DOI: 10.4172/2572-3103-C1-004

6th International Conference on

Marine Science, Coastal Dynamics and Management

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6th International Conference on

Oceanography, Ocean Technology and Marine Biology

September 21-22, 2018 | Dallas, USA

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Re-establishing sustainable coastal protection by mimicking natural processes

Coasts worldwide are ravaged by major storms. Planning on exposed coasts requires an understanding of the impacts of previous storm events. The approach taken for storm protection in this project was to re-establish native dune ecosystems with their inherent ability to withstand and recover from storms, rather than to construct a rigid engineered seawall. The May-June 1974 storms on the Australian east coast provided an impact benchmark for the likely "1 in 100-year events" for the Magenta Shores project. The calculated storm bite on previously mined Magenta beach dunes was up to 300m^3 of sand per linear meter. Mineral sand mining resulted in highly erodible loose quartz sand, 'stabilized' by the South African *Chrysanthemoides monilifera* subsp. *rotundata* (bitou bush). These highly degraded coastal ecosystems were on irregular landforms with a reduced occurrence of soil binding fungi and associated native host plants. Regular monitoring showed that colonization occurred in stages, with increases in diversity dependent on the ongoing removal of dense bitou seedlings. The primary colonizing species *Spinifex sericeus* and development of a fungal network were essential for secondary colonizing species *Acacia longifolia* subsp. *sophorae*. Within three years, native species dominated the stabilized dune ecosystems. The dune shape depended on establishing the prostrate primary colonizer Spinifex, and maintaining the shape and sand volume was dependent on the sand grain-trapping mechanisms of the fungal hyphae and their host plants. Overall, the project demonstrated the importance of mimicking natural processes–by allowing windblown sand to form crests and swales parallel to the beach; creating protected fibrous coastal tea-tree windrow microenvironments; burying *Spinifex* seedheads in the moist sand layer for primary colonization of the reconstructed dune and establishing primary colonizing native vegetation cover and associated fungal hyphae.

Biography

AnneMarie Clements is the Director and a restoration ecologist of Anne Clements & Associates, a group specialising in botanical conservation assessment, as well as developing and implementing optimal conservation strategies. She holds a MSc (Macquarie Univ.) Thesis - The vegetation of bushland in the northern Sydney area and a PhD (Univ. of Sydney) Thesis - The vegetation of the sand masses of the mid-north coast of New South Wales. She has more than 30 years' experience. Her major research interests include the re-establishment of native ecosystems, impacts of urban development on vegetation and soil, pattern analysis, effects of inundation and salinity on the plant communities, metal concentrations on plant growth and bioaccumulation. She has utilized her research in designing and implementing rehabilitation/conservation programs as part of sustainable developments.

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