

Biodiversity values of privet regrowth on the eastern Dorrigo plateau

By: Carla P. Catterall and Debbie Rudd, Environmental Futures Research Institute, Griffith University, Nathan Qld 4111
Prepared for: Coffs Harbour City Council

Background

Strategic reforestation is key to retaining and rehabilitating biodiversity and other environmental values. On the eastern Dorrigo plateau, rainforest was extensively cleared and converted to livestock pasture by the early nineteenth century, but areas of forest regrowth dominated by non-native small-leaved privet have now become common, especially bordering streams. Both the regeneration of rainforest trees and spread of the privet depend largely on the dispersal of seeds by native fruit-eating birds, but very little is currently known about either bird or plant diversity within privet regrowth on the Dorrigo plateau.



Small-leaved Privet (*Ligustrum sinense*) in fruit.
Photo © Dr B McDonald

Research project

We conducted a research project that aimed to:

1. assess the biodiversity and habitat values of privet-dominated regrowth on the eastern Dorrigo plateau, by quantitatively evaluating the extent to which bird and plant communities in the regrowth had moved from those which characterise pasture, towards becoming more rainforest-like;
2. use this and other information in further analyses to assess whether the privet regrowth was more likely to assist or inhibit the future recovery of further rainforest diversity; and
3. consider the implications for making informed management decisions.



Deforestation has primarily occurred to create areas of livestock pasture and other agricultural uses, causing diverse and complex forest ecosystems to be replaced with much simpler ecosystems dominated by non-native species. Photo © C Stehn

Research approach

The project surveyed 21 study sites representing three habitat types: eight privet-dominated regrowth sites surrounded by livestock pasture on privately-owned properties (representing typical privet regrowth in the study region); eight sites in livestock pasture (in the same properties as the privet sites); and five sites in old-growth rainforest (never cleared for pasture but likely to have been historically logged) conserved in national park or state forest. As far as possible all three habitat types shared similar soils and elevations and avoided steep slopes. The

regrowth vegetation in the privet sites was a strip about 20-100 m wide, being part of much longer linear regrowth ribbons that grow on the banks of streams running across the otherwise-cleared plateau; all sites used in this study contained at least 0.4 ha of continuous regrowth habitat.

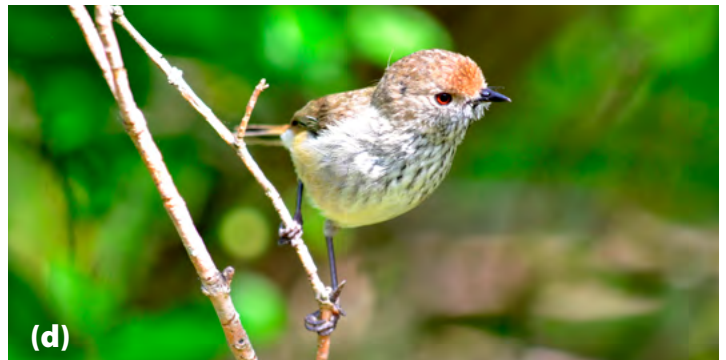
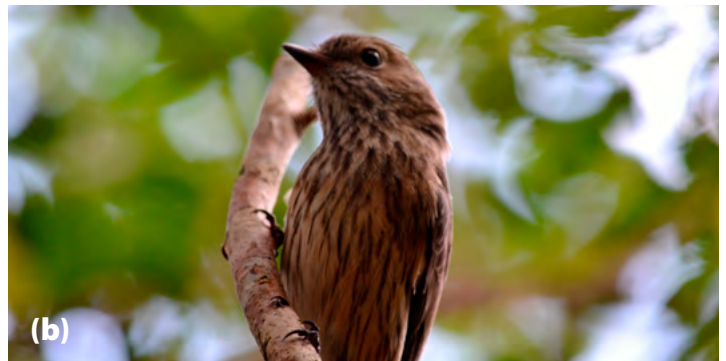
Vegetation structure, plant communities and bird communities were measured in transects at each site, by expert field ecologists, using a standard quantitative technique previously designed for evaluating the biodiversity values of restored rainforest.



Further examples of the three habitat classes used in the study: (a) pasture site with dense, managed grass cover; (b) pasture site with riparian regrowth visible in the middle ground and forested hills in the far distance; (c) pasture site with transect midline and 1m x 1m vegetation survey quadrat shown; (d) regrowth site with dense Small-leaved Privet in the understorey; (e) regrowth site with a more open understorey and visible cattle tracks; (f) forest site with an open understorey, tall, closed canopy and leaf litter and large woody debris all visible; and (g) forest site with special life forms including tree ferns, small palms and vines. Photo (f) © Dr B McDonald; photos (a) - (e) and (g) © D Rudd.

Biodiversity values of privet regrowth

The vegetation structure of the privet regrowth sites had recovered a moderate proportion of forest values. Fast recovery was seen in 25% of the 24 individually-assessed aspects of vegetation structure (including canopy cover and the densities of stems up to 50 cm diameter). However, 29% showed slow recovery (including densities of stems over 50 cm diameter, coarse woody debris, and the presence of some life forms such as small palms and epiphytic ferns). Most other quantitatively assessed aspects of vegetation structure showed intermediate recovery (38%) in regrowth. In general, the development of a substantially more rainforest-like vegetation structure is known to be associated with increased abundance and diversity of a range of native forest-associated animal species.



Insect-eating bird species recorded in regrowth sites: (a) & (b) male and female rufous whistler; (c) white-browed scrubwren; (d) brown thornbill. Photos © D Rudd

The tree and shrub community composition and diversity in privet regrowth showed only slow recovery of rainforest values. The diversity and density of established native trees and shrubs (having stems above 1 m tall) showed slow recovery patterns (36 native species per transect were recorded in rainforest, compared with 3.4 in regrowth and 0.1 in pasture). Additionally, while native fleshy-fruited species were very common among established trees and shrubs in rainforest (69% of species), they were under-represented in the privet regrowth (27%); this was even more so for larger-seeded species (28% of species in rainforest, 0% in regrowth). Native vines showed slow recovery, while non-native vines occurred only in regrowth. Epiphytes had slow recovery, being restricted to rainforest, whereas fern recovery was intermediate. Native herbs and grasses were both most diverse and abundant in regrowth, somewhat less in rainforest, and least in pasture, whereas

The bird community composition in privet regrowth had also recovered a moderate to large proportion of forest values. Although fast recovery was seen in only 2 of the 16 individually-tested bird species (which were both common in pasture but absent from regrowth and forest), a further 31% were much more abundant in the regrowth than in either pasture or forest (overshooting the rainforest value in a “deflected” pattern), and 12.5% showed intermediate recovery. At the community level, the overall diversity and abundance of rainforest-dependent species showed intermediate recovery (no such species were recorded in pasture surveys, compared with an average 2.3 species per transect in privet regrowth and 5.0 in rainforest), whereas bird species that typically use both eucalypt and rainforest habitats were most diverse and abundant in regrowth.

non-native herbs and grasses were very abundant in pasture, uncommon in regrowth and absent in rainforest.

Potential for future rainforest regeneration in privet regrowth

The privet regrowth sites had several properties which indicated a strong potential for facilitating future regeneration of rainforest trees and shrubs. First, they provided abundant fruits and complex habitat structure, attractive to seed-dispersing birds. Second these birds were abundant and diverse in the privet regrowth, including high quality seed dispersers such as Lewin’s honeyeater and satin bowerbird. Third, at ground-level, there were many areas of sheltered bare soil, providing suitable habitat for rainforest tree seedlings. Consequently, this study found that rainforest tree species were more likely to be present in

the regrowth as young seedlings (under 1 m high) than as established stems above 1 m tall, and fleshy-fruited (bird-dispersed) species were much better represented among the seedlings (71% of species) than among the established stems (27% of species).

The privet regrowth also had properties that may slow or inhibit the germination, growth and survival of rainforest seeds or seedlings that are dispersed into them. First, levels of livestock grazing in the privet regrowth were high, being similar to levels recorded in the pasture sites – rainforest seedlings are likely to be eaten by cattle. Second, the shade cast by the regrowth canopy could plausibly limit seed germination and the growth of seedlings. Third, the high regrowth stem density (mainly of privet) could plausibly indicate strong below-ground competition with recruited rainforest seedlings for nutrients and/or water. Field experimentation would be needed to clarify the roles of these factors. Finally, regeneration of some rainforest trees in both remnant rainforest and regrowth in the Dorrigo landscapes may also be slowed by regional scarcity of the larger-bodied rainforest-dependent frugivorous bird species that are most effective at dispersing large rainforest seeds, and if seed sources in remnant rainforest are too distant from potential regeneration sites. Clarifying these factors would also require further investigations.

Management implications and recommendations

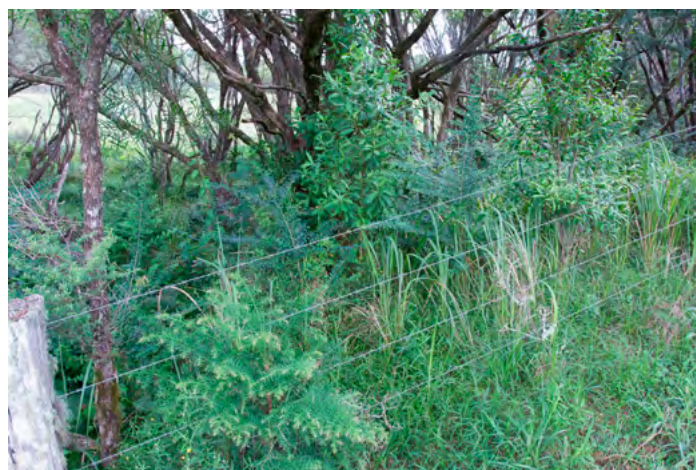
Management recommendations for biodiversity value.

This study has found that the biodiversity value of privet-dominated regrowth along streams on the eastern Dorrigo plateau is much greater than that of the previously-dominant livestock pasture. Regrowth provides complex habitat structure and resources that can support a wide range of forest-associated species which are absent from pasture, even though some rainforest specialists are lacking. The regrowth is also likely to have a range of other ecosystem functions, such as carbon uptake and storage, soil stabilisation, and regulation of water flows and water quality.

Therefore, destruction of the privet regrowth would have an adverse overall effect on biodiversity and other environmental values across the plateau. The recommended strategy is to retain this regrowth. Biodiversity values could then be further increased by investment in planned management interventions to shift the plant species composition towards greater representation of native rainforest species (with care to avoid adversely affecting wildlife habitat values).

Management recommendations for future rainforest regeneration in privet regrowth.

This study has found that the privet regrowth provides habitat that supports abundant seed-dispersing birds, capable of importing native tree seeds from areas of remnant rainforest, and that young recently-germinated native rainforest seedlings are present within it. However, the study has also found high livestock grazing likely to limit these seedlings' growth and survival, and has noted the possibility that competition from the established privet trees may also have this effect.



Stock exclusion fencing is likely to help limit grazing impacts on seedling growth and survival, leading to increased recruitment of native rainforest species. Photo © C Stehn

It is possible that exclusion of livestock and suppression of the privet over-storey in established regrowth could both lead to increased germination, survival and growth of native rainforest seedlings. An experimental management approach is recommended to test these possibilities – for example, through trial habitat manipulations consisting of selective removal of small-leaved privet, with and without the removal of livestock grazing, together with research and monitoring to assess the outcomes.

Acknowledgments

This project was aided by the expert field identification skills of Dr Bill McDonald (plants) and Dr Greg Clancy (birds), by advice from Craig Stehn and Dr Jacinta Zalucki, and by access permission from landholders.

Reference

Rudd, D.L. (2017) Can oldfield regrowth dominated by non-native privet trees contribute to biodiversity and rainforest regeneration? BSc (Honours) thesis, Griffith University. Available at: <https://www.jaliigirr.com.au/rudd-d-l-2017/>