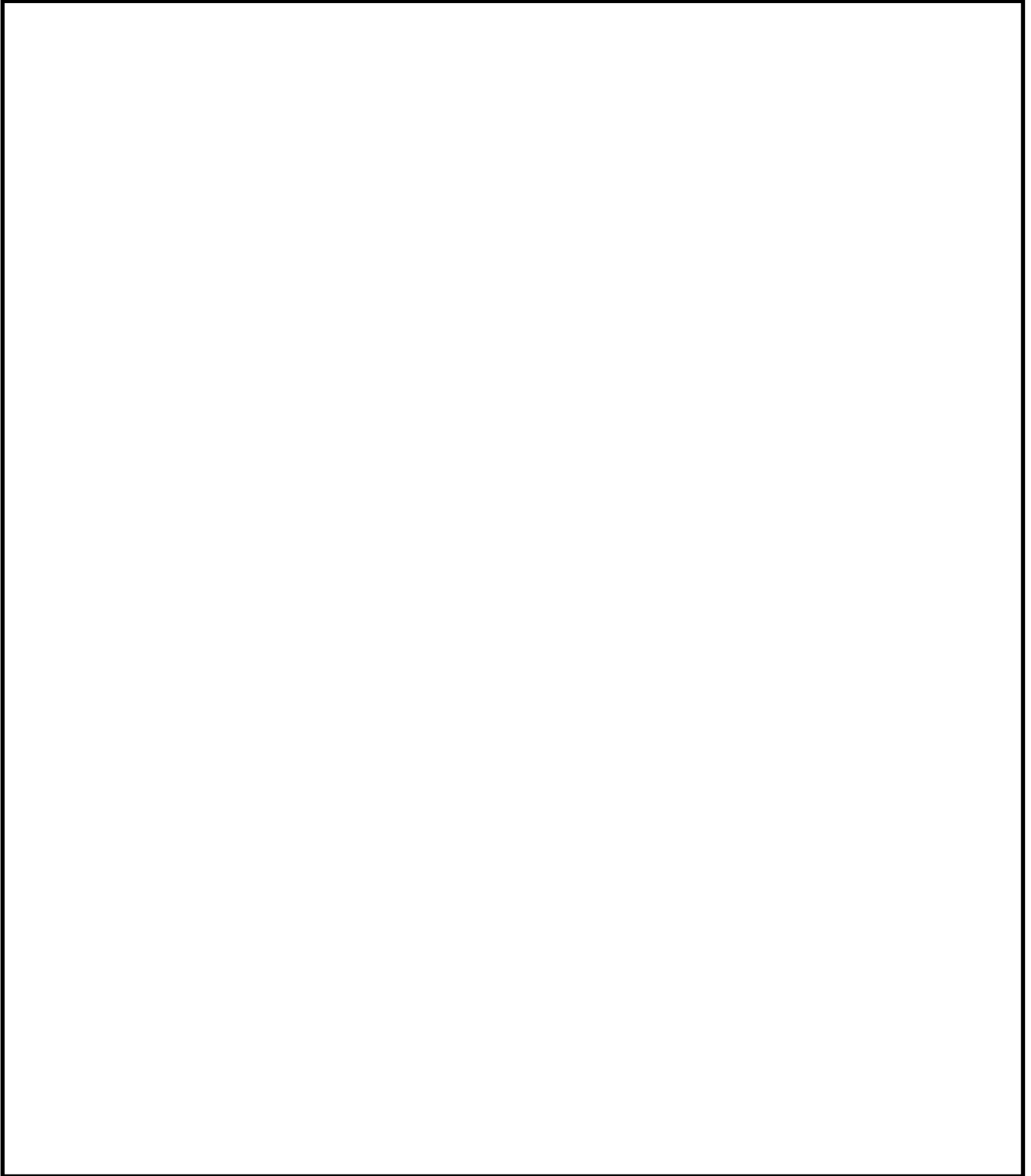


# INDIGENOTES



*Drawing by Joanne Ferguson*

# Seed Orchards

## Sue Mills - Indigenous Nurseries Network

Seed orchards, as the name suggests, are areas of land set aside for establishment of container or in ground plants grown specifically for the purpose of future seed collection. Areas of revegetation also provide the potential for seed collection given the presence of known provenance species and taking into account genetic considerations. Indigenous seed collectors, plant propagators and policy makers have suggested the establishment of seed orchards as at least a part solution to overcollection of seed from the wild and some have established their own from which most collection takes place.

In order to stimulate thinking on this issue Adrian Moorees and Matt White (DCNR 1993, pers. comm.) outlined one preliminary proposal. The idea is to establish a 'sunset clause' on all seed collection from remnant vegetation within five years. During that time:

- \* all collectors would be encouraged to establish seed orchards;
- \* research would be conducted into the genetic and logistic barriers to establishment of seed orchards and 'best practice' recommendations made;
- \* incentives to establish seed orchards could be developed particularly for those groups who are collecting for ecological rather than for purely financial purposes. These incentives could take the form of provision of Crown land and initial development assistance;
- \* awareness raising, consultation and education of permit holders and others would take place with the aim of developing a sound industry Code of Practice.

Steve Burke (GAV, 1993, pers. comm.) also recommended the development of what he termed a Code of Ethics that could encompass issues of sustainable collection practises, a commitment to adhere to State laws, and a commitment to comprehensive record keeping. A potential barrier to the development of a code of ethics could be a reluctance on behalf of industry. However, incentives in terms of reward for responsible practises could enhance competitiveness or conversely, some companies might become known as poor operators.

An enforcement blitz could then take place at the end of the five year period of grace. In instances where it is considered desirable or imperative for seed orchard stock to be supplemented with 'wild' genetic material, special permits could be given or appropriate (regulated) organisations could under-

take the necessary collection.

The concept and reality of seed orchard establishment itself is probably constrained by available resources and uncertainty related to genetic considerations. John Delpratt has been undertaking research in this field over recent years through VCAH Burnley. He has been concentrating on production of seed from herbaceous plants (as opposed to trees and shrubs) from grasslands and grassy woodlands in the Melbourne area and has developed some promising, although tentative, principles and practises.

The major questions usually asked regarding the cultivation of wild species for seed production are related to genetic considerations. Delpratt (1993) following Brown and Briggs (1991) has suggested as a 'rule of thumb' that "...collecting evenly from 10 to 50 individuals from the one site should capture most of the genetic diversity in that population" and that "A minimum of 15 established plants could be expected to maintain most of this diversity in cultivation" (p. 21). Delpratt has questioned whether seed collected and propagated from plants in cultivation eventually has an effect on their ability to survive in the wild. In the face of little available information, he has suggested that it would probably be sensible to start again with plants grown from wild seed after two or three generations.

A report from Seabrook (1990) from the Western Australian Wildflower Society suggests that seed orchards can prove to be successful commercial operations in addition to offsetting ecological problems connected with seed collecting from the wild. Good success rates have been obtained by that group over the last eleven years and have provided an income of \$1100 to \$1200 annually from less than one tenth of a hectare .

A more pessimistic assessment of the potential of seed orchards has been proffered by Greg Hill (1993, pers. comm.). He believes that there is a role for seed orchards (particularly for the [cut] wildflower industry) but that not enough research has been undertaken on the genetics of native

plants for orchards to be viable without ongoing access to remnant vegetation. Speaking on behalf of the Western Australian Native Seed Industry Association, Greg feels that seed orchards will never meet the requirements to restore the environment on a holistic or ecosystem basis because (i) cultivators will be unable to produce wild variants in a cultivation environment; and (ii) not enough is known about strategies and technical feasibilities\*.

In addition to the establishment of purpose specific seed orchards, there is enormous potential to utilise areas of revegetation for seed collection. However as Steve Burke (1993, pers. comm.) pointed out, this potential must be qualified by the lack of consistent record keeping of seed and plant provenance. He argued that "Direct seeding and revegetation is a deregulated industry and individuals or groups undertaking these activities have their own practises and standards rendering the development of uniform requirements difficult". The implications, in terms of plant genetics, of failure to record details when undertaking revegetation works were pointed out by Matt White who argued that "Many gene pools are irreversibly polluted. Undoubtedly propagative material is collected from plants established long ago, (or from plants outcrossed with these individuals) with unrecorded genetic histories, under the misapprehension that the seed/cuttings are remnant". However there are promising developments in this area. Groups such as the Merri Creek Coordinating Committee, the Yarra Bend Park Trust and various other groups are recording provenance of all species used in revegetation works - a practice that at least gives rise to the potential for future seed collection.

A recent development in relation to this whole issue is an initiative on the part of the Flora section, DCNR. Last October a group of "disparate individuals" (now christened the "Seed Orchard Reference Group") with an interest or expertise in the area came together to discuss the ecological, horticultural and practical potential and barriers to seed orchard development. A funding submission has been made to DCNR for the establishment of a productive containerised seed orchard for selected basalt plains flora. This pilot project, if funded, will provide a model for future seed orchards and serve to highlight, in a practical way, issues needing resolution.

One problem that has been raised is the potential for the same species of different provenances to cross pollinate within a nursery or seed orchard and thereby pollute formerly discrete gene pools. At present we probably do not have enough information about most species to give definitive answers or guidelines. However, a snippet of the current thinking will give some idea of the com-

**Drawing by Joanne Ferguson**

plexity of the issues. Graeme Lorimer, in reporting a talk given by La Trobe University Geneticist, Dr. Yvonne Fripp postulated that 'Introducing new genes to a population of inbred plants may be highly desirable in certain circumstances. On the other hand, mixing genes between two substantially different populations of a species can cause serious declines or even extinction. Unless you know whether two populations of a species are co-adapted, you have to assume that taking seed from one site to another can cause a disaster within a few generations'. This might be so but Ian Lunt, in advocating a regional rather than local approach to indigenous suggested that '...the prognosis for many species is so grim that concerns about "local provenances" within a relatively uniform botanical region such as the Keilor plains are fast becoming an irrelevant distraction.'

Both of the above discussions were couched in terms of revegetation and took different tacks but they do highlight the nature of the problems for seed orchard genetics in that the seed produced is intended primarily for propagation of plants for regeneration and revegetation. The question of how local is local rears its ugly head yet again and remains on notice until more genetic research is forthcoming. In the meantime protection of remnant vegetation from (over)collection of seed, especially on the Basalt plains is an ecological imperative, and it appears that the establishment of seed orchards, utilising as much information as is currently available, is an important step in the right direction.

#### References

Delpratt, John (1993) Considerations for Cultivation of Herbaceous Wild Species for Seed Production (pp.20-24) in Greening Australia Victoria, Environmental and

Horticultural Considerations for Plant Propagation: Proceedings and additional Articles, Melbourne

Brown, A.H.D & Briggs, J.D (1991) Sampling strategies for genetic variation in ex situ collections of endangered plant species, in Falk, D.A. & Holsinger, K.E. (eds.) Genetics and Conservation of Rare Plants, Oxford University Press, New York

Seabrook, J. (1990) Seed Production for Local Revegetation (pp.161-163) in 'Sowing the Seeds' Direct Seeding and Natural Regeneration conference, Greening Australia, Adelaide

Lorimer, Graeme Seed collection and horticulture of indigenous plants - Strategies, standards and future directions Indigenotes Vol. 4, Number 4, April 1991

Lunt, Ian Saving Regional Provenances Indigenotes Volume 5, Number 7, July 1992

## **Comments from Matt White of the Department of Conservation and Natural Resources on Seed Orchards**

\* 'restoration on a holistic or ecosystem basis' is not the sole objective of moving towards orchard production of indigenous seed. One of the main aims of producing propagative material in this way is to offset the growing demand for seed/cuttings from the wild populations for conventional horticultural purposes: cut flower production; landscaping; etc. (Which is principally why the W.A. Native Seed Industry Association collects seed from the wild.) The pursuit of this restoration ideal does not justify the overzealous collection of material from extant indigenous remnants.

In addition, the ideal is probably an unrealistic end point to pursue, given that environmental parameters, ecological processes, species composition (including exotics) and gene frequencies have been profoundly and irreversibly altered in many plant communities since European settlement. Any attempt to restore functioning and predominantly indigenous ecosystems will depend on constant environmental sorting of species and gene frequencies over extended periods of time.

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Drawing by Joanne Ferguson

# Snippets

## Use of Atrazine in Victoria

Extracted from a letter from Lindsay Herbert, Agricultural and Veterinary Chemicals Co-ordinator, Chemicals Standard Branch, to Chris Knight, Environmental Officer, Public Transport Corporation:

The attention of the National Registration Authority for Agriculture and Veterinary Chemicals (NRA) has been drawn to reports from the USA and Europe, that the herbicide atrazine has persisted in the environment and is detectable in ground (i.e. underground) and surface run-off water.

The chemical is used worldwide for weed control in a wide variety of applications. National and international maximum allowable concentrations of atrazine in water have been set. It is preferable for action to be taken now to prevent atrazine reaching these levels in Australia.

The basic approval of the chemical now rests with the NRA. This authority includes lead agency participation on chemical efficacy, public health and environmental safety. State government departments, in co-operation with each other and the national body, are responsible for actual controls on use of approved chemicals.

The NRA, on reviewing atrazine uses and the current and possible future occurrences of chemical residues in water, has recommended that changes be made to include:

- \* no mixing or loading or application within 15 m of any well, stream or river,
- \* no application within 20 m of where field surface water enters an intermittent or perennial stream or river,
- \* no application within 60 m of natural or impounded lakes or dams ( except farm dams unless used for drinking purposes),
- \* no use in channels or drains,
- \* no use in industrial or non agricultural situations (includes no use in forestry). (Ed. Does this mean no use in restoration or revegetation?)
- \* maximum rate of application to be to be 4.5 kg active ingredient/ha/year.

If there are valued uses other than those being considered, as outlined above, these would have to be justified to the NRA in the detailed cost benefit analysis which would include an ongoing monitoring program covering both ground and surface water.

The NRA intend to have the matter settled by early 1994 and are collecting information on current uses and proposals for wider uses.

Source: Weed Science Notes January 1994

*Editor's Note: This process of reassessing the use of Atrazine may affect the use of the herbicide in conservation. It does highlight the need to assess the impact it may cause when used in conservation work but it is probably used in minimal quantities compared to use in agriculture. Atrazine was used in huge quantities on a regular basis on farms in the U.S. for many years; this systemic use of the herbicide has been the cause of contamination in water supplies. I reckon the occasional and minimal use of herbicide in conservation won't cause many problems in the long run.*

**Help Fill This Space Next Month With Your Contributions!**

# Coming Events: For IFFA events see back cover

## Conferences/Workshops/Talks

**"Your Patch of Bush": Managing remnant Flora and Fauna.** Discussion and field days organised by the Victoria Conservation Trust. Each regional course will have an introductory day and 3-4 field days stressing local issues. Introductory days will involve a keynote address, presentations by local experts, workshops and field activities. They include:

**30 April Saturday in Bendigo.** Contact: Elvyne Hogan (054) 353344

**14 May Saturday in South Gippsland.** Contact: Frankie MacLennan (051) 871291

**21 May Saturday at Deep Lead.** Contact: Neil Marriot (053) 562404

Or contact James Todd (VCT) for details (03) 651 4040.

**27 April Wednesday 8pm. Geological Map Reading.** Peter O'Shea, Geological Survey of Victoria. Part of a meeting of the Geology group of the FNCV. At the Herbarium Hall, Birdwood Ave, Sth Yarra. For more details contact Karina Bader (03) 690 4653 or Doug Harper (03) 252 3772.

**29 April Friday, 7.45pm. Review of Revegetation of Organ Pipes National Park.** A talk by Geoff Carr organised by the Friends of Organ Pipes. Geoff has recently completed a review of the revegetation program and he will discuss his findings in detail at the Information Centre, Organ Pipes National Park. Contact Carl Rayner for more details (03) 337 4936.

**3 May Tuesday 8pm. Population Viability and Analysis for the Helmeted Honeyeater** and other rare species. Mark Bergman. As part of a meeting of the FNCV, this is a talk on the modelling of populations and looking at the minimum number of individuals for survival. The Herbarium Hall, Birdwood Ave, Sth Yarra. Contact Dr Noel Schleiger for details (03) 435 8408.

**7 May Sat. Sites of Natural Significance Workshop. Lilydale Shire.** Speakers will include Scott Seymour, Steve Craig, Randall Robinson, Jon Reid, Vivien Freshwater, Graeme Lorimer and Richard Hunter. Workshop groups will visit sites in Montrose, Mt Evelyn, Coldstream and Wonga Park. Contact Jenny Francis (03) 755 1398 for more details.

**8 May Sun. 2pm. A peep into the world of insects and spiders.** Dr Arthur Farnsworth. This is the first of our Sunday afternoon meetings of the FNCV through winter at the Herbarium Hall, Birdwood Av, Sth Yarra. Contact Dr Noel Schleiger (03) 435 8408 for more details.

**12 May Thurs. 8pm. Methods for collecting and preserving fungi.** Tom May. Part of the Botany Group meeting of the FNCV. Herbarium Hall,

Birdwood Ave, Sth Yarra. Contact Joan Harry (03) 850 1347 for more details.

**16 May Mon. 8pm. Mangroves and Saltmarshes.** An illustrated talk organised by S.G.A.P by Dr Malcom Calder. Herbarium Hall, Birdwood, Sth Yarra. Contact Miss E. R. Bowman (03) 882 5297.

**4,5,6 October. 1994 National Greening Australia Conference. A Vision for a Greener City: The Role of Vegetation in Urban /Environments.** The conference will examine the multi-disciplinary issues related to vegetation in both capital cities and country towns through three sub themes: Ecology of Cities and Country Towns, Planning for Conservation and Development and Management of the Environment. Location: Esplanade Hotel, Fremantle, Western Australia. Contact Martine Scheltema (09) 4812144.

## Excursions and field trips

**23 April Sat. Botany Group Excursion of the FNCV to Sea Winds at Arthurs Seat.** Annual boneseed pull. We need as much help as we can get. Ring Joan Harry on (03) 850 1347 for more details.

**23-25 April.** The fauna group of the FNCV are organising an **excursion to the Brisbane Ranges Area.** They will be focussing on the brush tail phascogales, cage trapping and spotlighting. Contact Ray Gibson (03)874 4408.

**27 April Wednes. Sugarloaf Reservoir and Environs.** A VNPA organised walk around Sugarloaf Reservoir in the Christmas Hills There may be some interesting wildlife to be observed. Call Don Bowrey (03) 510 3474 for details.

**30 April Sat. Walk, Talk and Gawk: Latrobe University Wildlife Reserve.** An afternoon stroll through areas of remnant woodland enhanced by recreated wetlands, managed for nature conservation. Contact Geoff Durham (03) 523 5559 for details.

**1 May Sun. 10.15am. General excursion of the FNCV to Gellibrand Hill Park.** John Seebeck (DCNR Flora and Fauna Branch- Wildlife Research Section) will speak on his work with the Eastern Barred Bandicoot. After lunch there will be the opportunity to visit Woodlands Homestead, and examine the geology of Gellibrand Hill by car shuttle and by foot. Enter from Somerton Rd at the entry marked "1055 Somerton Rd", first on the left, west of Providence Rd. Once in the gate, take the first left to the works centre. Mel ref 178 C6. Please notify Dorothy Mahler on (03) 435 8408.

**7 May Sat. Leadbeater Possum Survey - Powelltown district.** Part of the continuing work of the Fauna Survey Group of the FNCV. For details ring Ray Gibson (03) 874 4408.

**14 May Sat. Mornington Peninsula. A VNPA walk around the byways of Tootgarook Swamp and environs including Chinaman Swamp.** Call Ian Bell (059) 844 323.

**15 May Sun. Walk, Talk and Gawk: Ironbark Basin - Point Addis.** A spectacular coastline, BYO lunch at an historic red ochre mine, and interesting flora. An all day loop walk. Call Joan Lindros (052) 434 301

## Restoration Activities

### April

- 23 Sat. 2pm. **FO Sherbrooke Forest Project afternoon at Pound Creek Spur.** Bring garden forks for digging asparagus, ivy and hollies. Meet at parking area behind Micawber Park Tavern, Belgrave Mel ref. 75 G7. Contact David Wilson (03) 874 4969.
- 28 Thurs. 10am **FO The Helmeted Honeyeater.** Yellingbo Nursery Day. Meet in the Rangers office, Yellingbo State Nature Reserve, Macclesfield Rd Mel ref 119B F11. BYO lunch Also a revegetation day 15 May 10am. Meet at Yellingbo Store Mel ref 119 J8. BYO lunch. Contact Gaye Gadsden (059) 648 350.
- 30 Sat. 9.30am. **FO Werribee Gorge and Long Forest Mallee.** Tree guard removal, track maintenance, rubbish removal and information shelter cleaning. BYO spades, secateurs, gloves, rubbish bags, mattocks, and whatever else you can think of! Dont forget lunch and a drink. Contact Janet Laversha (053) 674 229.

### May

- 1 Sun. 10am. **FO Merricks Beach. The Bill Carroll Reserve planting day.** We will be planting aquatic species into the newly created wetland and terrestrial species in the rest of the reserve. BYO treeplanters, mattocks and spades. BBQ afterwards. Contact Jo Ferguson (03) 486 2097.
- 1 Sun. 10am. **FO Gardiners Creek Valley.** Project day, possibly planting. Also every Wednesday. Contact Kay Johnston (03) 885 770 for more details.
- 7 Sat. 10 am **Green Link Box Hill activity day.** Working activities every Monday and Tuesday morning at the council nursery in Nelson St, Box Hill. Contact Minette Russell-Young (03) 898 1364
- 7 Sat. 9.45 am. **FO Gellibrand Hill.** Meet at the work centre. Woodlands Major Project- 150th tree planting and a visitor survey. Contact Mark Corr (03)557 2783.
- 8 Sun. 10am. **FO the Yarra.** Revegetation activities at Galatea Point, Kew (also Wednesdays). Mel ref. 2D D7. For more details contact Judy Rutherford (03) 3472252.
- 8 Sun. 9.30am. **FO Sherbrooke Forest mapping survey.** Probably meet at the usual place - check with David Wilson (03) 874 4969.
- 8 Sun. 10am. **URAGE (Upwey Regional Action Group for the Environment). Project day.** Weeding and planting to restore indigenous vegetation along Ferny Creek, Upwey. Meet at the corner of Deans and Morris Rds, Upwey. Mel 74 k12. Contact Rob Stephen (03) 754 3792.
- 8 Sun. 3-5pm. **Green Link Camberwell.** Weeding, planting and seed collection in Welfare Pde. Meet at the corner of Dion St and Welfare Pde. Mel 60 E7. Contact Diana Burgess (03) 809 2092.
- 14 Sat. 9am **FO Organ Pipes Project Day.** Meet at the Information Centre. Contact Carl Rayner for details (03) 337 4936.
- 14 Sat. 10am. **Wurundjeri Garden.** This Koori food

garden by the Yarra in Hawthorn has been established for three years. Glen Avon Rd. Mel. ref. 45 A11. Planting and weeding. Contact Dorothy Sutherland (03) 818 4706.

- 15 Sun. 10am. **Men of the Trees.** Planting and weeding. Deep Rock, Yarra Bend Park; Melmap 2D, ref D6. Minette Russell Young (03) 898 1364.
- 15 Sun. 10 am. **Meander...**a group caring for the Menzies Creek and Emerald Tourist Track including weeding, planting and track work in the creek Reserve. Meet at A'Vard Picnic Ground. Melways 125 F 12. For further details contact Kate Forster (059) 685828
- 15 Sun. 10am-12 noon. **Brunswick Tree Group.** Working at Union Bush Park. Moonee Ponds Creek. Eric Ward 388 2123.
- 21 Sat. 9am. **Yarra Valley Tree Group.** Revegetation of the Yarra Flats at the historic property Chateau Yering at Yering. The property is 2km south of Yarra Glen on the Melba Highway. Bring boots and gloves. Contact Stephen Fletcher on (03) 730 1517 for more detail.
- 21 Sat. **FO Bradshaw Park Planting Day.** Contact Dave Bainbrige (03) 580 5992 for details.
- 21 Sat. 9.15am. **Doncaster and Templestowe Conservation Society inc. Plantings with Melbourne Water in our "Candlebark Grasslands"** project area, Yarra Valley Park. Mel ref. 21 G12. Plantings go ahead regardless of weather. Contact Judy Zimmerman (03) 850 4116 for details
- 21 Sat. 10am **FO Mullum Mullum inc.** The group's current project is CCRISPP (The Community and City of Ringwood Seed and Plant Project). They are establishing a nursery within the City of Ringwood's nursery and are involved in collecting and propagating indigenous seed to plant back into remnant bushland and into garden beds in parkland within the catchment of the Mullum Creek. For more details of their activities contact Ken Mc Innes (03) 8702541.

**"Friends" activities are published by the Victorian National Parks Association in their newsletter. For details contact VNPA on (03) 650 8296.**

**Visitors/participants are welcome to all events listed in Indigenotes.**

**Thank you to all the people who contact us regarding on-coming events their groups are organising. If you wish to have your events covered please get in touch with Jo Ferguson (see back cover).**

# IFFA NSW Meeting Report: February 1994

## Wetlands

**Paul Adams - Associate Professor  
School of biological Sciences,  
University of NSW**

Paul Adam's talk began with a discussion of the problems associated with categorising wetlands. In particular, the RAMSAR definition which categorised some rural water bodies as wetlands and caused an outcry among pastoralists who believed their dams might become protected.

He went on to discuss the ephemeral nature of many of our wetlands and how between 6-10% of Australia's land mass could be considered wetlands under this same definition. A strange concept for the driest continent in the world.

Many of our non-migratory wetland birds live in inland wetlands and feed upon an enormous invertebrate food source which is in itself nourished by an enormous nutrient flush associated with flooding. The size, duration and location of this flooding makes a mockery of any attempts to permanently define a wetland boundary. He then made the point that coastal wetlands are permanent and are the last refuge for inland birds during drought years.

In order to attempt to define a wetland area a close inspection of the endemic terrestrial plant species and where they give way to the cosmopolitan genera of wetland plant species provides as vague an approximation as any one should be prepared to give.

Paul Adams then made note of the strange distribution patterns for wetland plant species in the world. He also made some note of the fertile and seemingly anaerobic conditions in which wetland species grow and he went on to explain the survival mechanisms and soil/oxygen relations in the soil. He expanded upon this relating man's (sic) interference with natural soil hydrology which effectively destroyed wetlands. He used the past destruction of East Anglia peat bogs as an example of how draining wetlands caused oxidisation adding CO<sub>2</sub> to the atmosphere and creating an ozone depletion.

Paul Adams then discussed the importance of coastal estuaries and exposed the myth that finely sorted nutrient particles are the contribution (or pollution?) flowing to marine environments

from such estuaries. He said that in reality, the fish which fed on these particles in the estuaries are the export of the estuaries.

Wetlands provided the nursery grounds and fish at different stages of their life cycle occupied different niches within the wetlands. For example, juvenile Black Fish (*Givella tricuspidata*) prefer sea grass beds in river/creek mouths while older fish preferred rocky spots and mangroves within coastal environments.

He then discussed that the three migratory bird treaties that Australia are signatory on, RAMSAR, JAMBA and CAMBA, were meaningless but signified worthwhile intent. (*Editors banal comment - how familiar does this sound, remind you of any other govt. policy?*).

A brief discussion then began of the 20 sea grass species we have nation wide, the 30 mangrove species endemic to Australia (over 1 million hectares nation wide which is significantly greater than any other country in the world). There was note of how salt marshes grew higher in tidal slopes where salinity was greater due to evaporation.

Some publications were suggested as good reading. These included 'Better Drainage' Dept. Planning, 'Coastal Wetlands of NSW' Dept. Planning, 'Water Plants of NSW' Dept. Water Resources.

The contentious issue of Jervis Bay being used as an armaments depot was raised and the rare and threatened plant communities on the Beecroft peninsular which were likely to be destroyed was discussed.

# Fossils in conservation and the conservation of fossils

By Paul M.A. Willis

*Editor's Note: Paul Willis presented a talk on this subject to IFFA in NSW in December 1993. He subsequently presented this long but stimulating piece for Indigenotes. It will be published in two parts so please keep the ideas presented here in mind until next month.*

The interpretation and understanding of fossils has always been a tricky business. In pre-scientific days fossils were thought to be the remains of giants, dragons, mythical beasts or animals destroyed in the Great Flood. A good example is the earliest record of a dinosaur which was the description of the base of the thigh bone of a large carnivorous dinosaur described by the 17th century chemist Robert Platt. Unfortunately he didn't recognise it for what it really was and he thought that this 20 pound relic, 2 feet in diameter and consisting of two hemispherical bulges was the scrotum of a giant human, *Scrotum humanus*.

Even today the general public have a lot of misconceptions about fossils. Fossils are the remains of a plant or animal that have been turned to stone. However, there is a popular misconception that only dinosaurs are known from fossils. Fossils, particularly those of vertebrate animals are rare, delicate and require careful handling but most people think that, being turned to stone, all fossils are hard as rock and can endure anything. Fossils record the history of life on earth and offer unique insights on our world today but the popular conception is that they are mere oddities good only for children's stories.

A new popular perspective of fossils needs to be cast and this new perspective must address two vital aspects. Firstly the relevance of fossils to the world we live in; palaeontology is not a pure inapplicable science. Secondly, fossils as objects to be conserved. Fossils can be thought of as endangered species and they require the attention and care that would be afforded any other animal or plant on the brink of extinction.

A prime motivation for the efforts of conservation groups is the commonly held myth that extinction is forever. However, palaeontology offers a more hopeful perspective; extinction is not forever, it's just a bad phase that all species go through sooner or later. This is not simply a flippant comment; there is life (of sorts) after extinction. And

before I am accused of supporting the wholesale destruction of endangered species because extinction doesn't really matter, let me make myself perfectly clear; extinction is a one way path, once a living species goes into extinction it will never return to life (despite Stephen Spielberg's most recent fantasies) and we should do all that we can to prevent any species from becoming extinct. But, from a scientific point of view, when a species becomes extinct it does not cease to exist.

The nomenclatorial system, as established by Linnaeus and forming the basis of current biological taxonomy, does not distinguish between extant and extinct species; a species is just as valid whether it is alive or dead. Such a system of nomenclature is essential to a complete understanding of biology in an evolutionary perspective. An ancestral species must be distinguishable from its descendent species and thus it must be afforded the same conceptual existence regardless of its current viability.

This is not simply some academic point; extinct animals and plants have their own role to play in the continued existence of life on this planet. They still provide important information for ecologists and conservationists and they may make a weighty contribution to the whole understanding of biology. For example, the Tasmanian Wolf, *Thylacinus cynocephalus*, is completely extinct but is known from within historic times. Many specimens remain in museums throughout the world and from this data bank we can establish much of the animal's biology. *Thylacinus* was the top predator of the pre-European Tasmanian food chain (excluding aboriginals) and it is the only member of a whole family of marsupials that survived into historic times. Any ecological study of Tasmanian environments that fails to account for the role of the Tasmanian wolf is essentially flawed even though the animal no longer exists. How can a meaningful study of the natural population dynamics of Tasmanian macropods be successful if it has not taken into account the fact that their major natural predator is absent? Similarly, how can the diversity of marsupials be discussed without some mention of this representative of a now totally extinct family? A holistic approach to biology demands that we pay attention to extinct organisms if we are to fully understand the extant.

Such arguments can be extended further into the

**Continued next page**

# Fossils and Conservation

## Continued from page 9

past if we include the contribution fossils make to our understanding of biology. To continue with the example of the Tasmanian Wolf, we know from fossils that this animal extended over the whole of Australia and into New Guinea until the introduction of the Dingo and the native dog of New Guinea about 3,000 years ago. The most likely scenario of what happened is that the introduced dogs out competed the Thylacine, replacing them as the dominant carnivore. If this is the case, how else was the complexion of Australian ecosystems changed with the introduction of the Dingo? These ecosystems evolved without placental carnivores, if the Dingoes out competed the Thylacine then it is likely they exploiting similar food sources in different ways. For example, it appears that Thylacines hunted alone where as Dingoes can hunt in packs. Pack hunting can be an effective way to attack large prey items and it can also be used to more efficiently hunt elusive small prey items. Thus Dingoes may have placed pressures on animal food stocks that Thylacines didn't. The importance of this, the reason why we have to study these predatory battles fought thousands of years ago, is the simple realisation that all Australian ecosystems evolved in balance and isolation for 38 million years prior to the introduction of the Dingo only 3,000 years ago. It would only be reasonable to conclude then that all Australian ecosystems, except for those in Tasmania, have only recently come into a new balance to allow for the new predator or, more provocatively, *they may still be trying to reach that balance*. Modern ecological records for Australia extend back to a maximum of 205 years (to the beginning of white settlement) and, realistically, adequate records have only been kept within the last 100 years. Such a data set would be totally inadequate to detect the effects of the replacement of the Thylacine with the Dingo on the structure of Australia's ecosystems. In fact, without the palaeontological record, the Thylacine-Dingo swap would be mere speculation.

The palaeontological record is the only measure we have of long-term patterns of animal and plant distribution. Palaeontology offers a far more powerful tool for understanding the natural distributions of organisms than historical records of living organisms can provide. The original distribution of the Thylacine as compared to its historical distribution is a good example. Palaeontological records of the distribution of organisms can provide new insights into current distribution patterns. Many animals and plants are known to have extended over much larger or completely different ranges than has been recorded for them within historic times. Take the Dugong as an example. Currently

the Dugong is found in coastal waters off northern Australia above the Tropic of Capricorn. But "recent" fossil (ie. only a few thousand years old) dugongs have been found in New South Wales at Arakoon near the mouth of the Macleay River and at Shea's Creek, what is now the Alexandra Canal in Sydney. Agile Wallabies, now restricted to northern Australia, are known from fossils at Wellington Caves in New South Wales. Ghost bats are now widely distributed across Queensland, the Northern Territory and northern Western Australia but their numbers are so low as to be considered endangered. However, fossil of Ghost Bats are known from a number of sites across Australia including seven or eight caves in New South Wales. The Giant Echidna *Zaglossus*, now restricted to New Guinea, is known from fossils from as far south as Wellington Caves, New South Wales. And so on for numerous other animals. The message is clear; ranges of animals change through time for a number of reasons, not just because of the effects of Europeans and introduced pests. If we do not understand the way that animal distributions change naturally and why they change, then attempts to save endangered species may be entirely fruitless. Europeans, their influences and associated pests are not the sole extinction agents active in this country.

So far we have looked at the fossil record of species that are still alive or recently extinct. Is there anything to be learnt from fossils of animals that are completely extinct and have been so for a long time and what influence can they possible have on our understanding of living animals and their preservation? Again, the influence of extinct animals is probably still being felt on the the ecosystems of today.

Around 10,000 years ago Australia suffered a massive collapse of its ecosystems; we lost our megafauna. *Diprotodon*, the largest marsupial of all time, about the size of a water buffalo and its close relative *Zygomaturus*. The giant goanna *Megalania*, up to 6 metres long. A giant snake, *Wonambi*, up to 8 metres long and the river crocodile *Pallimnarchus* up to 6 metres long. The land crocodile *Quinkana* up to 4 metres long. Wombats the size of sheep. Kangaroos more than three metres tall. This is only part of the inventory of massive beasts that were the bulk of Australian terrestrial faunas for two million years or more before they went extinct about 10,000 years ago. The reason for this extinction is unclear. Possibly it was hunting pressure from early aboriginals. Climatic change also seems to have played some part in the extinction.

Whatever the cause of megafauna extinctions, and more than likely it was a combination of causes, these creatures that formed a whole echelon of Australian ecosystems suddenly ceased to be. What effect would such a dramatic shift in the

structures of ecosystems have on their long-term viability? We simply don't know. We are now talking about a mega-multifactorial equation the parameters of which we can only guess at. But more than likely a major reshaping of ecosystems such as the loss of our megafauna would have to take many thousand years before their absence from the great ecoequation can be fully accounted for. Even today, the ghost of *Diprotodon* stalks Australia.

Let us take a hypothetical example. *Diprotodon* must have been a prodigious crapper. An animal weighing around 1000kg probably produced between 25 and 50 kg of faeces a day so let us say 25kg to be conservative. Let us then assume an average population of 1 million in Australia at any one time, again this is probably a conservative estimate. So that is 25 million kg of high-grade fertiliser per day or 9,125 million kg per year. This faecal matter would have been an indispensable link in the nutrient cycles which must have collapsed with the extinction of *Diprotodon*. Plants reliant on these nutrient cycles must have been adversely effected. With such pressures on plants, what happens to the animals reliant on those plants. Through its droppings, *Diprotodon* probably distributed the seeds of particular plants and, if modern species of large mammals are any indication, there were probably plants that specifically required *Diprotodon*, and no other animal, to disperse its seeds. What insects were specifically dependent on *Diprotodon* scats? Simple considerations of the extent of the interconnected web of life that was mired in *Diprotodon* dung quickly leads to a realisation that the loss of this resource must have been devastating to Australian ecosystems. How long does it take to an ecosystem to recover from the loss of such an important resource? Similar thought experiments exploring the ramifications through the ecological webs for all of the other species of megafauna that went the way of *Diprotodon* must surely produce effects still being felt 10,000 years later even if we are not sure exactly what those effects are. To come to terms with the modern ecosystems of Australia we must recognise that they have a history and what effects this history is likely to have. Needless to say, the history of Australian ecosystems can only be explored through palaeontology.

Essentially we have looked at Australia for the last million years or so. But the fossil record extends much further than that. What can be learnt from older fossils, fossils in excess of, say, one million years? Palaeontological studies in Australia over the last few decades have recovered the remarkable history of life on this continent over the last 25 million years and this history too has profound consequences for today's conservation strategies.

**To Be Continued Next Month**

# IFFA activities:

## IFFA (Vic)

### Next meeting:

Tuesday 26 April at 7:30 pm\* at the Herbarium Hall, Birdwood Ave, South Yarra (Melways map 2G ref 12A). Subject: **Discussion of Fire Management in Australia: Forum and Discussion with a number of specialists.**

All welcome.

\* NOTE THE EARLIER MEETING TIME. Speakers will still start at 8:00, promptly.

### Committee meeting:

Thursday 5 May at Marita Syde's, 18 Dresden St., Heidelberg Hts., 6.30pm onwards.

### SPIFFA

Mon 2 May Waterfall Gully Citty Centre, Cnr Bayview Rd and Nixon St, Rosebud South at 7.30 pm. Subject: **Brian Cumming on Conservation Issues in Westernport Bay.** Contact Mark Adams (059)851122.

### Indigenous Nurseries Network subcommittee:

No meeting this month. Contact Murray Ralph (03) 419 3040 or Sue Mills (03) 383 2937.

## NSW activities:

### Next meeting:

Monday 2 April 7.30 - 10.00pm. Subject: To be Confirmed... In the Maiden Theatre, Mrs Macquaries Rd., Royal Botanic Gardens Sydney. Contact: Sally Fisher (02)9706486 (work), Penny Brown or Andrew McGahey (02)9133681 (work).

## Membership

IFFA membership costs  
\$40 for non-profit organizations,  
\$50 for corporations,  
\$25 for individuals and families,  
or \$20 concession.

Membership includes  
11 issues of *Indigenotes* per year.

*Memberships should be sent to the Membership Secretary. Include your name, address and phone numbers, and a bit about yourself.*

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**Contributions to *Indigenotes* should be sent to the editors — the deadline for the next issue will be 5 May. The views expressed in *Indigenotes* are not necessarily those of the Indigenous Flora and Fauna Association.**

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