international policies to ensure that the interconnections between the worlds' poor and wetlands are recognized. See www.wetlands.org.

POLICY BRIEFING NOTES AVAILABLE:

1. Valuing wetlands for livelihoods - the basis for sustainable management
2. Local institutions and wetland management