Keeping our forests in check

by Richard Robinson

The study of Western Australia's diverse range of flora and fauna has been undertaken in State forests for many years. These studies have generally focused on individual species or communities. Recently, however, a fully integrated monitoring program that aims to better understand and manage the amazing biodiversity of our forests was initiated.

In 2002, the Department of Conservation and Land Management (CALM) set up a new program to record and monitor the dynamic biodiversity of Western Australia's south-west forests and woodlands. Called 'FORESTCHECK', it combines the monitoring of invertebrates, fungi, lichens, flowering plants, vertebrates and the physical attributes of forest structure into one integrated program to gather more cohesive information on the status of the State's forest biodiversity. The program ensures that data are gathered on all groups of organisms from the same point in time and space, and uses standardised collection methods. This uniform approach allows for more accurate studies on the interactions between these organisms and the effects of management on biodiversity as a whole, without having to make assumptions about the varying environmental and climatic conditions that are inevitably recorded in separate studies.

Collective care

Developed through CALM's Science Division, with significant input from a wide range of scientists from other agencies, FORESTCHECK provides forest managers with information about changes and trends occurring in key elements of forest biodiversity associated with forest activities. The program stems from State, national and international obligations to ensure that our forests and woodlands are managed in an ecologically sustainable manner. It is a long-term project that aims to have a network of permanent sites—some of which will be monitored every five years or so—to continue to provide information on our forests for future generations. The first major analysis of information collected from the project since 2002 will be undertaken in 2006.

Considering the vast number of species that inhabit WA's south-west forests, the new monitoring program is an ambitious one. At present, the FORESTCHECK team is concentrating on the jarrah forests, with future plans to extend into other ecosystems. Up to 20 research, technical and office staff from CALM's Science Division are directly involved in gathering and analysing information on the abundant plants and animals—including mammals, reptiles, birds, fungi, lichens and insects—living in the forests, and on forest attributes such as structure, soil nutrients, soil disturbance, litter and woody debris. Staff members from local CALM districts in Donnelly, Wellington and the Perth Hills have also assisted with the establishment of monitoring sites.

Logging forest activities

Since the program started two years ago, FORESTCHECK researchers

Facing page
Main Coral vine (*Kennedia coccinea*) with jarrah trees in the background.
Photo – M & I Morcombe

Above The distinct brown and grey-banded fan-like fruit bodies of the turkey tail fungus (*Trametes versicolor*).
Photo – Richard Robinson

Left Western pygmy possum (*Cercartetus concinnus*).
Photo – Jiri Lochman

have set up permanent monitoring sites in the southern and central jarrah forest regions around Manjimup and Collie. Now, as FORESTCHECK enters its third year, sites are being set up for this year's monitoring in the northern jarrah forest surrounding Dwellingup and east of Kelmscott.

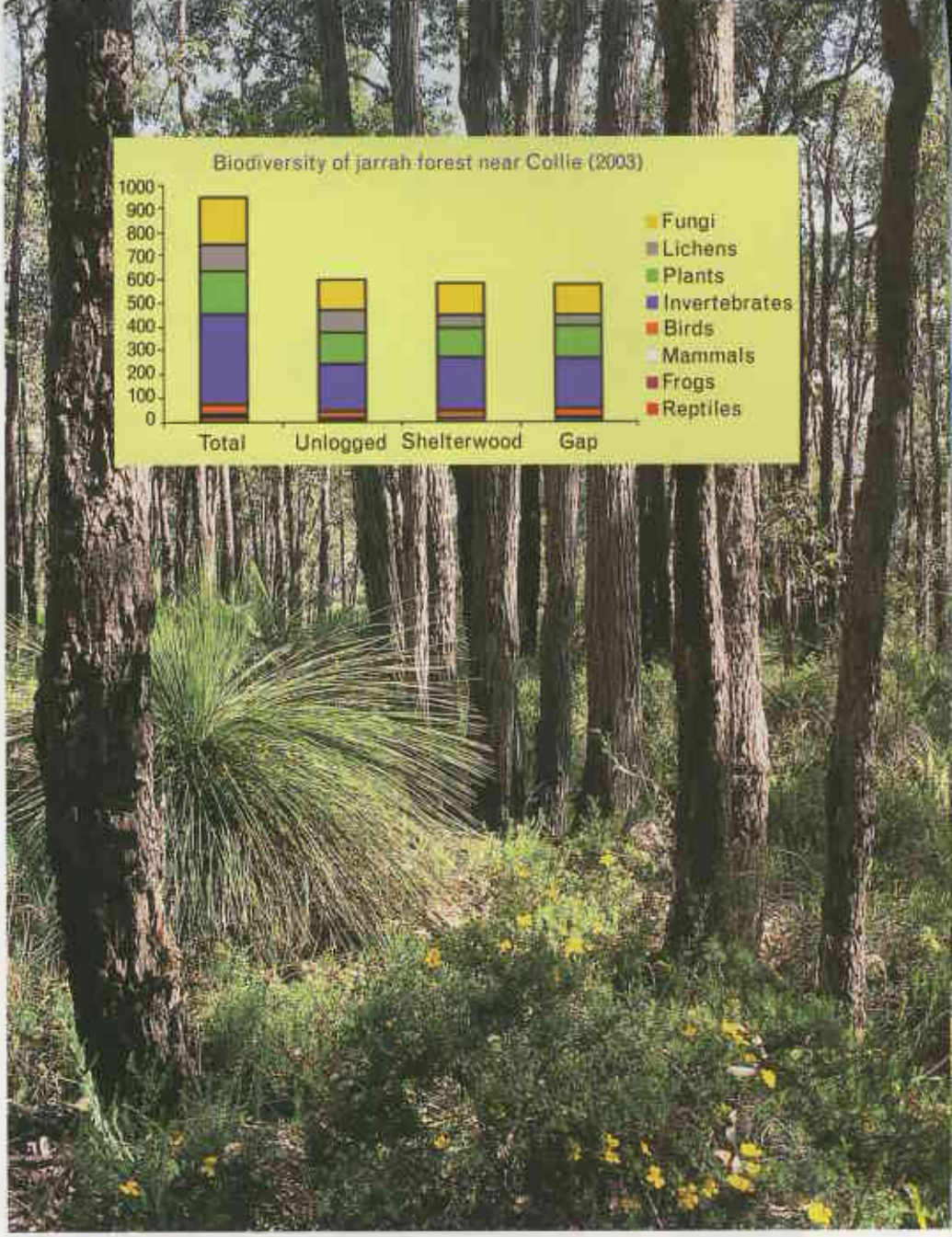
The sites in the jarrah forest are designed to monitor the effects of logging on biodiversity and the forest's recovery following logging. These sites include plots in unlogged forest, and forest that has been subjected to shelterwood and gap harvest methods. Shelterwood harvesting occurs when the trees are ready to be felled but there is not an adequate number of saplings established to take their place. The technique involves the partial removal of trees to encourage seedlings to establish and develop within the forest stand. Gap creation occurs when the stocking of saplings is adequate, and involves the near-complete removal of the overstorey to allow the saplings to develop without obstruction, and to eventually become a new forest.

Top left Southern boobook owl (*Ninox boobook*).
Photo – Jiri Lochman

Above A nesting box in jarrah shelterwood near Collie.
Photo – Lachie McCaw

Centre left The red and white mushroom of Cleland's russula (*Russula clelandii*).

Left An orange crust lichen, *Rhizocarpon polycarpum*, found on small granite rocks.
Photos – Richard Robinson



Right Regrowth jarrah forest.
Photo – Dennis Sarson/Lochman Transparencies
Inset graph Preliminary results from FORESTCHECK indicate that the numbers of species inhabiting logged and unlogged jarrah forest are similar, and that the majority of the species are in the little known invertebrate, fungi and lichen groups.

Variety—the spice of forest life

Information gained from data collected so far highlights the extraordinary diversity of life forms that flourish in our jarrah forests. In the jarrah forest surrounding Manjimup and Collie alone, the FORESTCHECK team has recorded the presence of 1,670 species—and that's after only two monitoring periods. The wide range of plants and the unique animals have always been a drawcard for people who want to explore the south-west jarrah forest. But team members have discovered an abundance of relatively unknown species of invertebrates, fungi and lichens. Combined, these three groups account for three quarters of the total diversity recorded, and species in each group number in the hundreds. Compared with flowering plants and vertebrates, study on the classification of invertebrates, fungi and lichens is limited. The majority of them are yet to be named, and many specimens have been collected and recorded for the first time. Insects, alone, are so numerous that it would take a disproportionate amount of time to sort them into their respective species, so only those larger than a centimetre are recorded, unless they are a distinctive or targeted species. Fungi are also plentiful, but only those that produce visible fruiting bodies late in autumn, following the start of the soaking winter rains, are recorded.

Functional fungi, invertebrates, lichens

Fungi are important in forest ecosystems because they decompose dead plant and animal material and recycle nutrients. The striking red and white Cleland's russula (*Russula clelandii*) belongs to a group of fungi that bind to the roots of plants and help them take up and absorb nutrients from the soil. Other fungi, such as the turkey tail fungus (*Trametes versicolor*) and the orange-footed mycena (*Mycena carmeliana*), decay wood and initiate the natural recycling process.

Recording the presence of fungi relies on them producing mushrooms or coral, puffball, cup and bracket-like fruiting structures (see 'Forest Fungi', *LANDSCOPE*, Spring 2002). But the majority of fungal fruiting bodies are short-lived and only produced over a short period of time, making them a challenge to monitor.

Invertebrates are also important as a food resource for other organisms such as reptiles, birds and mammals. Insects, like native bees and jewel beetles, are important because they pollinate the flowers of plants. Many insects are well hidden or only come out at night, so recording the presence of species like the Dryandra moth (*Carthaea saturnioides*) requires capturing them using light traps. Ground-dwelling insects, like crickets, and other invertebrates, like scorpions, are caught in small pitfall traps. Other insects, such as weevils, that live in the foliage of understorey trees and shrubs, necessitate the beating or shaking of branches to dislodge them onto a large sheet or tarpaulin. For large, dominant trees, it is difficult to record what insects are present in the canopy, and this is perhaps why we know so little about which species inhabit them.

Lichens are also important colonisers of harsh habitats such as rocks and bare soil. Because they absorb most of their nutrients from the atmosphere, or from the surface of the object or plant on which they grow, they are good

indicators of ecosystem health. Many lichens are obscure, blending well into their surroundings, and seeing them requires a keen eye. Others are brightly coloured (see 'Lichens', *LANDSCOPE*, Autumn 2003). Some are found on tree trunks, while others, such as species of *Usnea*, commonly called 'old man's beard', grow on the branches of many shrubs. Flat crust-like species of *Buellia*, *Rhizocarpon* and *Lecanora* can be found on the surface of rocks, and the leafy *Thysanothecium hookeri* is found exclusively on termite mounds.

Early findings

While preliminary results from FORESTCHECK suggest that logging in the jarrah forest has not had a major impact on the number of species present, they do show that different species inhabit the logged and regenerating sites compared with sites that have not been logged. How important this change in species

Top left A syrphid fly feeding on the nectar of a jarrah flower.
Photo – Tom Chvojk

Above Small mushrooms of the orange-footed mycena (*Mycena carmeliana*) on a jarrah log.
Photo – Richard Robinson

Centre left The spectacular Dryandra moth (*Carthaea saturnioides*) is caught in light traps.
Photo – Alan Wills

Left The echidna (*Tachyglossus aculeatus*) and other native animals rely on invertebrates as a food source.
Photo – Jiri Lochman

Right Gnarled veteran jarrah trees provide essential habitat for many native animals.
Photo – Lachie McCaw

composition is, will be the focus of the major data analysis planned for 2006.

Certainly, logging produces a general increase in compacted soils due to log landings (where logs are stockpiled in the forest for transport) and extraction tracks that are used to retrieve them—and mapping these tracks shows that, together, they cover about 16 per cent of the cut block.

The southern area of jarrah forest supports greater numbers of plant species and a higher proportion of marri trees. These forests tend to be denser and, probably because they are wetter, contain a few more species of weeds than the forests further north. Results show that gaps in the forest tend to be densely stocked with saplings, but their density in shelterwoods that have a high component of banksia and/or sheoak trees in them tends to be variable. This is likely to be due to the thick cover of leaves and needles that prevent the successful germination and establishment of jarrah seed.

No rare plants have been recorded so far, but some rarely seen mammals such as echidnas, pygmy possums and dunnarts have been captured and released. However, numbers of mammals were very low or not recorded in areas that had not been baited for foxes. Both boobook and masked owls have also been recorded during night spotlight studies. Scorpion flies (*Austromerope poultoni*), caught in both light and pitfall traps, are endemic to Western Australia and a relict species that has survived in the south-west from the time of the ancient Gondwanan forests.

Forests for the future

Forests are important habitats that harbour much of the biodiversity of south-west Western Australia. They are also necessary for human recreation and social well-being, while some areas are an important source for forest products such as timber and minerals. Management of our forests—whether for nature conservation, recreation, timber production or mineral extraction—has some impact on the ecology, and the plants and animals living there. Programs like FORESTCHECK, that are committed to monitoring these impacts, produce the necessary information to help protect our native forests and inhabitants, so that they will survive and thrive well into the future.

Richard Robinson is a research scientist at CALM's Science Division Research Centre in Manjimup. He can be contacted on (08) 9771 7985.

The staff involved in FORESTCHECK are: Tom Burbidge, Ray Cranfield, Janet Farr, Tom Hamilton, Karina Knight, Graeme Liddelow, Glenda Lindsay, Shelley McArthur, Lachie McCaw, Amanda Mellican, John Neal, Kirsten Pearce, Richard Robinson, Bob Smith, Verna Tunsell, Bruce Ward, Kim Whitford, Alan Wills and Lin Wong.

CALM is very appreciative of the many people from other agencies who attended workshops and provided comment during the initial development stages of FORESTCHECK, and to the Forest Products Commission which contributes to the funding of the program.

The FORESTCHECK concept was originally proposed by the Science Division's Director Neil Burrows and Science Adviser Ian Abbott, and is now coordinated through the Science Division Research Centre at Manjimup. Staff involved can be contacted at the centre on (08) 9771 7985.

Annual FORESTCHECK Reports can be viewed and downloaded from the Science Division website at: www.naturebase.net/science/science.html

Volume 19 Number 3 AUTUMN 2004

contents

Regulars

Publishing credits
Executive editor Ron Kawalilak.
Editor David Gough.
Assistant editor Carolyn Thomson-Dans.
Contributing editors Rhianna Mooney, Verna Costello.
Scientific/technical advice Kevin Kenneally, Paul Jones, Chris Simpson, Keith Morris.
Design and production Tiffany Aberin, Maria Duthie, Natalie Jolakoski, Gooitzen van der Meer.
Illustration Gooitzen van der Meer.
Cartography Promaco Geodraft.
Marketing Estelle de San Miguel
Phone (08) 9334 0296 *Fax* (08) 9334 0432.
Subscription enquiries
Phone (08) 9334 0481 or (08) 9334 0437.
Prepress Colourbox Digital.
Printing Advance Press, Western Australia.

© ISSN 0815-4465

Please do not send unsolicited material, but feel free to contact the Editor.

Visit NatureBase at www.naturebase.net

Published by the Department of Conservation and Land Management, 17 Dick Perry Avenue, Kensington, Western Australia.