

Pollinators are vital for reconnecting *Banksia* woodland remnants

Alison L. Ritchie^{1,2,3}, Paul G. Nevill^{1,2,3}, Elizabeth A. Sinclair^{1,2}, Prof Kingsley W. Dixon^{1,2,3} and Siegfried L. Krauss^{1,2}

¹School of Plant Biology, The University of Western Australia

²Kings Park and Botanic Garden

³Department of Environment and Agriculture, Curtin University

Restoring ecosystem services, such as pollination, is critical to ensuring the successful maintenance of plant reproduction. This study is one of the first to assess ecological and genetic connectivity between remnant and restored ecosystems, within a highly fragmented Global Biodiversity Hotspot. Pollinator observations and genetic data were collected for *Banksia menziesii* from natural remnants and two restored sites (a low and high plant diversity). Observed bird diversity was associated with the quality of woodlands and foraging behavior differed among remnants due to floral resources. Territoriality of larger bodied pollinators altered movement patterns, with an observed increase in intra-tree and near-neighbour foraging within restored sites. Microsatellite DNA markers were used to genotype adult plants and their seeds to assess pollen movement using direct (CERVUS) and indirect (TwoGener and Pollination Graphs) measures. Pollen dispersal was extensive within and among sites (up to 2km). Pollen networks showed an association between reduced pollinator services and low genetic connectivity in the low diversity restoration site. Pollen pool differentiation was lowest within the low plant diversity restored site ($\Phi_{ft} = 0.043$) and the highest in the high diversity site ($\Phi_{ft} = 0.081$), but overall all sites indicated multiple pollen donors per family (Φ_{ft} range = 0.043-0.087). The highest estimates of effective pollen donors per maternal (N_{ep}) were recorded in the low plant diversity restored site ($N_{ep} = 16.4$, likely due to high genetic diversity) and the largest natural site ($N_{ep} = 12.5$, likely due to the higher diversity of pollinators). Quantifying species composition, richness and behavior has confirmed the importance of restoring diverse species rich habitat to establish and maintain reproductive functionality. Highly mobile bird pollination is effectively saving remnants from genetic isolation, delivering pollinator services that are key to the resilience of these remnants by maintaining reproductive functionality.