

RESTORATION OF GRASSY WHITE BOX WOODLANDS

overview of the project

Researchers from Charles Sturt University carried out this project to find a practical method for conserving and enhancing native vegetation in degraded grassy woodlands. Millions of hectares of New South Wales wheat and sheep land, once covered by white box or yellow box Eucalyptus woodlands and native grasses and wildflowers, have been degraded by clearing and grazing. This has allowed exotic weeds to dominate the understorey. The project team identified a simple but effective tool to allow soil and vegetation to return to good health in these regions. They made the crucial discovery that applying carbon to the land in the form of sugar lowered the levels of nutrients in the soil. The application of sugar limited the growth of exotic weeds and allowed native plants such as kangaroo grass to return and dominate.



Marking out trial plots

Previous research has shown that simply removing the source of degradation, for example fencing out grazing animals, will not always promote a return to the original state. Active restoration work is needed to allow soil and vegetation health to return. The team showed that soil nutrients were a barrier to restoration and devised an ingenious method for removing this barrier. The results of their study are an important step towards conserving vast areas of grassy woodlands in NSW.

how the project was carried out

The project was carried out in two phases. Firstly the team investigated the processes involved in the degradation of woodland soils. They took soil samples from 59 woodland remnants in varying conditions and analysed these for their nutrient content and composition. At the same time they carried out surveys of native plants and weeds at the sites. Results showed that the more nitrates present in the soil, the bigger and more numerous the weeds. This led them to



Plots after treatment to reduce nitrates

the second phase, to explore reducing nitrates as a target for the restoration plan. They selected two experimental sites and applied different treatments. Carbon was added to the soil in the form of pure sugar every three months for two years. Other plots were subjected to burning and herbicide for two consecutive years. These treatments were followed by planting with seeds and seedlings and these were observed for growth.

from weed seeds in the soil. Furthermore, kangaroo grass itself kept soil nitrates at lower levels, providing longer term control of soil nutrients.

These findings provided a new model for restoring degraded woodland. The team developed a range of extension materials to communicate these findings to land managers, who will use them to more effectively conserve woodlands in their care. The team are now carrying out further studies to see how sugar application affects native wildflowers. They hope to find ways of making the sugar supplement more economical by using different forms.

benefits, challenges & lessons learned

This team has successfully identified a promising and sustainable new technique for restoring woodland understoreys. They identified that nutrient levels are a critical barrier to soil restoration and if we can lower these levels we can enhance soil restoration and allow native grass growth. The project faced challenges from harsh drought conditions following the planting stage, making it impossible to establish growth until the summer rains. Despite the drought they were able to obtain enough growth data over the two years to make viable conclusions.

outcomes now and in the future

The team was able to return the soils to normal nitrate levels using an easily accessible method. The sugar applications lowered nitrate levels dramatically, limiting the growth of exotic weeds and allowing the native kangaroo grass, *Themeda australis*, to dominate. Spring burning also encouraged the kangaroo grass to grow, possibly by removing competition