Summary

The aim of this project was to develop an evaluation system to determine whether the revegetation of agricultural land on the Cumberland Plain, west of Sydney, NSW, has led to the re-establishment of a grassy woodland.

The evaluation system developed in this Thesis was designed to compare three key ecosystem attributes. First, to assess how restoration was progressing, the species richness, composition and vegetation structure of abandoned pasture (starting point), was compared to that of restored vegetation of differing ages (putative mid points), and remnants (goal or end point). Second, the small-scale effects of planted tree canopies on species composition were assessed to test the hypothesis that native tree canopies facilitate the return of natives. Third, the effects of fire and neighbour removal on seedling emergence and establishment in pasture, restored vegetation and remnants were examined to explore what factors controlled germination and establishment.

The results of this study indicate that to date, there has been a partial success of the restoration program at the study sites with a trajectory of native species composition *not* in the direction of remnants. Native species richness was found to be increased due to revegetation at one sampling time only, while other positive changes in species composition and vegetation structure have been patchy and variable. Native species found to be returning after revegetation comprised a different suite of species to those in remnants.

Native species composition underneath tree canopies remained unchanged following the planting of trees, falsifying the hypothesis that native species return preferentially under tree canopies. There was however, increasing exotic species richness detected underneath planted tree canopies.

Patterns of seedling emergence observed in this study suggest that recruitment does play a role in the maintenance of the species composition found in restored vegetation, with

seedling emergence dominated by exotics. Exotics responded to any form of neighbour removal; native emergence and establishment was low, and patchy by comparison.

Recruitment of a diverse understorey species following tree planting needs additional input to overcome restoration barriers. Further efforts may be needed for an improved trajectory towards success, for example importing additional genetic material via either seed or established seedling and creating recruitment opportunities.

The restoration evaluation methodology further developed here will be useful to an industry that involves tree planting, landcare, revegetation and bush regeneration. It will complement guidelines provided by government and other sources that advise on practical aspects of revegetation and will be one of the few which have examined the success of revegetation in ecological terms and are founded on sound scientific basis.

If restoration is held to be a possible answer to degradation of grassy woodland systems, the long time-frames and risks of restoration failure should be acknowledged and accommodated in planning.

The evaluation methodology developed within this Thesis is a transparent and accurate way to measure ecological changes in vegetation that have occurred as a result of restoration.