MUTALE PEAT WETLAND

South Africa's 40 000-year-old Mutale Peat Wetland: threats from historical land transformation and changing climate

Norbert Hahn from the Department of Biological Sciences, Faculty of Science, Engineering and Agriculture, University of Venda draws attention to the unique Mutale Peat Wetland, one of only a few functioning wetland systems remaining in the Soutpansberg.

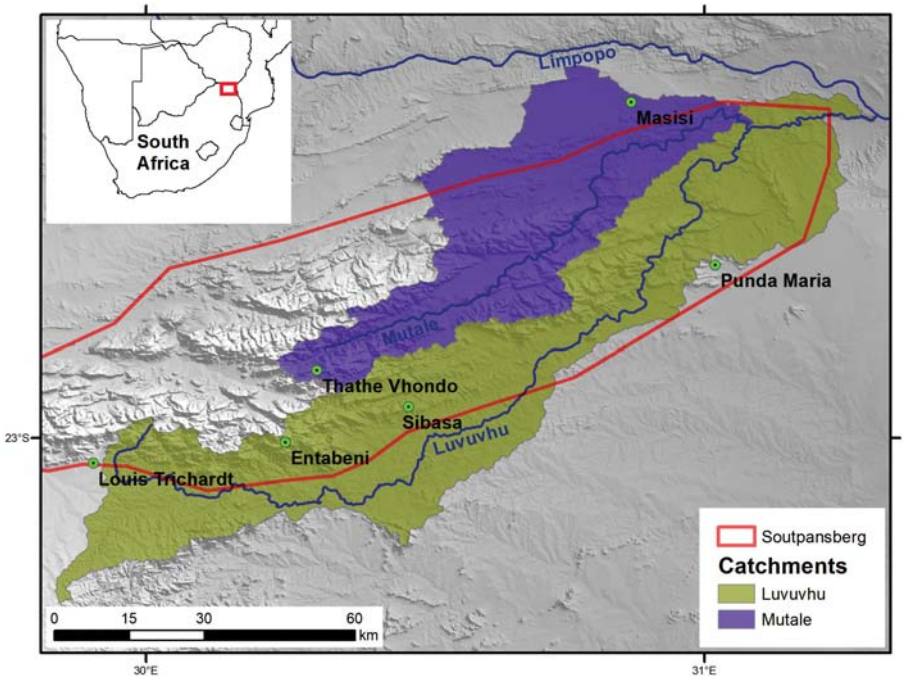
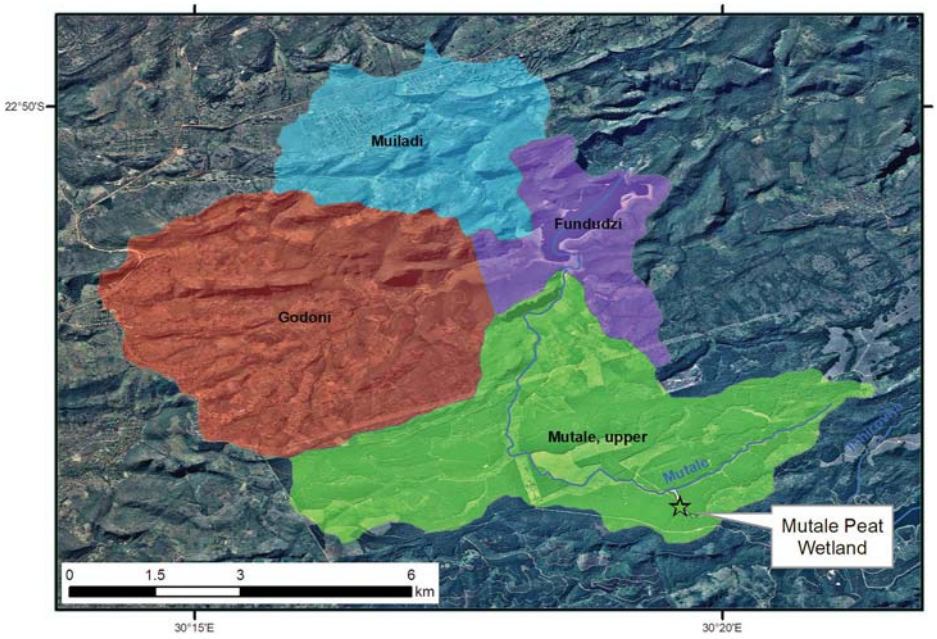


Figure 1. The Luvuvhu and Mutale catchments relative to the extent of the Soutpansberg mountain range and the main rivers in these catchments, tributaries of the Limpopo River.

Physical setting

The Mutale Peat Wetland is situated within the Soutpansberg geomorphic province and forms part of the greater Luvuvhu River catchment, a main tributary of the Limpopo River (Figure 1) (Partridge ***et al.*** 2010, Hahn 2011). The Mutale River originates in the uplands of the Soutpansberg at Thathe Vhondo, first flowing west-southwest before turning north and discharging into Lake Fundudzi after 10.5 km (Figure 2). The Mutale Peat Wetland lies along a tributary of the Mutale River and is situated 3.2 km downstream of the latter's source. The wetland forms part of the upper Mutale River catchment, an area of approximately 3.2 ha at an elevation of 1 180–1 200 m above sea level (Figure 2). Within a catchment of ~76 ha, the wetland is not fed by any major river system and is totally dependent on rainfall to sustain itself.

The upper Mutale catchment in turn forms part of the greater Lake Fundudzi catchment which also includes the Godoni and Muiladi as well as the smaller catchment surrounding the lake (catchment names follow Van der Waal [1987]) (Table 1). A large portion of the Mutale Peat Wetland is made up of extensive peatlands with a peat accumulation of up to 3 m (Baboolal 2014). The wetlands of the Mutale system are poorly represented on the South African National Wetland Map and warrant further study (Van Deventer ***et al.*** 2020).



2008 image from the Chief Directorate: National Geo-Spatial Information, Mowbray, Cape Town).

Figure 2. The four catchments of Lake Fundudzi (2008 image from the Chief Directorate: National Geo-Spatial Information, Mowbray, Cape Town).

Table 1. The four catchments of Lake Fundudzi and their sizes.

Name	Size
Fundudzi	6.5 km^2
Godoni	21.8 km^2
Muiladi	10.2 km^2
Upper Mutale	21.3 km^2
Total	59.8 km^2

Rainfall

Entabeni (Figure 2), situated ~10 km south of Thathe Vhondo, has the highest recorded annual rainfall for the Soutpansberg with 1 874 mm whereas Sibasa, situated ~17 km to the south-east, receives 1 063 mm (Hahn 2006). As no rainfall data exist for Thathe Vhondo it is postulated that the annual rainfall lies between these two figures. The high rainfall regions of the Soutpansberg are identified as one of South Africa's Strategic Water Source Areas (Lötter and Le Maitre, 2021).

Photograph from the late Pierre Cuénod

Figure 3. A view across the grassy slopes of Entabeni about 1902. Today the area is covered by plantations and secondary bush encroachment (photograph from the late Pierre Cuénod).

"The Mutale wetland's main importance is its supportive function to the hydrological integrity of Lake Fundudzi."

Historic landscape

Visiting Lake Fundudzi, Trevor (1919) described the landscape as: '*. . .an open down-like plateau, with scattered* Protea *trees and close-growing grass, which might be taken for a portion of the Transvaal high veld, though the actual altitude is under 4 000 ft* [1 219 m]'. At present, most of this area is exotic timber plantations, bush encroachment and rural settlements.

Both Scott (1987) and Baboolal (2014)**,** in their palynological studies of the Mutale Peat Wetland, recorded a sharp increase in charcoal accumulation towards about 1 500 BP (Before Present), correlating to the first Iron Age settlements south of the Limpopo River at 1 550 BP. Both studies confirm, through pollen spectra, that even though historical anthropogenic disturbances led to a reduction of the woody component in the area, grasslands were always predominant.

The high rainfall grasslands of the Soutpansberg situated on clay soils derived from weathered basalt, previously covering approximately 10% of the area, are extinct (Hahn 2017). The demise of these grasslands was rapid with the main period of transformation across the wider landscape between the 1920s and 1950s. Grasslands growing on soils derived from both quartzitic-sandstone and basalt constituted the largest part of the historical Thathe Vhondo habitat with only a few degraded patches remaining, with soils too shallow to be planted (Figure 3). The development of Thathe Vhondo into a commercial timber operation started in about 1939 with the building of roads and the main transformation, the establishment of plantations, began after 1951 (Figure 4).

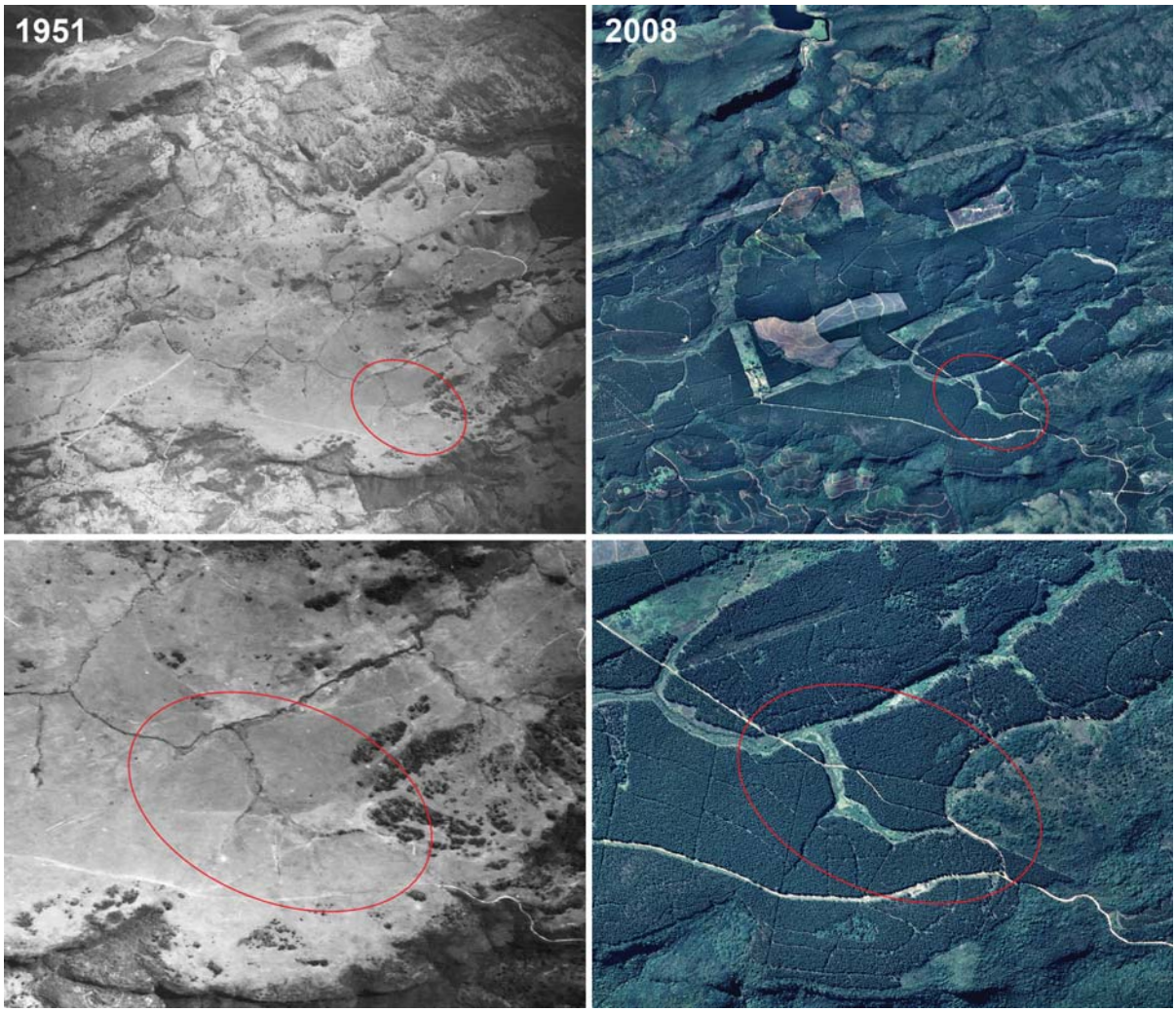


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Figure 4: Thathe Vhondo as it was in 1951 (left) and in 2008 (right). The red oval indicates the location of the Mutale Peat Wetland

Significance of the site

Figure 5: Lake Fundudzi in March 2001 photographed from the west (22° 51′ 5,184″ south & 30° 17′ 23.496″ east) and looking in an eastly direction.

The Mutale wetland's main importance is its supportive function to the hydrological integrity of Lake Fundudzi (Figure 4). Lake Fundudzi is the only limnetic depression in South Africa formed by a landslide and is of considerable age, probably 100 000 years (Partridge & Scott 2000). Most of the Godoni and Muiladi Rivers catchments are transformed by human habitation, agriculture and land degradation leading to extensive erosion (Figure 6). The silting up of Lake Fundudzi due to erosion is clearly visible from the delta formation at its inflow, most prevalent in the catchment of the Godoni (King 1951, Van der Waal 1987) (Figure 6 & Figure 7). The still-functioning wetlands in the upper Mutale catchment are critical in maintaining water quality and reducing siltation of the lake.

The Mutale Peat Wetland is one of only a few functioning wetland systems remaining in the Soutpansberg. What sets it apart from most other wetlands in the mountain range is that it is a peat driven system with an age of at least 40 000 years (Baboolal 2014) (Table 2). At present no equivalent intact system has been recorded for the Soutpansberg. Scott (1987) was the first to study the wetland, obtaining a 12 000-year palæoclimatic record from it. Baboolal (2014) conducted a later study which extended the palæoclimatic record another ~30 000 years.

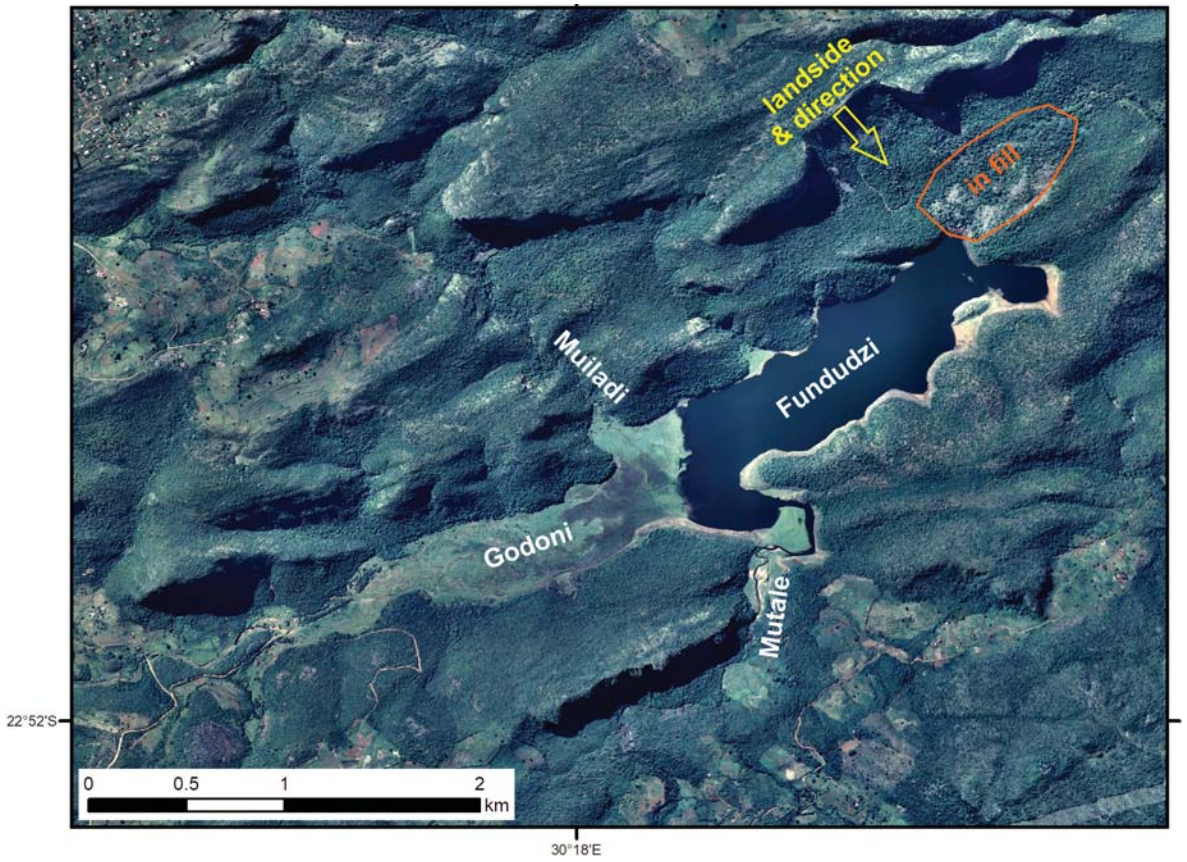

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Figure 6: 2008 aerial photograph of Lake Fundudzi showing the delta formation at the inflow of its three main rivers and the location of the landslide which formed the lake.

Lake Fundudzi is also of significant cultural importance to the VhaVenda people, being considered the most sacred site in all of Venda. It is believed the lake is inhabited by water spirits known as the Vhatavhatsindi. From time immemorial, at the beginning of summer, the inhabitants surrounding the lake make sacrificial offerings to the Vhatavhatsindi in the hope that they will be accepted and that the land will be blessed with a good rainfall season. It is also believed that in times of floods the red, murky silt-laden water of the Gondani does not mix with the clear dark water of the Mutale which sinks to the bottom of the lake passing through it (Van der Waal 1987).

Heidi van Deventer, 2019.

Figure 7: The inflow of the Godoni river into lake Fundudzi clearly showing the heavy siltation.

Figure 8: The Mutale Peat Wetland looking upstream from the road culvert. The photograph shows pond formation caused by the culvert, pine trees establishing within the wetland, Passerina montana *dominated bush encroachment on the upper banks and pine plantations surrounding it.*

Threats

As South Africa is a semi-arid region, peatlands are extremely rare and under pressure from degradation, especially as a result of water loss (Grundling ***et al.*** 2021). The Mutale Peat Wetland is severely threatened by habitat transformation including silviculture, alien invasive infestation, aided by land transformation, and infrastructure (Figure 3 & Figure 8). The road crossing the wetland has led to a channel forming causing the lower section of the wetland to become incised. The building of roads in the area has potentially major effects on run-off leading to erosion and downstream siltation, including of Lake Fundudzi. Plantation establishment has huge ramifications for water loss in such wetland systems as, unlike grasslands, they do not function as well to hold water in times of flood, leading to major fluctuations in river inundation, greater erosion and the river becoming incised (Figure 9). The planting of alien monocultures has had a huge impact on the consumption of ground water leading to a significant reduction in the flow of the Soutpansberg rivers (Hahn 2017, Ramulifho 2020).

Conclusion

For the period 2021–2050 relative to 1961–1990, the maximum temperature increases may exceed 3 °C in the northern interior of South Africa and up to 7 °C for the 2070–2099 period (Engelbrecht 2019). The incidence of heatwaves will also drastically increase, while rainfall may increase over eastern South Africa.

The Mutale Peat Wetland is totally dependent on rainfall to maintain itself as it is not fed by any rivers. Future temperature increases will place the existing plantations under greater heat stress leading to increased water consumption alongside an upsurge in evaporation. In all likelihood, water consumption and evaporation will exceed any increases in precipitation, leading to the demise of the wetland.

To possibly preserve the Mutale Peat Wetland a drastic reduction in the extent of pine plantations surrounding it is needed. A comprehensive study of the wetland to understand its functioning would be invaluable for the management of it, and for similar systems.

Acknowledgments

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References

- Baboolal, D.L. 2014. ***A 40,000-year record of vegetation and fire history from the Tate Vondo region, Northeastern Soutpansberg, South Africa.*** M.Sc. thesis. Westville, University of KwaZulu-Natal.
- Engelbrecht, F. 2019. ***Green Book – Detailed Projections of Future Climate Change over South Africa***. Technical report, Pretoria, CSIR.
- Grundling, P.-L., Grundling, A.T., van Deventer, H. & Le Roux1, J.P. 2021. Current state, pressures and protection of South African peatlands. ***Mires and Peat*** 27(26): 1–25. https://doi.org/10.19189/MaP.2020.OMB.StA.2125
- Hahn, N. 2006. ***Floristic diversity of the Soutpansberg, Limpopo Province, South Africa.*** Ph.D. thesis. Pretoria, University of Pretoria.
- Hahn, N. 2011. Refinement of the Soutpansberg Geomorphic Province, Limpopo, South Africa. ***Transactions of the Royal Society of South Africa*** 66(1): 32–40. http://dx.doi.org/10.1080/0035919x.2011.566422
- Hahn, N. 2017. An historic account of the extinct high rainfall grasslands of the Soutpansberg, South Africa. ***Transactions of the Royal Society of South Africa*** 73(1): 20–32. https://doi.org/10.1080/0035919X.2017.1346528
- King, L.C. 1951. ***South African scenery, a textbook of geomorphology*** 2ed. London, Oliver & Boyd.
- Lötter, M.C. & Le Maitre, D. (2021) Fine-scale delineation of Strategic Water Source Areas for surface water in South Africa using Empirical Bayesian Kriging Regression Prediction: Technical report. Prepared for the South African National Biodiversity Institute (SANBI), Pretoria. 33 pages.
- Partridge, T.C. & Scott, L. 2000. Lakes and Pans. In: Partridge, T.C. & Maud, R.R.
- (Eds.), ***The Cenozoic of Southern Africa***, ***Oxford Monographs on Geology and Geophysics*** 40: 145–161.
- Partridge, T.C., Dollar, E.S.J., Moolman, J. & Dollar, L.H. 2010. The geomorphic provinces of South Africa, Lesotho and Swaziland: A physiographic subdivision for earth and environmental scientists. ***Transactions of the Royal Society of South Africa*** 65(1): 1–47. https://doi.org/10.1080/00359191003652033
- Ramulifho, P.A. 2020. ***Modelling flow and water temperature in the Luvuvhu catchment and their impact on macroinvertebrate assemblages.*** PhD thesis, University of Venda.
- Scott, L. 1987. Late Quaternary forest history in Venda, southern Africa. ***Review of Palaeobotany and Palynology*** 53: 1–10. https://doi.org/10.1016/0034-6667(87)90008-X
- Trevor, T.G. 1919. Some notes on a visit to Lake Fundusi in the Zoutpansberg district of the Transvaal, paid in, August 1917. ***Transactions of the Royal Society of South Africa*** 8: 87–89.
- Van der Waal, B.C.W. 1987. Fundudzi, a unique, sacred and unknown South African lake. ***Southern African Journal of Aquatic Sciences*** 23(1): 42–55. https://doi.org/10.1080/10183469.1997.9631387
- Van Deventer, H., van Niekerk, L., Adams, J., Dinala, M.K., Gangat, R., Lamberth, S.J., Lötter, M., Namhla Mbona, N., MacKay, F., L Nel, J.L., Ramjukadh, C.-L., Skowno, A. & Weerts, S.P. 2020. National Wetland Map 5: An improved spatial extent and representation of inland aquatic and estuarine ecosystems in South Africa. ***Water SA*** 46(1): 66–79. https://doi.org/10.17159/wsa/2020.v46.i1.7887