



## **Linking vegetation and morphology in a disturbed desert dune system via high resolution modelling of drone data**

Mitchell Lyons (1), Charlotte Mills (1), Christopher Gordon (2), and Mike Letnic (1)

(1) University of New South Wales, Australia (mitchell.lyons@gmail.com), (2) University of Wollongong, Australia

The structure and composition of vegetation has strong links to the formation and maintenance of geomorphological features of the landscape. In arid and semi-arid Australia, trophic cascades have been attributed to changes in the structure and composition of plant and animal assemblages, for which increased woody plant density is a key consequence. In this work we combine both ecological and geomorphological theory, to investigate whether changes in biology can lead to changes in the underlying physical characteristics of an arid dune system. We utilise the emerging technology of remote sensing via drones, to survey dunes in high spatial resolution, including 3D reconstruction of their morphology and population surveys of woody shrubs. We found that dunes had significantly different physical characteristics in areas with altered biological assemblages as a result of the disruptive trophic cascades. Using generalised additive models, we tested hypothesis on the relationship between shrub density and morphological characteristics, and found that several strong relationships existed. We explain these relationships in context of sedimentary processes and wind flow regimes from geomorphology theory. We speculate that dunes with low shrub densities exist in a bi-stable state, mediated by climatic variation, whereas dunes with high shrub densities (a consequence of the trophic cascade) are pushed into a permanently vegetated stable state. The implication is that anthropogenically induced trophic cascades are not only altering biological assemblages, but are also altering the physical structure of the landscape over large spatial scales.