

Understanding natural processes to assist recovery and restoration of seagrass meadows

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Rottneest Island sits on the edge of the continental shelf under the influence of the warm, southward flowing Leeuwin Current, approximately 20km off the coast of Perth, Western Australia. The largely pristine waters support healthy kelp, coral and seagrass ecosystems. However, the island is also a popular destination for holiday-makers, with water sports high on the list of activities. Managing the delicate balance between recreational activities and being a Nature Reserve is difficult; some damage to seagrass meadows has occurred, mostly due to damage from anchoring, maintenance of jetties and wharves and boat moorings. Recovery from this type of damage is slow, but occurring. We developed a hydrodynamic model to understand inshore water movement patterns and potential dispersal connectivity among meadows of the dominant seagrass species, *Posidonia australis*. We also examined population genetic structure in four meadows (high and low diversity sites on the north and south side of the island), and collected recruiting seedlings over three consecutive years to determine whether recruitment was occurring from within the meadow or by dispersing seeds. The model showed high levels of potential connectivity among the genetically diverse meadows on the northern side of the island. Meadows on the southern side were not well connected and genetic diversity, reproductive output, and seedling recruitment were much lower. A small proportion of seeds were dispersed southwards via the Leeuwin Current delivering seeds to these southern coastal meadows. Assignment of recruiting seedlings to a source meadow was low, but was from local (self) and other meadows, and this differed annually. This study used a hydrodynamic model to demonstrate potential contemporary demographic and actual genetic connectivity is realised through seed dispersal. This study illustrates how an understanding of the natural processes can augment and create self-sustaining on-ground restoration management strategies to recover damaged meadows.