

CALM NEWS

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DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

August 1993



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After 10 years' intensive research, CALM principal research scientist Bryan Shearer and technical officer Richard Fairman identified the chemical compound phosphonate. Pictured is Richard using an hydraulic injector to treat a banksia with phosphonate. Photo by Peter Ramshaw, courtesy *The Australian*

CALM scores breakthrough in fight against dieback

FOR the first time, Western Australia can get on the front foot in the fight against the dieback fungus (*Phytophthora cinnamomi*).

After 10 years research by CALM scientists, the chemical compound phosphonate has been identified as a safe and effective method of controlling the disease in areas of high value.

Earlier compounds investigated to control the fungus were either too expensive to use in bushland or were too toxic to our phosphorus-sensitive native plants. Phosphonate has been found not to have these problems.

It stimulates natural,

but dormant, biochemical mechanisms that enable the plant to resist invasion by the fungus and can be applied either by direct injection into the plant stems or sprayed from the air.

It is not yet practical for broad scale application because of the cost, and phosphonate does not give resistance to plants that emerge after spraying.

Used strategically, however, it is expected to hold the disease in check.

CALM has already treated a number of areas of special value. These include populations of rare and endangered plants, beauty spots of high public use and areas used for teaching the importance of

environmental principles and processes.

Trials so far indicate that the chemical can give protection against the fungus for up to five years.

CALM will step up the strategic application of phosphonate, especially on the heathlands of the South West.

The second big step in the dieback fight will be to identify resistance to dieback within natural populations of jarrah trees.

Since the early 1960s isolated, healthy jarrah trees have been reported in forests among ranks of dead white trees and research has shown that these healthy trees have unusually high resistance

to *Phytophthora*.

This resistance offers opportunities to repair the five per cent of forest where jarrah has been so devastated.

CALM can now establish small colonies of resistant jarrah throughout these areas between Mundaring and Albany.

A review of dieback research to build on these advances has been initiated by Environment Minister Kevin Minson.

"While we are excited at the possibilities chemical treatments and resistant jarrahs offer, the research effort must continue," he said.

Continued page 2

CALM expertise attracts Korean investment in south west tree plantations

THE development of hardwood plantations in Western Australia entered a new era in July with a ceremony commemorating 500 hectares of a planned 10 000 hectare Tasmanian bluegum venture in the South West.

The plantation is a joint project among the Korean company, Hansol Forest Products, SECWA and CALM and is the first established by a Korean company outside Korea.

The 500 hectares are being planted on SECWA's Coolangatta property, seven kilometres north-east of Collie.

It represents an investment of \$3 million a year for the first 10 years. Export earnings are forecast at \$60 million a year in the second 10 years of the

project. It also is creating 20 new jobs now, but more than 100 will be created when harvesting begins in 10 years' time.

CALM's Collie team has been supervising the plantings and has notched up some fairly impressive figures when it comes to productivity.

Planting team leader Steve Cole says the team of eight has averaged around 25 hectares a day - that's about 31 250 seedlings. But on one day, the figure topped 31 hectares or more than 38 500 seedlings.

At the commemoration ceremony, Premier Richard Court said the decision by Hansol to choose Western Australia for this first plantation was a tribute to the State.

"It also is an acknowl-

edgement of the expertise Western Australia, through CALM, has developed in managing hardwood resources, whether they be in native forests or in plantations," he said.

Mr Court said Korea had one of the world's fastest growing economies and had developed extensive skills in processing and manufacturing, but it needed a secure supply of wood fibre for its pulp and paper industry.

Western Australia could provide this secure supply and at the same time reap economic and environmental benefits.

Further tree plantings by Hansol will be integrated into existing farms, creating another partnership between farmers, CALM and the Korean company.



WA Premier Richard Court, Hansol Forest Products President Won Kil Nah, and Deputy Administrator of Forests Korea, Dr S W Park join forces to plant some of the trees. Photo courtesy Collie Mail.



Although these days (and at this time of the year) I am often happiest when surrounded by spinifex and marble gums, two of the most enjoyable days I have had in the last year have involved trips to CALM's Collie district.

On the first occasion I had been asked to open the Department's newest training venture, a pilot Mammal Conservation Course for field staff, which was being held over several days out in the Battaling State forest.

I always love a day in the bush, especially when I get to see CALM men and women working hard at a worthwhile task, and enjoying themselves, but this was a special day.

The Mammal Conservation Course was delivered by experts; located in a highly interesting patch of jarrah and wandoo forest intermingled with old farmland in the Wellington catchment; and directed at foresters, rangers and reserve officers from districts from all over CALM territory.

The idea was two-fold; to teach basic skills in fauna survey and management, and to stimulate interest and further education. I found it to be a very well-designed course, pervaded by an atmosphere of great enthusiasm on all sides. The pilot course was a tremendous success.

A second course is on later this year, and I see it becoming a regular training fixture, along the lines of the highly successful training programs which have been running for some years in fire, dieback and recreation management. The benefits to CALM are easy to see - but above all - the Department can take on its mammal conservation responsibilities with greater confidence. I am also delighted with the benefits to staff. They learn a wider range of skills, and they have new doors opened to an area of life-long interest and reward.

I also visited Collie last month for the ceremonial tree planting at the Hansol project by the Premier and visiting dignitaries from Korea. This was a very historic and proud occasion for the Department. Many CALM staff, from Syd down, earned the bouquets handed out that day. However, I didn't miss the fact that while the distinguished guests and others like myself were celebrating in the marquee after the speeches, CALM's Collie crews were out there in the chilly, rain-swept paddock slapping in those little bluegums! (I was glad to hear they were not forgotten later in the day.)

There is no doubt in my mind that in years to come, people will look on these events at Collie as watersheds in nature conservation and land management in Western Australia.

Roger Underwood
General Manager

CALM staff who don't mind if you call them Mallee boys

THE State Government has launched a project to begin the first commercial-scale plantings of eucalyptus oil species in the Western Australian wheatbelt.

Deputy Premier and Trade and Commerce Minister Hendy Cowan said the project could develop a multiple-purpose tree crop that would open new economic options for farmers and help combat land degradation.

1000 hectares of mallees

The project involves planting 1000 hectares of oil-producing mallees over two years in the Lake Toolibin area east of Narrogin.

The area is being established as a prototype commercial production centre that could become a model for other centres. This would require plantings covering 5000 hectares within a 30-kilometre radius.

The program is being funded by the State Government with \$318 500 and a \$108 000 Commonwealth Farm Forestry Program grant.

Mr Cowan said the current world market for eucalyptus oil was 3000 tonnes a year, mainly for pharmaceuticals, but this was too small to absorb any major new production.

Large scale use in industry

But research by CALM's Vegetation and Tree Planting Advisory Service (VATPAS), headed by principal re-

search scientist John Bartle; Professor Allan Barton of Murdoch University, and Alcoa of Australia had shown eucalyptus oil had potential as a solvent for large scale use in industry.

"The oil is attractive because it also can replace petroleum-based solvents considered harmful to the environment," Mr Cowan said.

"One significant market opportunity is to replace trichloroethane of which more than one million tonnes is used worldwide each year.

"This solvent is scheduled to be withdrawn from use in Australia by 1996 so there is a potential new market for eucalyptus oil right on our doorstep."

Mr Cowan said the development of a eucalyptus oil industry would give wheatbelt farmers an adaptable crop that could help soften the impact of inevitable market downturns in the traditional wheat and wool industries.

Environmental benefits

It also had environmental benefits as mallees would help combat land degradation, particularly salinity in many areas of the wheatbelt, and provide stock shelter. The oil tree crops would become part of farmers' normal land care tree planting activities.

He said the oil project also would dovetail with other major rehabilitation programs aimed at restoring the renowned waterbird habitat of Lake Toolibin



Deputy Premier and Trade and Commerce Minister Hendy Cowan plants a young mallee under the watchful eye of CALM senior technical officer Tim Birmingham.
Photo courtesy Narrogin Observer

that was threatened by salinity.

Direct establishment costs of oil mallees were about \$500 a hectare. Harvesting and extraction costs were about \$60 a tonne of leaf.

Analyses by CALM suggested likely achievable yields were 30 kilograms of oil per tonne of leaf and 2.5 tonnes of leaf a hectare. At \$3 a kilogram for oil, returns were quite attractive, especially given the land care benefits.

High oil-yielding mallees

Mr Cowan said several mallee species had been identified as promising high oil-yielding types. These mostly were WA

native species but included the NSW and Victorian blue mallee which had shown big improvements in oil yields in NSW Agriculture Department breeding programs.

CALM also has started breeding programs on local species.

The mallee seedlings would be planted in blocks or hedgerows. The hedge would consist of two rows 2.5 metres apart with 1.5 metre spacings between trees.

Harvesting could begin three years after planting then every two years after that.

Mr Cowan said CALM would enter into share-farming contracts with farmers. These contracts would be similar to those

used with farmers on the south coast growing Tasmanian bluegum plantations.

CALM would provide seedlings and the farmer would plant and manage the crop.

A project team led by CALM's VATPAS manager John Bartle, and involving local farmers, would be set up and project adviser appointed.

"We're also looking at other potential centres such as Woodanilling, Merredin, Kalannie and Morawa.

"The real gains to the rural community lie in adopting mallee as a crop to complement other farm operations and to achieve land care and other environmental benefits."

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CALM Classified

THIS column is divided into sections dealing with 'for hire', 'for sale', 'surplus equipment', 'swap', or 'wanted'. If you have any equipment or requirement that you wish to advertise through this service, please send or fax type-written details to:

The Editor,
CALM NEWS,
Corporate Relations Division

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Chairs in good condition. Preferably ergonomic or similar. Contact Lynne Oakes, Dwellingup 538 1078.

Computer - Macintosh Powerbook/Laptop. Have Macintosh IIsi, 5 MB RAM, 40 MB hard disk, standard keyboard, Apple 13" hi-res colour monitor for swap/trade-in. Contact

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Firefighters honoured

MORE than 370 firefighters who had risked their lives to protect the community were honoured recently with national medals for fire service.

Environment Minister, Kevin Minson said that the awards were given for distinguished and diligent service to the community.

"The awards recognise the skill, dedicated service and personal risk undertaken by CALM firefighters to protect the community and their assets," he said.

Recipients were current and retired employees from CALM's Central Forest, Southern Forest and Swan Regions. They received medals for 15 years' fire service and medals and clasps for

further 15 year periods.

"Mr Gavin Wall, formerly of Kirup, and Mr Les Warner, formerly of Busselton, gave more than 45 years of fire service. Both are now retired," Mr Minson said.

"It's the first time such awards, put forward by the Commonwealth Government, have been presented."

He said that in the 1991-92 fire season 446 wildfires were suppressed.

"As a result, a remarkably low 3 320 hectares or 0.1 per cent of forests on Crown land was burnt out."

CALM firefighters also carried out the prescribed burning of slightly more than 300 000 hectares of Crown land forest in the

same period, reducing the severity of wildfires that did occur. Mr Minson said firefighters rarely received

community recognition. "CALM is indebted to them and to their families for their support."

STAFF NEWS

Appointments:

Arthur Pepper, Park Maintenance Worker, Francois Peron National Park.

Transfers:

Helen Plowman, Officer, to Albany; Roger Markham, Officer, Crawley.

Promotions:

Grahame Rowland, to Senior Agricultural Protection Officer - Information, Agricultural Protection Board.

Continued from page 1

"The review will provide an objective assessment of the importance and nature of the problems that *Phytophthora* poses in WA, particularly for the conservation of nature reserves and national parks.

"It will also assess the current status of research and identify lines for further investigation.

"It will evaluate the scientific basis and effectiveness of existing strategies and recommend the changes needed.

"In particular, it will look at the level of fund-

ing and the structure of agencies needed in this research."

Mr Minson said Dr Frank Podger, the man who identified the cause of jarrah dieback, would head the review team.

Other members would be Dr Sid James and Dr Maurice Mulcahy.

Dr James, a plant geneticist, is associate professor of botany at the University of WA.

Dr Mulcahy, a soil scientist, is a former member of the Environmental Protection Authority and principal administrator of the original Jarrah Dieback Research Foundation.

Getting their goat

The rugged gorges of the Kalbarri National Park are a major attraction for tourists. They are also home to the highly destructive feral goat.

The park is in the Midwest region where very high numbers of the hardy animal occur.

The abundance of goats has resulted in widespread soil and habitat degradation; destruction of crops, fences and native vegetation; competition for food and habitat with native fauna; and the spread of weeds and disease.

In the past goats in the park have been shot whenever possible, and while this has accounted for an annual average of 500, the inaccessible terrain has limited the potential of this random method.

To significantly reduce goat damage at least two-thirds of the population must be removed annually, which means some extra effort is required.

by David Burton

To address the problem the Agriculture Protection Board (APB) established a Land Conservation District Committee comprising Kalbarri National Park staff and adjacent landholders.

As a result, an experimental aerial shooting program took place in late April in the gorges of the park.

The program was funded by CALM, with sharpshooters, rifles and ammunition supplied by the APB.

An area of about 15 000 hectares, from Hardabut Pool in the east to Hawks Head Lookout in the west, was selected as the site where the funds could be most effectively used.

Public safety was of the utmost importance, and the area was cleared and secured the day before.

Constant vigilance of all access ways by ranger

staff not only ensured a safe operation, but also gave would-be visitors an opportunity to express their opinions.

Additionally, the event was advertised both locally and throughout the Northampton Shire, with the good public response confirming the community's awareness of the problem and the need for action.

The aerial operation began at sunrise with the arrival of the local Air Charter Bell 47 helicopter.

This method of shooting allowed good coverage of the area and the total of 357 goats and one pig represented an excellent return for nearly six hours flying time.

During the debrief at the park headquarters it was unanimously acknowledged that not only was the trial a resounding success, but that it was the best option currently available for goat control in the park.



Chartered helicopter with sharpshooter aboard sweeps the river gorge for feral goats. Photo by David Burton



Ron Coyne (left) and Malcolm Roberts view one of their projects, the Salmon Hole beach access steps at Torndirrup National Park. Photo by Richard Pemberton

Sponsorships in kind

GENEROUS donations of rubber belting from Alcoa and cement from Cockburn Cement Company, negotiated by Torndirrup National Park rangers Chris Hart and Richard Pemberton, have helped to complete track stabilisation projects in several South Coast region national parks.

The industrial rubber belting is disused conveyor belt, 900 millimetres wide and extremely heavy, weighing half a tonne per 20 metres. Because of the weight, the belting had to be cut into manageable lengths.

Richard Pemberton carried out the initial experiments with help from mo-

by Martin Lloyd

bile rangers Terry Bloomer and Paul Udinga and found a 20-metre length could be safely managed by two people.

Two lengths of belt were laid side by side, each one covering the wheel ruts on the steep sandy hills in West Cape Howe National Park.

The severe impact from four-wheel-drive vehicles had ensured there would be no difficulty in finding suitable tracks on which to experiment.

On the flatter parts of the track, erosion was not as severe as on the hills and it was here the cement was put to good use.

The cement was applied

to a slightly moistened track surface by first marking out a required spacing for each bag.

The bags were then emptied and the cement raked evenly over the track surfaces.

The cement was then rotary-hoed to a predetermined depth and compacted.

The initial trials of belting and cement stabilisation proved most successful and have held up very well over several public holiday weekends.

The track stabilisation program received an unexpected boost from the Contract Employment Program for Aborigines in Natural and Cultural Resource Management

(CEPANCRM).

The contract has seen two Nyoongars, Ron Coyne and Malcolm Roberts, assisting the two Torndirrup National Park rangers with track stabilisation.

Ron and Malcolm have now helped in a variety of projects in many other national parks in the Albany District and both have expressed a keen sense of ownership and pride in their work and a strong desire to continue their work with CALM.

Funding under the CEPANCRM program continues until the end of 1993, but the Albany District will seek ways to keep these two valuable employees beyond that date.

Exchange workshop

CALM staff from Science and Information Division (SID) and the Midwest region met over two days recently to discuss activities of mutual interest and to develop closer working relationships.

The workshop was jointly organised by acting head of CALM's Wildlife Research Group, Tony Start, and Midwest regional manager, Greg Leaman, and was the outcome of recommendations from a fire management seminar held at the Stirling Ranges earlier this year.

These recommendations included the improvement of communication links between the regions and SID, familiarisation of Midwest staff with research undertaken in the region, and the briefing of SID staff on the research needs of regional operations staff.

SID staff presented 10

papers and the director of the Western Australian Threatened Species and Community Unit (WATSCU), Andrew Burbidge, presented papers on current research topics and methods relevant to the region.

These covered flora and fauna conservation, biogeographical research, monitoring needs, fire management and the roles of the WA Herbarium and WATSCU.

Midwest regional staff presented papers on operational matters such as fire management, feral animal control, declared rare and endangered flora, planning issues, managing the marine estate, dieback control, reserve selection, agro-forestry and developing better communications between the regions and SID.

Participants agreed that further workshops were necessary to deal in more detail

with specific issues.

The workshops would be initiated by Midwest Region in collaboration with SID and WATSCU and would cover dieback management and assessment of ecosystem conservation values relating to land acquisition, training on monitoring and other procedures, establishment of scientific reference groups for planning projects and assistance with grant applications for specific management programs.

In his summary, the Acting Director of the Western Australian Herbarium, Neville Marchant, said that communications between SID and the region had already improved as a result of the workshop.

"It is hoped that implementation of the action plan will build on this relationship and lead to greater achievements," he said.

Technology has impact on West Aussie flora

Technology is having an impact on CALM's WA Herbarium.

As an example of this the Herbarium demonstrated its prototype of an electronic flora database at the Technology Park Expo held in Bentley recently.

The project is an initiative of the INFORM group led by CALM botanists Alex Chapman, Nicholas Lander and Terry Macfarlane assisted by consultant research assistant Grazyna Paczkowska.

The interactive method uses the powerful DELTA software developed by CSIRO's Dr Mike Dallwitz in Canberra.

The project is expected to take three years and will cover the 271 species on the Declared Rare Flora List.

by Grahame Rowland

computer-generated distribution maps, data, scanned colour photographs and line drawings have been assembled for 30 species. The system allows the user to search through the data in a manner not possible with normal printed biological keys.

"In a regular key there is only one path to follow to identify a particular plant - so if a technical character is unfamiliar, or maybe a specimen isn't flowering or doesn't have fruit, and these are required by the key, you can be stumped," Alex said.

"This method allows the data to be accessed in a variety of ways to overcome such problems."

"Further, once a tenta-

tive identification is made, this can be checked using the distribution maps and images of the species from within the DELTA software."

A workshop was held in April to inform CALM scientists, field staff and managers of the project's progress and to invite critical discussion.

Alex said many of these suggestions, such as adding soil or landform data, could be accommodated relatively easily and would greatly increase its usefulness to CALM staff.

The INFORM group is to host a national seminar to explore the issue of coordination between the various herbaria and museums using DELTA and related software.

The seminar would be held in Perth next October.



Left to right Vince, Francis, Harry and Franklin take a welcome rest from some back-breaking work during the walk trail construction. Photo by Murray Banks

A new way of walking to the Yanchep NP Ghost House

A new walk trail to the Ghost House ruins has been built on the west side of Loch McNess in Yanchep National Park.

The project was made possible by Federal government funding of Aboriginal groups carrying out work in the natural environment.

The Yanchep National Park Management Plan recommended moving the trail from the firebreak to a more scenic and natural alignment.

When Aboriginal projects officer Graham Ellis-Smith visited the district looking for projects of this nature we jumped at the chance.

A highly labour-intensive project such as this could not have been

by Murray Banks and Mike Meinema

achieved with the staff available in the park.

A contract between CALM and the Aboriginal contractor was arranged, setting the task of completing the walk trail in six weeks.

The work was carried out by the Northside Aboriginal Corporation (NAC) from Balga, and was headed by Harry Nannup, Snr, with co-workers Vince, Harry, Franklin, Francis and David.

All were unemployed, keen to earn an income and to work in the bush.

The trail construction

began with the 4.5 kilometre, labour-intensive slashing of dense vegetation that had regrown after a wildfire had swept through the area in 1991.

Brush cutters were used to cut the trail, with the clearing up work carried out by hand using rake hoes.

Fortunately, the weather was mostly fine, so there were few disruptions to the work.

The NAC was highly satisfied with its efforts, which resulted in an excellent trail designed for bushwalkers looking for a long and challenging round trip.

The trail travels through a variety of vegetation types that overlook scenic views of the sur-

rounding wetlands.

It also caters for those interested in waterbirds, caves, wildflowers or just bushwalking.

Signs are being made and erected so the trail start and other information can be quickly found.

Before this project in Yanchep National Park, NAC, worked elsewhere in CALM's Perth District, removing dumped car bodies and rubbish from nearby pine plantations and national parks.

The group used a tractor to pull the cars onto nearby tracks so collection could take place.

A large amount of general and household rubbish was also collected and removed.

A new urban forest plan for Gnangara

AWARE that residential developments are closing in, the Swan Region has set up a planning team to develop strategies for making Gnangara an urban forest to cater for the local community as well as visitors.

by Rebecca Coombs

"We want everyone to feel that Gnangara is not just a dynamic working forest producing valuable timber, but also a great place to go for passive and active recreation, for

environmental education, for getting in touch with nature, and for finding some space," regional manager Alan Walker said.

"If we can design a project which provides all these things for the visitor while preserving the integrity of the considerable expanses of wetlands within the plantations,

CALM will have developed a resource of priceless value worthy of international acclaim."

Regional landscape planner Alan Hordacre said that the sequence of timber harvesting would receive careful planning.

"This will enhance the appearance of the operations and the scenic qualities can be further improved by adding wildlife corridors, refuge areas and roadside plantings and re-

Former forestry man supports the urban forest concept

GNANGARA has changed a lot since 1925 when two young forest rangers set off on a two-day journey from Mundaring by horse and sulky.

The young men, Dick Perry and Bill Ross, were in search of a suitable site for a pine nursery, and Gnangara had been chosen because of its similarity to the Landes region surrounding Bordeaux in France.

Dick, now 91 and still going strong, said: "Research, trial and error, keen observation and a stroke or two of luck provided the Forests Department with the answers."

The success of the nurs-

ery enabled the establishment of the *Pinus pinaster* plantations and Dick recalls the first visit of the conservator of forests, Mr Kessell.

"I took him into the area on the back of the only transport we had - an old Harley Davidson motor cycle - and after bouncing over miles of rough, narrow, barely formed tracks and fighting off dust, flies and ticks, the conservator praised the work done in establishing the plantations, but said he didn't want to go near the place for at least another five years."

Gnangara has changed dramatically since then.

Today, CALM manages the 24 000 hectares of maturing pines, important not

only for timber, but also water, honey, commercial wildflower production and recreation.

Looking back, Dick Perry said: "I always thought that Perth would spread to the Gnangara Forest, though not in my lifetime."

"I think it's wonderful that CALM is taking the time to have a good look at all the components of the area and I hope that the urban population will also realise the value of this forest and surrounding natural bush and resist turning it into housing estates."

However, in the next few years recreation will be a key emphasis of management.

CALM makes good use of Canadian technology

VIDEO games are familiar to many people and soon our fire fighting and support staff may be using a sophisticated version for training.

In May representatives from various emergency services, including CALM's fire protection and training staff, attended a demonstration of a fire simulator developed in Canada.

The simulator was demonstrated by Rob Thorburn, a fire control instructor at Alberta's Forest Technology School, who has been closely involved with its development.

Like simulators used for training pilots and submariners, this version makes use of slides, video and sound.

by Grahame Rowland

The trainees are assigned roles and then must respond to the changing conditions created by the trainer from the nearby control room.

To 'communicate' with the simulator, the trainees use radios or telephones which cause the appropriate images to be instantly displayed on a one-and-a-half square metre screen, complete with sound effects.

Rob said the interactive nature of the simulator was its biggest advantage.

"People learn far more by doing something rather than just sitting in a lecture room and listening."

He said the simulator was the place to make

mistakes. "That's the place to burn up the timber and the lodges - and to learn from those mistakes," he said.

"Then when we go out into the real world we can avoid making those mistakes again."

He said similar 'real' training was just too expensive and it was often simply too difficult to organise in advance, not to mention its danger.

"If the simulator can train people better, the cost is recouped quickly by the saving of property, environmental values, timber and especially lives."

Rob said the simulator could replay the whole exercise to allow the trainee's actions to be discussed during the debriefing.

"The debrief is very important for analysis and

can be longer than the exercise itself."

The number of scenarios are only limited by the amount and range of video film available.

CALM's acting fire protection manager Chris Muller said it was a major problem to provide people with fire fighting experience.

"Ironically, the more successful we are at our fire protection the fewer the people who gain experience at managing major fires when they do occur," he said.

"So this simulator is an excellent tool to help fill this need."

Rob Thorburn was brought to Australia by the Australian Association of Rural Fire Authorities of which CALM is a member.



Retired forester Dick Perry and Swan region ecologist Jeni Alford examine moss found at the base of a radiata pine in the Gnangara Forest. Photo by Alan Hordacre