Responsible Management of South African Peatlands -

The impact of the hydrogeomorphic peatland type and peat soil degradation on the restoration potential and sustainable management

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Background

The overall requirement for the formation of peatlands is a positive water balance. Different hydro-geomorphological settings may account for a surplus of water. These settings are generally referred to as hydrogeomorphic peatland types (HGMT). Within the same climatic region and overall land-geomorphological settings, peatlands from one HGMT share certain ecological characteristics. For the assessment of restoration possibilities of peatlands on the Maputaland Coastal Plain, it is important to investigate which common features distinguish the HGMTs from one another, in order to predict the hydro-ecological response to certain restoration measures. Within the scope of the study area in the Northern Maputaland coastal plain three HGMTs were investigated so far.

Important soil properties

- C- and P-contents with decomposition i.e. degradation
- Bulk density, pore space distribution and hydraulic conductivity become attenuated with proceeding decomposition
- Assessment of degradation exemplified considering the bulk density

The bulk density is an applicable measure for the impact assessment of degradation. Exposure to aerobic conditions leads to increased microbial activity in peat and hence to a breakdown of peat structures. The bulk density increases with increasing decomposition. As to be expected, the bulk density of the topsoil is affected by the health of the peatland.

Conclusions

- The hydrogeomorphic peatland type seems to influence the substrate composition of the peatlands distinctly.
- The bulk density seems to be applicable as a measure for peatland degradation, however, it must be interpreted carefully, considering the substrate composition and hence the HGMT. Interdune depression depressions with large quantities of organic gyttja intermixed with the peat yield higher values than "clean" peat in the valley bottom peatland.

More research needs to be conducted to ascertain characteristic substrate composition patterns amongst the different HGMTs. Consequently, research must be undertaken to determine certain physical properties and attribute them to specific substrates. In this context the saturated hydraulic conductivity and the hydrophysical are of great importance, as well as the pore space distribution to calculate the capillary rise. Hence, these properties should yield a solid foundation for the assessment of restoration of peatlands.

References

- Ollies et al. (2013)
- Godwin et al. (2013)

Three selected sites from the research area will be investigated, each representing a different hydrogeomorphic peatland type

Site 1: interdune depression
- Vegetation dominated by Thelypteris interrupta, Schoenoplectus sp and sedges
- Preliminary
- Cultivation at the fringe

Depth of about 180 cm

Legend for composite charts
- Black light: Prior to cultivation
- Red light: After cultivation
- Green light: After drainage
- Blue light: After drainage and cultivation

Bulk density vs. depth

In sites 2 and 3 the bulk density is decreasing in the first 150 cm. In Site 3 it is decreasing stronger. In Site 1 the bulk density is increasing up to 160 cm. From the first 150 cm on, Site 1 is still primarily due to the presence of mineral gyttja, whereas Site 2 slightly degraded and Site 3 degraded.

Interdune depression peatland

- Shape is closed
- Spatial extent mostly just a few hectares
- Water table is connected to local groundwater table
- Vegetation is dominated by sedges

Unchannelled valley bottom peatland

- Shape is open to one or two sides
- Spatial extent varies from a few to many hectares
- Water originates from groundwater and lateral influx from the sides
- Vegetation may be dominated by reeds, sedges or also peat-swamp forest

Channelled valley bottom peatland

- Shape is two-sided open
- Spatial extent varies from a few to many hectares
- Inclined valleys are likely to be in touch with major aquifers (Grund et al. 2014)
- Water also derives from lateral influx from the sides
- Vegetation is dominated by peat-swamp forest

Site 2: unchannelled valley bottom
- Vegetation dominated by Phragmites austriacus, Typha capensis and sedges
- In succession after cultivation
- Drainage ditches closed

Site 3: channelled valley bottom
- Covered by trees until the 1970s, then cleared for cultivation; for two years under follow
- Peat-swamp forest remains on the eastern edge and southern corner of the section
- Drainage ditches still active

- Fluctuation in the central part and at the fringe is the same
- Clearly inundated in the wet season

- Depth of to 500 cm
- Inundation
- Siltstone-reversal of sedimentation (gyttja) and periods of sedimentation (peat)

Site 1: interdune depression

- Depth of up to 280 cm
- Close to the fringes mineral layers are alluvial deposits
- Amorphous peat as topsoil (effect of drainage)
- Woodpeat formation on mineral gyttja followed by radicel peat formation

Site 3: channelled valley bottom

- Depth of up to 280 cm
- Close to the fringes mineral layers are alluvial deposits
- Amorphous peat as topsoil (effect of drainage)
- Woodpeat formation on mineral gyttja followed by radicel peat formation

Site 2: unchannelled valley bottom

- Depth of up to 500 cm
- Amorphous peat as to pool (effect of drainage)
- Siltstone-reversal of sedimentation (gyttja) and periods of sedimentation (peat)