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Land degradation mapping along the Eastern Cape Wild Coast using Landsat 8 surface reflectance data

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Land degradation and desertification is a major environmental challenge affecting many parts of the world [1]. The mapping of landscape degradation features, compilation of spatial inventories and identification of high risk areas is essential for the mitigation and prevention of desertification. Although commonly regarded as being pristine, parts of the environmentally–significant Wild Coast of the Eastern Cape Province, South Africa are ravaged by active soil erosion that presents significant challenges to sensitive ecosystems and indigenous land use practices.

Investigations in the northern Xolobeni region of the coastal zone using a time/seasonal series of aerial photographs and satellite images revealed some of the critical landscape and climatic factors under pre- and post-erosion development conditions. The study identified complex erosional histories associated with the larger wind and water erosion features and has provided spatial and temporal data that can be interpreted in the context of spreading rates of erosion features. Vulnerable areas where degradation is incipient were identified and informed measures proposed to mitigate the effects of expanding areas of land degradation [2, 3].

The current phase of this research aims to expand the mapping, inventory and spatial analysis methodologies to cover the full 258 km of the Wild Coast. NDVI data derived from Landsat 8 surface reflectance data for the end of wet season (January to April) 2014 and 2015 imagery facilitated the mapping of a range of degradation features. Many of the observations supported the findings in the Xolobeni pilot project area [2, 3]:

(a) Wind erosion is focused in areas where previously tilled lands on sandy eluvial soil horizons occur on valley slopes aligned with the prevailing winds. The spread of thin sand sheets is followed by parabolic blowouts and development of transverse dune fields. Illegal mining of aeolian sediments is a localised disturbance that is rapidly exploited by wind and water erosion.

(b) Widespread gully (donga) erosion exposes the underlying regolith. This erosion occurs as a result of increased runoff and concentration of overland flow occurs on steep slopes where deflation of sandy topsoil from disturbed agricultural areas or vehicle tracks.

(b) Expansion of wind erosion features is occurring in recently denuded areas whilst other deflation features have stabilized over the past decades.

(c) Deeply gullied ancient erosion features have been partly stabilized by peripheral vegetation that slows the expansion of parabolic ‘blowout’ dunes. Deposition of eroded sediment buries wetlands.

(d) Anthropogenic activities including traditional agricultural practices, rural homestead settlement patterns, inadequate drainage of unsurfaced vehicle tracks, overgrazing by large stock and collection of

firewood from indigenous forest patches have all contributed to the widespread expansion of desertification in parts of the Wild Coast region.

References:

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