



Modelling Flow and Erosion: The Key to Ecological Integrity on Incising Channels, the Isle of Wight Chines

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The Isle of Wight Chines are deep canyon-like features, caused by small streams incising through soft clays and greensands as they flow to the sea. These features are locally referred to as “Chines”, and are believed to be unique to the coasts of the Isle of Wight and Dorset, UK.

The Chines form part of the ‘Vegetated sea cliffs of the Atlantic and Baltic coasts’ habitat of the South Wight Maritime candidate Special Area of Conservation. These actively slipping and eroding cliffs and slopes support a complex mosaic of vegetation. The deeply incised channels of the Chines afford a great deal of shelter from prevailing winds, and thus form particular habitats, supporting a wide variety of flora and fauna. Of particular significance are pioneer communities, associated with bare ground exposed by erosion, and a range of successional stages, including woodland, influenced by landslips.

This paper outlines some research conducted under the EU Birds & Habitats Directive Review of Consents into the potential impacts of water abstractions on the Chines. Understanding the geomorphology of the Chines to be fundamental to their ecological integrity, the interaction between hydrology and erosion became the focus of the study.

Standard and simple sediment erodibility assessments are based on physical properties of the sediment. However, the cohesive nature of the sediment of the Chines required direct measurement of the erosion resistance of the sediment. This was achieved through *in-situ* jet tests, in which hydraulic stress was applied to the sediment. This allowed the calculation of the critical shear stress, and an erodibility coefficient. By means of a standard equation expressing erosion rate, erosion thresholds and rates of

erosion were calculated for each Chine.

Rainfall-runoff modelling of the Chines was used to assess the flows under different abstraction scenarios, together with the relationship between flow and erosion. This allowed a thorough and scientifically rigorous analysis of the impacts of water abstractions on the hydrological, geomorphological and ecological integrity of the Chines.

This case study illustrates the close relationship between hydrology, water resources, geomorphology and ecology, within a fascinating and complex environment. The study also details how recent developments in science can be incorporated into applied research with positive results.