Many of the world’s wetlands are highly degraded with restoration projects underway in many places, such as the Macquarie Marshes. Wetland plants, which are the focus for this restoration, have similar traits around the world. We were interested to find which were the most predictable traits for restoration success and failure of different wetland plants on Pillicawarrina, part of the Macquarie Marshes. This area, once cultivated for crops, was the focus of wetland restoration after it was purchased with its water license by governments in 2009.

We examined the influence of land-use history and flood frequency on the trait-based composition of wetland plant communities. Traits are characteristics of different plant species that allow them to disperse to suitable sites (e.g. seed size, dispersal method), survive environmental conditions there (e.g. roots that can be flooded) and alongside other plants in the community (e.g. leaf size, plant height). Identifying plant trait variation along environmental gradients offers a way of understanding processes of community assembly and can provide insights for restoration of wetlands around the world. We looked at standing vegetation and soil seed banks; comprised of seeds and vegetation fragments lying dormant in the soil until suitable conditions arise.

We combined analysis of i) species in soil propagule banks and standing vegetation, ii) species traits, and iii) environmental conditions to identify traits most related to species’ responses.

The occupancy and abundance of native species in the propagule bank and standing vegetation increased with flood frequency and decreased with duration of agricultural land-use. Species in standing vegetation that use water-borne dispersal (hydrochory) were favoured by flood frequency. In contrast, species with higher specific leaf area (thin and large leaves; early colonising plants) were favoured by increased land-use duration.

Key Outcomes: Our trait-based analysis helped disentangle effects of dispersal and environmental filters. Success for hydrochorous (wetland) species in standing vegetation was negatively related to land-use duration but the opposite to flooding. However, in the seed bank, hydrochorus species were not negatively related to land-use duration but continued to be positively related to flooding. This suggests that previous land-use does not limit plants’ dispersal ability, but limits species presence in standing vegetation.

Legacies of agriculture can impede restoration of plant communities while environmental flows that increase flooding may alleviate these impacts, by dispersing propagules and providing environmental conditions that favour native wetland species.

Recommendations. There are plant traits which are useful for predicting which species are most likely to be successful in restoration projects. These primarily relate to the importance of increased flooding. They are likely to be similar for other wetland restoration projects around the world give the process and types of plant traits are common among global wetlands.