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High altitude montane wetland vegetation classification of the Eastern Free State, South Africa ☆

R.F. Brand [a], P.J. du Preez [b], L.R. Brown [a,*]

[a] Applied Behavioural Ecology and Ecosystem Research Unit, Department of Environmental Sciences, University of South Africa, Private Bag X6, Florida Campus, South Africa
[b] Department of Plant Sciences, University of the Free State, Nelson Mandella Drive, South Africa

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ABSTRACT

Wetlands occur where biotic and abiotic conditions combine to create unique habitats and plant assemblages. These systems have anaerobic or hydric soil resulting from waterlogging and are found across all nine biomes in South Africa. Wetlands can thus be regarded as hosting azonal vegetation. On Platberg, the freshwater wetlands are embedded within the Grassland Biome forming distinct units. Platberg wetlands were surveyed and described to explain and document vegetation of this inselberg. Additional aims were to elucidate Afro-montane floristic links with the Drakensberg Alpine Centre, and provide data for conservation management. The study site is located in the Eastern Free State, South Africa, on edge of the Great Escarpment. It is one of an archipelago of more than 20 inselbergs stretching north from the Drakensberg. A total of 51 sample plots (30 m^2) were located in a randomly stratified manner within the wetland units to include all variations in the vegetation. The data was analysed using the TWINSPAN classification algorithm, refined by Braun-Blanquet procedures. The analysis showed the wetlands divided into five communities, six sub-communities and six variants. The wetland communities had an average of 13.56 species per relevé, ranging from 7 to 29 species per sample plot. Numerous floristic links with the Drakensberg Alpine Centre, the Cape Floristic Region and the Grassland biome were found. Platberg shows vegetation and hydrogeological affinity with low altitude freshwater and the high altitude Lesotho Mires of the Drakensberg Alpine Centre. A list of high altitude wetland species was compiled.

1. Introduction

Wetlands have traditionally been regarded as wastelands and as a result large systems have been drained, mined, or modified for agricultural, silviculture, and other related development purposes (Grundling et al., 1998; Stern, 1997). As more research on wetlands has been conducted people started realising the significance of these sensitive ecosystems. Today wetland systems are regarded as irreplaceable components of the environment that is highly threatened due to a variety of human activities (Ewart-Smith et al., 2006). Freshwater wetlands are one of the most productive ecosystems in the world exhibiting distinct differences in their hydrology, plant communities, species richness, ecosystem functioning, and soil types (Reddy and DeLaune, 2008).

The word wetland is a generic term (Janecke et al., 2003), which does not allow for an adequate description of the complex differences in types of wetlands, the processes that formed them or to effectively quantify the vegetation. The presence of water, whether it is flowing or stagnant, salty or fresh, seasonal or permanent, is the primary factor in forming habitats suitable for wetlands and the associated vegetation (Mucina and Rutherford, 2006).

There is no universally acceptable definition for wetlands (Davis and Brock, 2008; Ewart-Smith et al., 2006). For South Africa, Collins (2005) defines wetlands as areas where surface water collects or underground water discharges to the surface making the area wet for extended periods of time. Ewart-Smith et al. (2006) and Collins (2005) extend the term wetlands to aquatic systems, which can be permanently or temporarily saturated. Temporarily saturated wetlands are regarded as 'transitional' wetlands.

For South Africa, the Department of Water Affairs and Forestry (DWAF, 2003) has provided a definition of wetlands in the South African Water Act to help researchers and other users in their work. The Act's definition incorporates three important concepts used to define a piece of land as a wetland namely hydrology, soil wetness, and hydrophilic vegetation (Collins, 2005). Although the vegetation component is recognised, the abiotic component (landform, soil and substrate)

* Corresponding author.
E-mail address: lrbrown@unisa.ac.za (L.R. Brown).

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is used as the primary indicator in their wetland classification system for South Africa (Ewart-Smith et al., 2006).

Research on wetland vegetation in South Africa has been conducted for many years but these attempts have only recently been combined in a comprehensive phytosociological based classification system with the publication of "The Vegetation of South Africa, Lesotho and Swaziland" by Mucina and Rutherford (2006). In their publication Mucina and Rutherford (2006) describe wetlands present in all eight biomes according to their vegetation component. Mucina and Rutherford (2006) use the term *azonal* vegetation sensu stricto, where it is understood that plant community structure and floristic composition are the result of special substrates (soil or bedrock), or hydrogeological conditions (waterlogging) which exert overriding influence on floristic composition, structure and dynamics over microclimate (Mucina and Rutherford, 2006) as in wetlands. This is especially true for the Mountain wetlands occurring on high altitude areas such as Platberg in the Eastern Free State.

Platberg as an inselberg in the Eastern Free State, South Africa (Fig. 1), represents a refuge for indigenous plants and animals (Mutke et al., 2001, Burke, 2001). It has an altitude ranging from 1900 m (footslopes) to the highest point of 2394.4 m (Chief Directorate: Survey and Mapping, 2000) (Fig. 2). The unique, high altitude conditions found above 2000 m, lead to high levels of endemism in organisms; plants, animals and bryophytes (Hillard and Burtt, 1987; Van Wyk and Smith, 2001; Carbutt and Edwards, 2006; Mucina and Rutherford, 2006). This is due to the compression of climatic life zones over a short topological distance that makes mountains hot spots for biological diversity (Körner, 2003). Mountains may be regarded as analogous with an archipelago of islands in an 'ocean' of low-level vegetation types which act as an isolation factor (Taylor, 1996; MacArthur and Wilson, 2001).

Mountain wetlands as a special sub-division of freshwater wetlands form an archipelago of isolated patches embedded in the Grassland Biome (Mucina and Rutherford, 2006), most of which are found above 2500 m in Lesotho, and the South African Drakensberg. For Platberg, the wetlands comprise drainage-line grassland and forblands, and represent an outlier of the AZf4 Drakensberg Wetlands (Mucina and Rutherford, 2006) while also sharing some floristic links and similarity of hydrogeological characteristics with the AZf 5 Lesotho Mires.

The concept of zonality and its corollary, azonality to describe and map wetlands, (Mucina and Rutherford, 2006), particularly for small wetland habitats is directly applicable for Platberg, with its relatively limited size (3000 ha), and numerous, small wetland habitats.

This paper aims at:

i Describing the floristic composition of the different wetland communities of the study area.
ii Classifying them into different hydrogeomorphic categories based on the degree to which the dominant plant species are associated with wetlands.
iii Elucidating Afro-montane floristic links with the Drakensberg Alpine Centre and provide data for conservation management plans.
iv Providing a baseline plant species list for this area, as no definitive list of high altitude wetland plants exists on inselbergs.

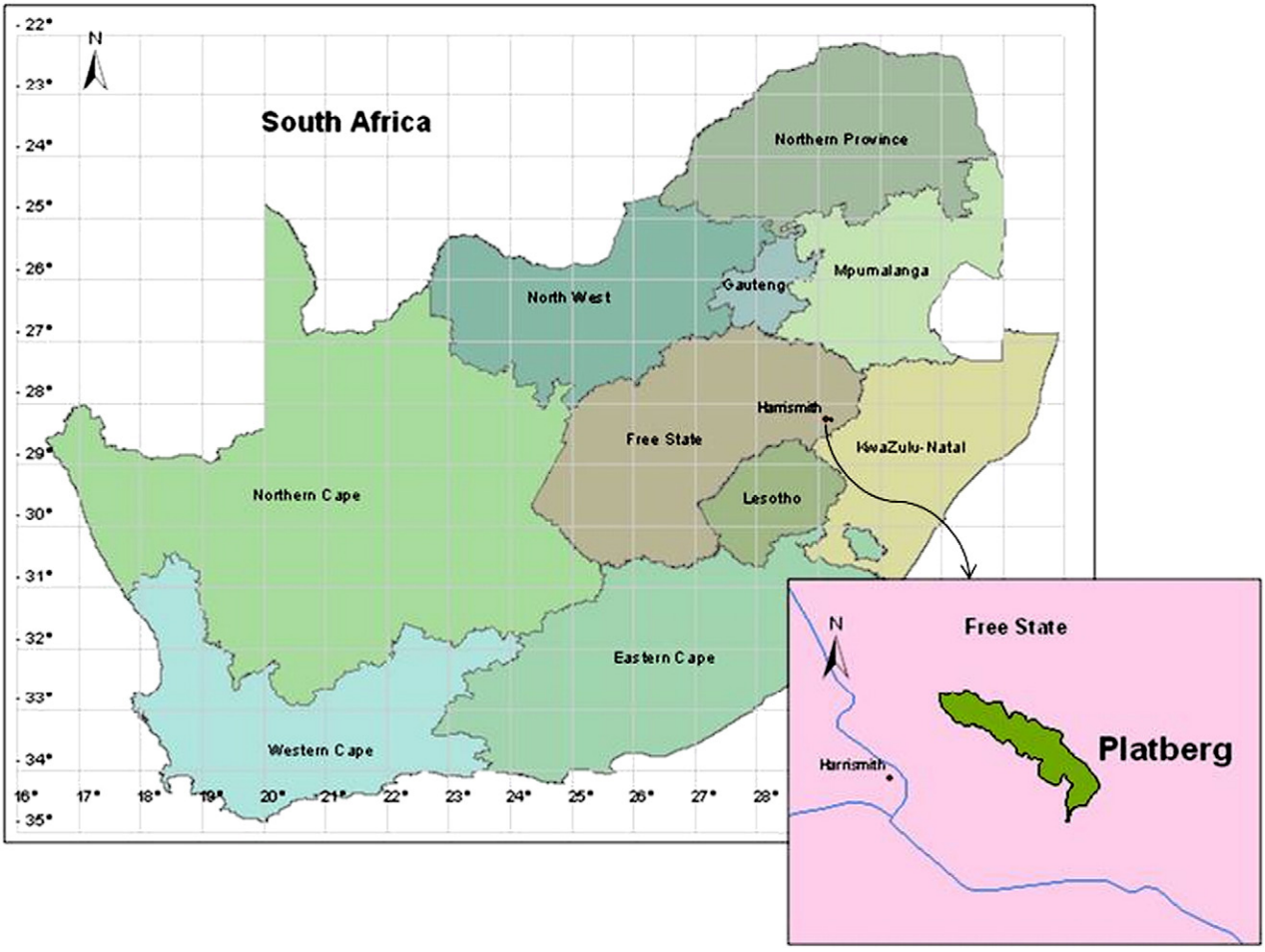

Fig. 1. Location of study area.