THE ECOLOGY, CLASSIFICATION, AND MANIPULATION OF ROADSIDE VEGETATION IN THE ARMIDALE REGION, NSW.

By

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Chloris truncata (Windmill Grass), *Danthonia richardsonii* cv 'Taranna' (Wallaby Grass) and *Microlaena stipoides* (Weeping Grass) at Cluny Road field trial site.

Psoralea tenax (Emu foot) growing next to the tarmac on the New England Highway, 5 km north of Armidale, NSW.

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ABSTRACT

Roadside reserves are extremely variable land units, which are influenced by a broad range of natural and anthropogenic processes, have a multiplicity of functions, and are administered by a range of government and community authorities. One of the most important issues associated with roadside reserves at present, however, is an increasing public awareness of their environmental values, particularly with respect to native vegetation.

A project was undertaken with the main objective of developing revegetation and management strategies for roadside vegetation along rural roads. The aims of the project were as follows:

1. To classify roadside environments in the vicinity of Armidale according to the vegetation, landscape features, geomorphology, width of the roadside reserve, and other relevant features.

2. To set goals in terms of the desired native vegetation for each class of roadside site identified.

3. To develop strategies and investigate methods for manipulating existing conditions to achieve the desired goals.

A survey of 20 roadside sites within 50 km of Armidale was undertaken which aimed to categorise these sites according to vegetation, anthropogenic, and environmental variables. The survey concentrated on the nature and zonation of, and the factors influencing, the herbaceous vegetation. For each site the soil type, slope, aspect, landscape position, altitude, and road topography was recorded. Zones were identified according to their position within the reserve and distance from the road, and assessed for soil profile alteration, water run on and run off, general soil fertility, and propagule input. The presence/absence of component species in each zone was recorded using sub-quadrats in five adjacent 1 m^2 quadrats running parallel to the road, and percent frequencies calculated. Over the twenty sites 242 samples were taken - the number of samples at each site varied according to the width and heterogeneity of the road reserve.

Percent frequency data were subjected to a two-way cluster analysis, to group species and samples. Chi-square values were calculated to test the relationships between these groups and environmental variables.

The occurrence of exotic species was strongly related to soil disturbances and native species were associated with a lower incidence of soil disturbance. A few species, mostly perennial grasses, occurring at relatively high percent frequencies characterised the four sample groups identified in the analysis, and a wide range of other species had low frequencies within samples and/or low occurrence across the range of samples. Of the 100 species used in the analysis, 24% were native perennial forbs, 21% exotic annual forbs,

14% native perennial grasses, 13% exotic perennial forbs, 11% exotic annual grasses, 9% exotic perennial grasses, and the remaining 8% native annual grasses, forbs and indeterminate taxa.

Sample group one was characterised by communities dominated by *Phalaris aquatica* and/or *Festuca elatior*, with associated low species richness and high litter accumulation. Such samples most commonly occurred on narrow road verges with fertile basaltic soils, in the absence of regular soil disturbance, and with adjacent improved pastures, and it is suggested that such sites favour competitive species. Sample group two was characterised by sparse vegetation with a low percent frequency and high diversity of a wide range of taxa from various life history types, of which *Plantago lanceolata*, *Vulpia* spp., *Hypochaeris radicata*, and *Avena fatua/barbata* were the most abundant. Such samples were generally located on road verges and where duplex soils had been scalped, and could variously be described as favouring stress and/or disturbance-tolerating species. Sample group three was dominated by a number of taxa of native perennial grasses including *Danthonia* spp., *Poa sieberiana*, *Bothriochloa macra*, *Imperata cylindrica*, and *Microlaena stipoides*, as well as *Plantago lanceolata* and *Hypochaeris radicata*. This group most commonly occurred on undisturbed poorer soils and in adjacent paddocks. Sample group four was dominated by *Themeda australis* and occurred almost exclusively in undisturbed habitats. Species richness in both groups three and four was higher than in group one but lower than group two.

Three plant strategies in relation to soil disturbance were recognised:

1. Disturbance specialists, which included species most abundant where the profile had been altered
2. Native and exotic disturbance-tolerators, and
3. Species intolerant of disturbance.

A model is presented which is designed to assist in the formulation of goals and strategies for native roadside vegetation, based on the state and transition model, and the roadside survey results. Various states within the verge, table drain, cutting, embankment, and the road reserve are defined, along with possible transitions between them, and suggestions as to how they may be achieved.

A field trial to assess the emergence and survival performance of three species of native grasses, *Chloris truncata*, *Danthonia richardsonii* cv. 'Taranna', and *Microlaena stipoides* was carried out on a denuded roadside site and at the Traffic Education Centre, Armidale. Seeds were sown monthly for eight months from October 1992 to May 1993 in seven roadside environments.

Generally, rainfall events of 40 mm or more were associated with substantial emergence events of at least some of the species sown. Over 40 mm of rain was recorded in all months except February through May, with January being the wettest month, and April the driest with no rain.

Seedlings of the three species which emerged from October through to January sowings generally did so within a month of sowing following rainfall events and generally reached their maximum emergence percentage within two to ten weeks. *C. truncata* had less than 1 % emergence from the February sowing and failed to emerge from the March to May sowings, while *Danthonia richardsonii* cv. 'Taranna' and *Microlaena stipoides* seed sown in these months did not emerge until May or June.

Emergence of *M. stipoides* from the January through to May sowings was significantly (P < 0.05) higher than the other two species, and was over 40 % for all sowings except December and February. The highest % emergence of *C. truncata* was from the October, November and January sowings while the highest % emergence of *Danthonia* occurred from November sowings, when it was significantly (P < 0.05) greater than the other two species, and from the October sowings.

Total % emergence in the seven environments varied significantly (P < 0.05) with month of sowing, averaged over all species, and in general was highest in environments with the least compact surface soil or which had been ripped.

There was no significant interaction between species and environments, indicating that the relative emergence of the different species was the same for each environment.

For individual months of sowing, there was no significant difference (P > 0.05) among percentage survival of the three species except for the December sowing where *M. stipoides* was significantly higher than *C. truncata* and *D. richardsonii*. The October sowing of all three species and the November sowing of *C. truncata* were significantly higher (P < 0.05) than December and January sowings, and *C. truncata* and *D. richardsonii* sown in December were significantly lower than all other sowings. Survival of *C. truncata* and *D. richardsonii* was significantly higher (P < 0.05) in October and November than in January, which was significantly higher than in December. Survival of *M. stipoides* from December and January sowings did not differ significantly (P < 0.05), but was significantly lower than the October sowing, with the November sowing intermediate.

There were significant differences (P < 0.05) in survival among sowing times in five of the environments, and the highest survival rate occurred in environments where the soil had previously been ripped or was in close proximity to undisturbed native grassland. The poorest survival was in environments where seeds were sown into subsoil or compacted soil.

The study indicated that all three species have potential for roadside revegetation work, although *M. stipoides* may require different techniques for more successful survival and robust growth on similar habitats to those used in this trial. The importance of soil characteristics and seedbed preparation is also obvious, and the maintenance of soil moisture is of utmost importance. The emergence of seedlings of *D. richardsonii* and *M. stipoides* following up to four months in the soil with little rain implies that these species may be sown during dry periods and will remain viable in the soil until rain promotes emergence. The ability of *C. truncata* to form a continuous ground cover is also of great value for soil conservation reasons.

Overall, the project indicated the great variability found in roadsides and the vegetation therein, identified some of the component species, and suggested reasons for this variability. Recommendations for management priorities include conservation of remnants and other native vegetation, control of the spread of noxious and other weeds along roadsides, revegetation of denuded areas on roadsides, and replacement of exotic perennial pasture grasses with a range of native species.

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