ECOLOGY AND CONSERVATION IN FARM TREE PLANNING

By Dr K J Atkins - Department of Conservation and Land Management, Narrogin.

The main purpose of tree planting and native vegetation retention on farms in the wheatbelt, is soil conservation. That is, for combating salt, water-logging and erosion problems on the farmland. Alternative purposes include stock shelter, aesthetics, and commercial production. But what about nature conservation? Does this play a part in having trees on a farm? I believe it does, from two viewpoints - the conservationist's and the farmer's.

Conservation

From a strictly nature conservation viewpoint the remaining native vegetation in the wheatbelt is worth conserving in its own right. The flora of the wheatbelt is one of the richest in the world and many species are unique to the area. Unfortunately however, the wheatbelt has been largely cleared of its original vegetation. The Avon Botanical District occupies the main part of the wheatbelt, and this district has been 93% cleared in total, with woodlands being worst affected. Individual woodland associations are: marri/wandoo (94% cleared) and york gum/wandoo/salmon gum (97% cleared).

The direct result of this clearing is the loss and reduction in numbers of many of the regions flora, with the highest concentration of rare and threatened native plants in Australia being found in it. Fifty two wheatbelt species are thought to be extinct. This loss of plant species not only means a loss of part of our natural heritage, but also the loss of unknown potential benefit to man.

By way of example, the story of *Bromus mungo* in South America highlights this problem. The Incas cultivated this native grass extensively prior to the Spanish invasion. The Spaniards converted all of the *Bromus* fields to wheat. Ten years ago the *Bromus* was believed extinct, but in 1987 a population was found high in the Andes. This population has since been used as a source of cold tolerance genes for crops. Thus a valuable genetic resource was nearly lost due to agricultural development.

Ecology

Ecology is the study of plants, animals, microorganisms, and their inter-relations with each other and their environment.

In the wheatbelt the natural ecology has been disrupted by the large scale clearing and replacement of perennial native vegetation with annual crops. Re-vegetation schemes to combat resulting problems such as salt and erosion, have largely concentrated on selected tree species designed to perform specific tasks, such as water uptake or wind breaking.

Several problems arise from being too specific in ones selection of plant species for re-vegetation. Firstly, as detailed above, if we are entering a period of climate change then the greatest safeguard that we have for the security of our re-vegetation areas is to have as much diversity as possible so that if some species fail others may survive.

Related to the above argument is that of a changing local environment. Many salt affected sites will deteriorate further before improving. Hence, trees that are planted on such areas should be able to survive in the changed environment. How much an area will change is not necessarily known and thus to a degree it is a guess. But again, diversity will give the most options.

Insects and Pests

Natural ecosystems are complex and have evolved to exist with a balance between the organisms whether they be potential pests or not. In agricultural systems, or modified ecosystems however, the complexity is reduced and the balance upset. As a result natural pest predators are lost and the area is more likely to be ravaged by pests and diseases. With the natural controlling factors being absent artificial controls are required to maintain these man-made ecosystems.

Insect attack of isolated farm trees, or re-vegetation areas, can be a serious factor in rural tree decline and re-vegetation failure. Where re-vegetation areas are composed of single, or only a few species, the effect of insects can be devastating as the provision of suitable host plants and the potential for reproduction of the insects can be virtually unlimited.

Other examples exist also. For example wild apple and grape varieties are now being preserved for their genetic resource. In Australia however, the use of native plants in horticulture is limited to the macadamia nut, despite sustaining the Aboriginal people for 40 000 years. The poor utilization of our flora is a reflection of the lack of work that has been done on it. The potential is unknown.

Plants, animals and micro-organisms provide all our food, and almost all our medicines and drugs. As such they are a valuable resource, with species regarded as useless today (in economic terms), possibly being of great value in the future. If we allow species to become extinct then we reduce our options for the future. It should be noted that only about ~~100~~ ? species of plants out of the world total of 250 000 are used for food, medicine, textiles etc.

Recently researchers from Macquarie University in Sydney discovered that many members of the *Pimelia* genus of Australian native plants possess a chemical that destroys cancer cells while leaving healthy cells unharmed. Those species that showed the greatest potential in this regard are rare and possibly endangered. Without species conservation these plants could be lost, along with their beneficial properties.

Another aspect where we require options for the future is the impact of the Greenhouse Effect. Predictions of the future for the wheatbelt are a rise in temperature of up to 4 to 5 $^{\circ}$C, and a decrease in overall rainfall coupled with a shift in rainfall from winter to other seasons.

This will mean changes in farming practice and also changes in the conditions that have moulded the natural vegetation. Some species will cope; others will be favoured; while others will be disadvantaged. What the impact will be on our vegetation remnants, we don't know. But whatever it is they will have to develop in isolation from other remnants, that is, there is little chance of genetic movement between these patches of bush.

Vegetation diversity will be integral to the maintenance of healthy vegetation in remnants, and for that matter in re-vegetation areas on farm properties. Hence the maintenance of the remaining bush, and all of the species in it will give the best option for the future of these areas. From past experience we know what would happen to our soil if there was a further loss of vegetation from the landscape.

Diversification in the tree species retained or planted on farms will help to buffer the effects of insect attack by reducing suitable host trees if only specific varieties are being attacked. This will result in the insects having reduced potential to multiply. Also after the attack the remaining tree species will still provide the benefit intended.

In the modified or artificial ecosystems on farmland the potential for natural insect and other pest control can be enhanced by the establishment or retention of suitable habitat for the various animals that normally keep the pests in check. Many species of native birds for example, are insectivorous and can have an important controlling effect on insect pests. (In New South Wales birds are reported to be able to eat over half of available insects). Most of these birds however are also dependant on areas of vegetation for shelter, nesting, and alternative food sources such as nectar. The provision of suitable habitat is thus necessary to maintain these birds, and other pest predators, in an area.

Western Australian birds can be grouped into categories of major feeding mode and habitat requirements (Arnold *et al*, 1987). Tree martins for example feed in open farmland in Autumn, but in Spring (when insect outbreaks are greatest) they are restricted to feeding adjacent to tree clumps where they were nesting.

Many of the small insectivores are associated with areas of woodland or clumps of trees. Scattered trees presumably have similar food sources but the patches of food are apparently too far apart to be suitable for foraging and most birds will not move across the open paddocks to these trees.

Isolated trees on a farm generally do not have a long term future. These trees are under most stress and suffer the greatest degree of dieback. They are affected by exposure, and in particular wind storms; by trampling and browsing from stock; by insect attack; and by other factors such as mistletoe. Attack by pests and diseases is often accentuated on trees that are already stressed, either by previous attacks or the other dieback agents. To improve the viability of trees on farmland, the ecology of these areas must be improved to make them more amenable to the requirements of the trees.

Trees should be established and retained in clumps so that they give each other protection and offer a more viable area for birds to occupy. Species diversity of trees should be maximised so that any affect on one species won't devastate the area, and also so that the diversity of birds can be increased. Treed areas ideally should be fenced off to prevent stock damage by trampling and compacting the soil, ringbarking trees, and eating seedlings.

The encouragement of understorey plants will also help to re-establish some of the natural ecosystem components. Most re-vegetation areas have only tree species. This may allow agriculture to continue, and will help control the watertable, but the longer term health of the area may be in doubt. The establishment of flowering shrubs that flower in winter can assist in this. The winter bloom attracts honeyeaters to the area. Then in Summer when no flowers are present the honeyeaters will change over to eating the insects that are plentiful at this time of the year.

Such natural insect control not only helps to maintain the re-vegetation areas, but can also have a beneficial effect on the adjacent crops or pastures.

Species Selection

The final point which I will address is on species selection. There are several criteria for selecting plant species for re-vegetation, viz:

they must be able to grow under the local climatic conditions;
they must be able to grow in the current and anticipated soil conditions;
they must provide the desired result in terms of water use, soil stabilization or shelter;
they must be resistant to local diseases and pests; and
they must be readily established.

There are often many species that fulfil these requirements, but it is strongly recommended that local native species be considered first. It is these species that are proven performers in the area, and are known to satisfy the above conditions. In addition, local species are more likely to maintain ecosystem processes; they are less likely to become invasive and damaging to the environment; and they are available for seed collection and production by the local community.

The obvious benefit to conservation in using local species is that native species are retained and, in the case of some rare species, conserved, and the unique character of the Western Australian landscape is maintained.

References and Further Reading

Arnold G.W.; R.A. Maller and R. Litchfield (1987) Comparison of bird populations in remnants of wandoo woodland and in adjacent farmland. Aust. Wildl. Res. 14, 331-41.

Breckwoldt, R. (1983) Wildlife in the Home Paddock. Angus and Robertson, Melbourne.

Campbell, R; R. Chandler and G. Thomas (1988) Victoria Felix: Improving Rural Land with Trees. Department of Conservation Forests and Lands and Monash University, Victoria.

Coates, A.M. (1987) Management of Native Vegetation on Farmland in the Wheatbelt of Western Australia. Report from the Voluntary Native Vegetation Retention Project.

Department of Arts, Heritage and Environment, in association with the Institute of Foresters of Australia (1985). Think Trees Grow Trees. Australian Government Publishing Service, Canberra.

Smith, G.T. (1987) The changing environment for birds in the south-west of Western Australia: some management implications. In Saunders, D.A.; G.W. Arnold; A.A. Burbidge and A.J.M. Hopkins. Nature Conservation: The Role of Remnants of Native Vegetation. pp 269-277. Surrey Beatty and Son Pty Limited in Association with CSIRO and CALM.

+ Corridors