# Welcome to the Launceston *Firewood: A Biodiversity, Consumer and Human Health Issue* Conference

## Firewood: A Biodiversity, Consumer and Human Health Issue

### Summary of Opening Speech by Max Kitchell, Chair, National Firewood Task Force, Environment Australia

Fuel wood forestry seems to be the forgotten industry, with many people until recently dismissing it as insignificant. Yet it is estimated that the firewood industry in Australia consumes the same amount of timber as the woodchip industry. The attention paid to the two issues however, until recently, could not have been more polarised.

CSIRO recently produced a report, *Impact and Use of Firewood in Australia*, that estimates over 6 million tonnes of firewood per year is harvested for domestic and industrial use in Australia. Tasmania is responsible for about 16% of the national consumption, with up to 1 million tonnes consumed here annually. Per capita, Tasmania uses more firewood than any other state in Australia.

This conference has been supported with funding from the Commonwealth Government through the Natural Heritage Trust's Bushcare Program, which aims to reverse the decline in the quality and extent of Australia's native vegetation – on which firewood collection has a big impact.

#### *Impact of firewood collection on Australia's biodiversity*

Many threatened species rely on habitat, such as hollows, provided by dead wood, standing or fallen. The CSIRO report mentioned above indicates that up to 20 woodland bird species may be declining due to loss of habitat from firewood harvesting. The report also found that 84% of firewood comes from private land and 9.5% from state forests. Up to 70% of the firewood that is bought is purchased from unregulated small operators, it is estimated that this market is worth $260 million per year. Of this unregulated firewood, over 80% is obtained from private land.

In Tasmania, the CSIRO report states that dry forest and woodland within 50km of Hobart and Launceston are potentially suffering from firewood collection. It also states that each Tasmanian household uses close to 6 tonnes of firewood each year. Janice Miller recently produced a pilot study for the World Wide Fund for Nature Australia, *Conservation of Threatened Woodlands and Dry Forests by Management of Firewood Collection.* It was estimated that about 90% of Tasmania's open grassy woodlands have been cleared for agriculture over the last 200 years, with the remaining 10% surviving at high altitudes and on steep slopes. Firewood collection is exacerbating the effects of this clearing. This is a frighteningly similar scenario to the loss of ironbark woodlands in the wheat–sheep belt of Southern Australia. To prevent Tasmania suffering the same degradation, we need to act now.

#### *Taking the next step*

Commonwealth, State and Territory Environment Ministers have recognised that firewood collection is having an impact on Australia. The National Council of Australian and New Zealand Environmental Ministers (ANZECC) Firewood Taskforce developed a draft *National Approach to Firewood Collection and Use in Australia,* which was available for public comment until 31 March 2001. It identifies the sustainable production and harvesting of firewood as a desirable component of sustainable forestry practices and explores six strategies for addressing the detrimental effects of firewood harvesting:

**Improve the information base**

- Ascertain how much firewood is collected from various forest and woodland ecosystems and the impacts of collection on the biodiversity of remnant woodlands and forests, to allow the development of better policies and management guidelines.

**Educate the community**

- Educate commercial and private firewood collectors and the community about the impacts of firewood collection.

**Market mechanisms**

- Proposes the introduction of a voluntary national code of practice for firewood merchants to encourage a more sustainable firewood industry.

**Regulation**

- Aims to ensure existing firewood regulations and controls throughout the country are sufficient to protect habitat for threatened species and ecological communities.

**A sustainable firewood industry**

- Encourage firewood collection from private native forests and woodlands and from farm forestry plantations, in a sustainable manner. Multi-purpose plantations provide residues that can be used as a source of firewood whilst still being a viable commercial enterprise. Sustainable management of native forests for firewood and the use of logging waste for firewood, may be of much greater significance in Tasmania than growing plantations for firewood.

**Links to air quality**

- For instance, measures that support the take-up of the most efficient wood heater models would lessen the amount of wood collected and biodiversity impact, as well as the amount of wood burnt and smoke produced. The adoption of appropriate regulatory, education or other strategies for limiting moisture content of firewood should also lead to a significant reduction in wood smoke emissions.

Several concerns were raised throughout the consultation process, including the use of forestry residues for firewood and the need for additional controls on the firewood industry. There is community concern that the draft *National Approach* seeks to ban the collection and use of firewood. It does not. It recognises the importance of firewood use and seeks to reduce its impact. A revised version of the *National Approach* which addresses many issues raised in the consultation process, will be endorsed by ANZECC at their meeting on 29 June. State Action Plans will then be prepared for consideration by the Natural Resource Management Ministerial Council.

### *The challenge ahead*

Not all elements of the draft *National Approach* will be appropriate or necessary in all jurisdictions but they provide a framework for State Action Plans that can incorporate locally appropriate management responses.

The challenge for this conference and others to follow, is to decide how the National Approach can be applied in Tasmania.

### *Conclusion*

The firewood issue is of great ecological concern and it is encouraging to see the attention it is receiving. Thanks to the Tasmanian Conservation Trust for organising the Conference in order to increase that attention and reach some solutions.

# Keynote Topics

## Woodlands, Wildlife, Firewood (and Lung Disease): An Overview of the Firewood Issues in Australia

### B J Traill, Woodlands Ecologist, The Wilderness Society

Around 85% of temperate woodlands on the mainland have been completely cleared for agriculture and virtually all the remnants have been deleteriously affected by logging, mining, over-grazing and invasion by weeds and feral animals. In Tasmania more than 90% of the original gum and peppermint woodlands have been cleared. As a consequence woodlands have a disproportionate number of threatened species and there is a wave of local and regional extinctions occurring amongst woodland birds.

Due to lower rainfall, most of the trees in woodland and drier forest areas are generally slower growing and have denser timber, with greater heating value per volume, than most trees from wetter forest areas. Consequently it is from these woodland and dry forest areas that the bulk of the firewood currently comes.

An estimated 6–7 million tonnes of firewood and fuelwood are burnt annually in Australia, most of it for domestic heating. Increasingly industrial 'fuelwood' uses (wood for power, wood for smelters etc.) are also targeting the same woodland and dry forest vegetation communities.

This is creating a major environmental problem which has, to date, received little attention.

### *The problems*

There are two major environmental problems with firewood cutting and burning: where the wood comes from; and what happens when it is burnt.

#### Loss of wildlife habitat

The large-scale removal of firewood directly degrades wildlife habitat. The effects are often poorly understood, possibly because firewood removal is usually incremental. However, the continuous removal of firewood has similar effects on the 'structure' of woodlands to clearfelling. Changes to habitat include the following:

- **Removal of fallen timber**. In areas where firewood removal is allowed virtually all fallen timber is removed. Fallen timber provides habitat for insects and other invertebrates, reptiles and ground-feeding mammals and birds.
- **Removal of dead standing timber.** Firewood cutters often target dead trees both in paddocks and in uncleared country. Such trees are more likely to have hollows than live trees and are favoured as nesting sites by a range of possums, parrots, bats and other wildlife. Dead standing timber also provides shelter or food for particular insects and insect-eating species.
- **Reduction in the number of large mature trees.** Due to over-cutting and the systematic removal of larger trees by forest services in some states, many woodland and dry forest areas now have greatly reduced numbers of large mature trees. In some areas large mature trees, unsuitable for other timber uses, are still targeted for removal and use for firewood during silvicultural operations. In addition, continued over-cutting of the small trees is in many areas preventing the re-establishment of large mature trees (e.g. greater than 60 cm diameter) which provide resources such as hollows and nectar in greater abundance than small trees.

#### Air pollution

Wood smoke contains a diverse range of cancer-causing chemicals and is a major source of small particle emissions. As discussed in greater detail in other papers at this conference, such pollution causes a range of heart-lung illnesses and cancer.

Wood smoke causes some of the worst air pollution in the nation in winter in smaller towns and cities such as Launceston and Armidale.

### *Solutions*

To remain in the long term, the firewood industry in Australia needs to develop an ecologically sustainable supply of firewood and burn it in a way that doesn't affect people's health.

Arguments have been put forward for the need to have a 'balanced' outcome on how wood is collected and/or further research on how to take wood from woodland areas sustainably. However, even if demand is reduced over time, millions of tonnes of firewood will still be sought. In Australia only small areas of temperate woodlands remain, almost all of which have already been degraded by over-cutting of wood. Local and regional extinctions are already occurring in temperate woodlands, many related to loss of standing and fallen timber and mature trees. To best conserve remaining native species we need to protect *all* remaining areas of woodland for wildlife conservation and for control of salinity and other 'ecosystem services'. Small-scale removal of wood for local use may be sustainable in some areas. However, restoration of the former structure of the woodlands is required and continued large-scale removal of firewood will only slow the recovery of areas.

The only exception to this may be targeted one-off ecological thinning programs of some young over-crowded tree stands in a few woodland types. *Ecological* thinning is a process where better ecological management is the sole aim, where commercial pressures don't influence selection of trees for removal, with firewood possibly being a side-product of the thinning process. Such one-off processes are largely irrelevant to attempts to establish a long-term sustainable firewood industry.

Alternative commercial sources of fuel, such as waste wood and plantations, urgently need to be developed, as a sustainable supply of firewood into the future.

To reduce air pollution, tighter regulation of firewood use in towns and cities is required. In areas particularly prone to air pollution, wood heaters may ultimately need to be banned to protect people's health.

# Do Woodheaters Have a Future in Launceston?

## John J Todd, School of Geography and Environmental Studies, University of Tasmania

### *For or against woodheaters?*

The widespread use of woodheaters and open fireplaces in Launceston is causing decreased air quality and there is anecdotal evidence of ecological problems associated with firewood collection.

If firewood comes from 'tidying up' properties where it would have been burned in situ anyway, then it is near greenhouse-gas neutral. If it comes from forest that would otherwise remain uncut, greenhouse gas emissions are similar to coal.

The negative aspects of firewood use are mostly environmental, but there are important social benefits.

| Negative | Positive |
|---|---|
| Woodsmoke | Low cost heating |
| Inconvenience | Large heat outputs |
| Safety | Income for wood cutters |
| Health (wood smoke) | Health (warmer homes) |
| Ecological damage | Self-reliant<br>Ambience<br>Greenhouse neutral |

Table 1: Both sides of the woodheater argument (issues in bold are considered the most important).

#### Inconvenience

People have to collect or buy firewood, stack and store it, split larger logs, cut kindling, light and refuel the heater and remove ash. However, many find this acceptable or even a positive factor.

#### Safety

Adoption of the Australian Standard for heater installations has largely solved the problem of house and chimney fires but children still suffer burns, which could be prevented by fire-screens.

### *Social issues*

#### High heat output

Compared to other heaters, woodheaters provide high heat outputs, inexpensively.

#### *Insulation*

It takes less energy to heat a well-insulated home. There are no minimum insulation standards for new homes in Tasmania and there is no government assistance for insulating existing homes. Such measures seem a long way off, so Launceston homes will need large heat inputs for many years to come.

#### *Gas*

Natural gas, expected in Launceston within a few years, may offer a relatively cheap alternative. But it is still unlikely to be a financially viable alternative for lower-income families, especially those who collect their own firewood.

#### Low running cost

| Type of heater | Energy requirements[1] | Running costs |
|---|---|---|
| Woodheater | Supply heat equivalent of 14,000kWh, need 5 tonnes air-dry firewood and 65% efficient heater | Firewood $80/tonne. Annual cost $400<br>But if self-collected the cost is approximately $0 [2] |
| Gas[3] | Supply heat equivalent of 12,500kWh<br>Need 20 cylinders LPG | Annual cost is $1600 |
| Electricity | Supply 12,000kWh per year.<br>Assuming good heat pump with COP = 2.5[4] | Household tariff = $1400/year<br>H'hold tariff + heat pump = $560/year<br>Hydroheat tariff = $925/year<br>Hydroheat + heat pump = $380/year |

Table 2: Comparative heating costs in Launceston.

[1] Woodheaters cannot be switched on and off quickly so it is assumed some of the time heating is occurring when it is not needed. For gas, this response time is quicker so less overall heating is needed and for electricity it is quicker still.

[2] If a special trip is made to collect the wood then travel costs should be attributed to the wood. But some collection is done as part of normal weekend activity (e.g. at a person's shack) or for recreation.

[3] The gas used in this calculation is bottled LPG because natural gas is not yet available in Launceston.

[4] The COP of a heat pump is a measure of how much heating is delivered for a given amount of electricity. A good heat pump, operating in Launceston's winter months should provide about 2½ times as much heat as supplied by the electrical input. Not all heat pumps will achieve this.

The capital cost of a heating system must also be considered. The installed cost of a heat pump and *Hydroheat* tariff electricity is around $4000. Central heating systems using heat pumps may cost three times as much.

#### Income for wood-cutters

If purchase of firewood is decreased, loss of cash flow from the urban region to rural communities would create serious problems.

### *Environmental issues*

#### Reducing wood smoke

- Low emission woodheaters can help reduce smoke emissions, provided they are used correctly. The wood-pellet burner minimises the problem of incorrect use but pellets are expensive. As replacing existing woodheaters will take many years, this is not a short-term solution.
- Education programs on correct woodheater use have had little environmental impact.
- The draft air quality policy proposed for Tasmania includes penalties for producing unacceptable smoke. Offenders would be warned, informed

about correct heater use and, if they persist, fined.

- The draft policy provides for (non-compulsory) accreditation of firewood sellers. It also regulates moisture content for firewood, which should reduce smoke emissions but is unlikely to have a major effect.
- Financial incentives could accelerate the change to other forms of heating or new low-emission woodheaters, but the buy-back scheme announced this year is relatively expensive and will not overcome financial problems for low-income households.
- Banning the installation of woodheaters and open fireplaces in new homes, or their use in existing homes, would cause severe hardship to some lower income households.

**Ecological problems associated with firewood collection**

Proposed measures to encourage sustainable firewood supply:

- Some firewood merchants support the introduction of a Code of Practice for firewood collection. This could be enforced through accreditation of sellers.
- Existing police, local government and national park powers could be used to clamp down on illegal firewood collection.

### *Conclusions*

Wood-smoke concentrations in Launceston appear to have decreased, mainly due to a 20% swing from woodheating to electric heating, encouraged by the *Hydroheat* electricity tariff and availability of heat pumps. The most likely means of reducing wood-smoke concentrations in Launceston is via this voluntary movement from woodheating to electricity (or gas, when available).

Encouragement/education about new lower-emission woodheaters is needed for those purchasing new wood heaters. The second-hand sale of older models for use in the Launceston area should be discouraged/forbidden.

The Natural Heritage Trust's *Air Pollution in Major Cities Program* has funded: education campaigns on correct woodheater use; inspectors to investigate smoky heaters and check firewood moisture; and subsidies to get rid of older models of woodheaters. This should reduce smoke and accelerate the rate of change to other forms of heating. The proposed new smoke nuisance regulations will need to be enforced sensibly.

Surveys will be needed to determine the economic and social impact on rural communities of reduced demand for firewood.

The extent to which firewood collection causes ecological damage needs to be established. If damage is identified, collection from sensitive areas must be prevented. This is unlikely to affect firewood price or access as plenty of 'waste' wood is generated every year in Tasmania.

If the use of woodheaters is to be restricted further, there must be a safety net for low-income households, including assistance to upgrade the thermal performance of their homes.

## A Sustainable Firewood Industry for the ACT – A Case Study

**Kathryn Maxwell, President, Conservation Council of SE Region and Canberra**

An estimated 17,000 homes in Canberra use firewood for heating – in 10,000 non-certified wood heaters, 2,000 certified wood heaters and 5,000 open fireplaces. These consume 60-80,000 tonnes of firewood each year. Wood comes from up to 600 km away, as closer supplies have been exhausted. The Conservation Council ('the Council') has been campaigning for an ecologically

sustainable firewood industry in the ACT since 1991, focusing on reducing two key impacts: air pollution and clearing of endangered woodlands in surrounding NSW.

The ACT experiences high levels of firewood smoke pollution. Canberra has a greater concentration of fine particles in the air during winter than larger cities like Sydney and Melbourne. These particles are associated with burning wood for heating. About 95% of the wood being burnt in Canberra is from the most endangered ecosystems in south-eastern Australia, such as yellow box, red box, white box, grey box, red ironbark and river red gum, sourced mainly from surrounding NSW. About 5% is pine from ACT plantations.

### *An ecologically sustainable industry*

Discouraged by the lack of social and political will in the ACT to ban wood heaters, the Conservation Council has instead campaigned for the licensing of firewood sellers. Without a licensing system, wood merchants who want to use plantation sources and sell properly seasoned firewood were being undercut by itinerant traders. Such traders often run illegal businesses, remove trees from reserves and sell unseasoned wood through newspapers or markets. Licensing would probably force them out of the market as overheads rise, creating a level playing field for sellers. Prices are also likely to rise as merchants meet the requirements of the licence – to sell only seasoned wood, by weight. As prices approach the true cost, many households will replace firewood with other heating (e.g. gas) have supplementary heating (saving firewood for special occasions) and use mixed loads which include plantation pine. Firewood plantations will then become more economically viable. These changes should help to reduce air pollution and the loss of woodlands.

### *A brief history*

In 1992 an ACT Government committee inquiry into the firewood industry recommended:

1. A registration system for ACT suppliers of hardwood fuel for sale.
2. A public air-quality advisory service during the months of peak emission pollution.
3. A high profile publicity campaign, directed at households.

The only tangible response by the ACT Government to this report was to amend the Air Pollution Act in 1993 to set emission standards (to AS 4013) for solid-fuel burning heating appliances.

In 1995 the ACT Firewood Working Group was established to advise the ACT Government on how to reduce the environmental impact of the firewood industry and address fair trading issues. It has maintained pressure for a licensing system for sellers of firewood in the ACT.

The ACT Government launched the ACT Firewood Strategy in March 1999. It included an industry voluntary code of practice, a public education campaign, a compliance initiative and promotion of mixed loads. The Working Group suspended its licensing campaign for 12 months to give the Strategy a chance to work but by the end of the 1999 firewood season it was clearly not working. Only six legitimate merchants in Canberra had signed on, reflecting the lack of market advantage to be gained from accreditation. In fact, these merchants were competitively disadvantaged. As a result, the Firewood Working Group pushed again for licensing. Legislation was passed in August 2000. The licensing system commenced on 5 April, in time for the 2001 firewood season. Anyone who sells or supplies firewood in the ACT is required to have a licence and:

- Disclose to customers the source of the wood.
- Sell only seasoned wood, by weight (no more selling from markets or trailers).
- Promote the use of a wider range of woods including plantation timber and pine.
- Promote correct wood-burning practices and the source and type of wood.

At the same time the ACT Legislative Assembly passed a motion requesting that the Government:

- Review the air pollution monitoring system, to ensure that it can detect concentrations of particles down to 2.5 micrometers in diameter, across Canberra on a continuous basis.
- Initiate an air-pollution warning system and ask households to use alternative forms of heating on days of high air pollution.
- Investigate ways to assist low-income households to install less-polluting heating systems.

### *Lessons learned*

**Voluntary codes do not work.** Itinerant merchants who, by their very nature, avoid paying tax, were not going to sign up to a voluntary code which increased their overheads.

**Passing of legislation to license merchants is one step in the campaign.** The ACT has a minority government and the legislation was passed by the opposition and cross benches. The recent budget did not provide extra funding for an adequate education campaign or for monitoring and enforcing the licensing system. Legislation is important, but cannot achieve an ecologically sustainable firewood industry without government commitment to monitor and enforce it.

### *Where to from here?*

**In the ACT:** the Council will encourage the ACT Government to resource the licensing system properly and ask ACT election candidates for a commitment to:

- Implement the firewood licensing system fully, including sufficient resources for education, monitoring and enforcement.
- Financially assist low-income households to replace or supplement firewood heaters with less polluting heating.
- Implement fines for illegal removal of firewood from roadsides, reserves and other public land without a permit (legislation allows for on-the-spot fines of $100).
- Encourage use of supplementary heating, keeping firewood for special occasions.
- Only permit the sale of the most efficient, least polluting slow-combustion wood heaters.
- Ban the sale of open fireplaces and the resale of old, less efficient, wood heaters.

**Outside the ACT:** to date, the Australian and New Zealand Environment and Conservation Council's work to establish a national approach to collection and use of firewood seems set to repeat the ACT's mistakes, aiming only for a voluntary code of practice for the wood sellers and awareness-raising. The Council would like to see a Firewood Working Group in each state/territory, involving firewood merchants, conservationists, consumer advocates, academics and departmental representatives. The Council has attended all three firewood conferences to share experiences of what has been tried and failed and will continue to lobby for certification of wood heaters that burn softwoods and manufactured fuels.

### *Conclusion*

Responsible wood merchants have been an excellent ally in the campaign. If wood heaters are used primarily for special occasions, along with supplementary heating and plantation-sourced firewood, the firewood industry could be ecologically and economically sustainable.

## Firewood Cutters and Sellers – Their View of Tasmania's Firewood Industry

### Nick Jones, D & B Wood Supplies, Launceston

Firewood merchants have openly suggested that regulation in the industry is needed to go some way to fixing the air pollution problem. However, there is no incentive for the merchants to achieve accreditation when there is no penalty for the rest of the supply chain who are doing the wrong thing.

The draft Air Quality plan states that "*promoting the lower moisture content will mean correct weight and more wood for the consumer*". This just underlines the lack of understanding of the industry, as most firewood is sold by the cubic metre with an approved measuring tape (Department of Weights and Measures). The only legal way of selling firewood by weight is with an approved weigh bridge ticket, it is unlikely that there is more than one wood merchant in the whole of Tasmania with a weigh bridge. Most wood is sold by the cubic metre and therefore moisture content makes no difference to the seller apart from customer satisfaction, as the volume is the same.

If the government is serious about improving air quality then the most simple regulation will have an enormous effect on the problem, ie:

- All firewood sellers to be accredited, this accreditation to be dependent on the most basic of requirements:
  - chainsaw ticket.
  - approved measuring tape
  - moisture metre
  - delivery
  - docket book.

This would then earn the wood seller a wood seller's license number. The number would be displayed on the rear of the delivery vehicle. (This would cover all merchants and roadside sellers.) Advertising in any publication must include the wood seller's license number.

None of these most basic requirements will have any detrimental effect on any segment of the industry. They will however encourage the cowboy element to become far more professional and encourage the industry as a whole to be far more measurable.

The penalties for selling wet wood can be introduced over time, in the short term the only regulation that needs to be put in place is the requirement for any advertising and the delivery vehicle to carry the license number, just as in the second hand car industry.

The suggested delivery docket outlined in the draft document is a very sensible suggestion. It would detail when the wood will be suitable for burning and puts the onus on the wood seller to supply the correct moisture content of wood for the consumer. It would also negate any requirement for restricting sales at any time during the year.

The very simple system of the license number then enables any type of monitoring the Government chooses, including knowing the basic details of all the itinerants. The license number could be issued by the same people who issue number plates for vehicles, it could easily be cost neutral with a small charge for the plate. The Department of Weights and Measures could then more easily monitor firewood sellers as they try to do now, but with little success, as trucks change, drivers change and addresses change.

# Firewood a Conservation and Human Health Issue

# Session 1: Biodiversity Impacts

## Impact and Use of Firewood – A National Perspective

**Don A Driscoll, School of Geography and Environmental Studies, University of Tasmania**

Environment Australia commissioned CSIRO Sustainable Ecosystems to provide a national perspective on firewood harvesting, particularly in relation to impacts on biodiversity and knowledge gaps. Improving the information base on firewood harvesting is one of six strategies identified by ANZECC (2000) in their National approach to firewood collection and use. The full report (Driscoll et al. 2000) is available from the Biodiversity section of Environment Australia.

### *Biodiversity*

A comprehensive review of literature addressing impacts of firewood collection on biodiversity, revealed that there is widespread concern that firewood collection may have a major impact on wildlife. However, those concerns are largely based on anecdotal or inferential evidence. There is very little evidence demonstrating the impact because very few studies have directly addressed the problem. For example, the recent Action Plan for Australian Birds listed 21 species that may be threatened by firewood collection, as they use dead wood for foraging, nesting or shelter. But there is no series of published experiments showing that each species declines after removing a percentage for firewood.

Evidence of likely impacts on invertebrates was especially convincing. For example, there are several ant-butterfly relationships, where the butterfly depends on a particular ant species, which in turn is dependent on dead wood. Invertebrates often play important ecological roles, like pollination, nutrient recycling and forming the basis of many vertebrate food chains (Britton 1995; Jelinek et al. 1994).

### Firewood use in Australia: telephone survey results

Four hundred and fifteen people who use firewood were interviewed.

### *How do people obtain their firewood?*

About half buy it. Sixty per cent comes from small suppliers without established premises. This shows that regulation will need to reach beyond the big wood yards to be effective.

The rest collect their own firewood. Three quarters take fallen timber, 18% take dead standing timber and only 6% cut live trees. Therefore, to establish how sustainable a firewood supply might be, the rate of input of dead wood must be considered (as well as tree growth rate). Loss of habitat is a concern since firewood collectors target dead wood, which is used by many invertebrates.

About 80% of firewood collected comes from private property so there is an urgent need to tackle the tricky issue of what people do on their own properties. Firewood collection on public land is already regulated. Collection from roadsides and state forests is likely to be under-reported: if they suspect it is illegal, interviewees are unlikely to admit they do it. On-the-ground measurements are needed to find out where impacts are most severe. If the frequency of collection from each category of land (Figure 1) corresponds with the area that the category occupies, firewood collection might be relatively evenly spread across the landscape.

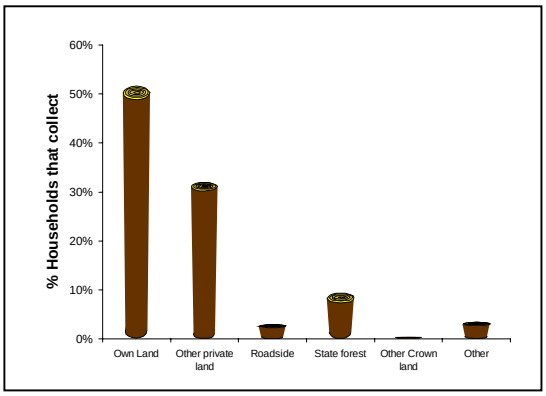



Figure 1: Where people collect firewood.

### *What do people burn?*

About one third of people did not know what species of tree they burned. Education is needed, as people who don't know what they are burning probably don't know where it comes from or the ecological impact of its removal.

### *How much wood is burned and who burns it?*

Between 4.5 and 5.5 million tonnes of firewood is burned annually in Australian households. Households outside of capital cities burned about 80% more wood than those in the cities. A lower proportion of households in capital cities use firewood (20% v 35% in non-capital cities) and less firewood is used per-capita in capital cities (2.3 t/yr vs 3.6 t/yr).

From a biodiversity perspective, the exact amount is not as important as where it comes from. If it all came from genuine waste sources, there would be no additional impact on biodiversity. If the national harvest was only 100 tonnes per year, but it all came from remnant white box woodland, there are substantial biodiversity implications. As a very large amount is burned, impacts could extend across a broad spectrum of plant communities.

### *Threatened communities*

It appears that most of the wood comes from the most extensively cleared landscapes, e.g. river red gum from the inland riverine plains and box and ironbark species from the wheat and sheep belts inland of the Great Dividing Range in Victoria and NSW. Burning of 'local eucalypts' implies that a range of vegetation types near population centres may be affected.

Apart from this broad overview, there was almost no information to pinpoint plant communities that are heavily targeted for firewood collection. This information gap might be filled in the following manner. The RFA biodiversity assessment identified regional vegetation classes, mapped remnant vegetation in each class and identified potential threatening processes. The reports indicated that 30 woodland and 23 forest communities may be threatened by firewood collection, mostly in low rainfall zones. Followed up with on-ground work to establish the extent and nature of the threat, this mapping could form the basis of an effective firewood management strategy.

To know if the resource has already been over-exploited, or if timber can be taken in a sustainable manner, we need answers to three basic questions:

1. How much timber would there be in a particular vegetation class if it had not been harvested for firewood?
2. How much timber is there now?
3. How much timber does there need to be to maintain biodiversity and ecosystem processes?

MacNally et al. (2000) took an estimate of fallen timber from unlogged red gum forest of 125 tonnes per hectare, then surveyed hundreds of plots. None had 125 tonnes of fallen timber per ha, only 5% had more than 50t/ha and almost half had less than 10t/ha. The fallen timber resource was extraordinarily depleted. To ascertain the likely impacts on the native biota, they surveyed vertebrates in three areas, spanning seven levels of fallen timber. They found no effects for frogs or reptiles, a slight peak in bird numbers at 20t/ha and a significant increase in the density of the only small native mammal at 45t/ha. Based on this result, MacNally et al. recommended that fallen timber loads should be at least 45t/ha in riverine river red gum forests.

To quantify the threat posed by firewood collection, we need at least this level of information from a broad range of vegetation communities. If we continue to use remnant vegetation as a firewood source, the MacNally study will need to be repeated many times to establish the size of the resource and how much we can burn before biodiversity starts to decline. This first example shows us that the resource is already well below ecologically sustainable levels.

### *References*

ANZECC (2000). *A national approach to firewood collection and use in Australia*. Australian and New Zealand Environment and Conservation Council.

Britton, D. R. 1995. Research on the ecology of the Coconut Ant and breeding biology of the Small and Large Ant-blue and other target butterflies at Mount Piper, Broadford. Report to the Department of Conservation & Environment (unpublished), Melbourne.

Driscoll, D. A., G. Milkovits, and D. Freudenberger. 2000. Impact and Use of Firewood in Australia. CSIRO Sustainable Ecosystems; Bush Care, Environment Australia, Canberra.

Jelinek, A., D. R. Britton, and T. R. New. 1994. Conservation of a 'threatened butterfly community' at Mount Piper, Victoria. Memoirs of the Queensland Museum 36:115-120.

MacNally, R., Parkinson, A., Horrocks, G., Conole, L., Young, M., Tzaros, C., Koehn, J., Lieschke, J. & Nicol, S. (2000). *Ecological significance of coarse woody debris on south-eastern Australian floodplains*. Report Number R7007. Murray-Darling Basin Commission, Natural Resource Management Scheme I & E Program, Riverine Program.

# The Fireplace for the 21st Century

## Bill Carey, Pellet Fires Australia Pty Ltd, Beaumaris, Victoria

Pellet heating – efficient, effective and eco-friendly – is designed to be convenient and cost-effective and enhance the ambience of your dwelling without harming the environment.

The residential wood pellet fuel industry in North America was created in the early 1980s as a response to the energy crisis. Today, almost one million tons of pellets are sold each year – used in nearly 500,000 free-standing pellet fires and fireplace inserts in homes throughout the USA and Canada. These fires are convenient, efficient and allow consumers to control heat output.

In the USA there are now 80 pellet mills recycling wood waste by-products to manufacture high-quality fuel. Europe's annual consumption of pellet fuel now surpasses that of the USA. Market share of pellet fires and fuel in these regions has been steadily increasing.

Wood pellets are made from wood waste products principally from sawmills. Untreated sawdust, timber chips and shavings are pulverized in a hammer mill and then fed into a drum drier to remove moisture. These dried particles are then made into hard, super dry, compressed pellets about 12mm long and 6mm in diameter. After cooling, conditioning and quality control screening, the pellets are packed into 20kg recyclable bags ready for distribution to the customer.

In Tasmania, pellets are made by two independent sources who have been involved in related activities for some time. Pellets are supplied factory-direct to the customer to ensure cost is kept to a minimum. Australian production of Pellet Fires is expected early in 2002 (they are currently imported from Canada). In Tasmania, the fires can be found at traditional heating retail outlets, the Home Ideas Centre Launceston, or mobile demonstration vans.

Pellet Fires come in two main forms:

1. *Fireplace inserts* can be retro-fitted into existing fireplaces and are equally as efficient as free-standing Pellet Fires.
2. *Stand-alone units* can be vented horizontally through an outside wall – the flue being 'invisible', installed on an internal wall with a vertical flue, or completely built in.

A 1.5kw hot-water booster is available as an optional extra on all Pellet Fires on low pressure mains.

### *How do pellet fires work?*

Pellet Fires look like gas fires or log burners but that is where the similarity ends. They have a fuel hopper storing up to 20kg of pellets. This provides up to 32 hours of burn time. Pellets are automatically fed into a burn pot where a simple electronic igniter lights the fire. An external dial controls fuel delivery, which regulates heat output. Combustion air is drawn through the burn pot by an exhaust fan ensuring perfect air-to-fuel ratios and maximum efficiency. Fresh air is passed through a series of heat exchangers and fan-forced into the living area using a variable speed convection fan. Additionally, heat from the burn pot radiates through the glass door. This dual system ensures an automatic ambience and heat efficiency of 83%, unparalleled in solid fuel appliances.

### *Environmental advantages*

Wood pellets are a non-fossil fuel made of compressed sawdust from renewable sources – a manufacturing by-product which might otherwise go into landfills. Pure untreated sawdust is used (no additives). Pellet fuel is also carbon neutral so does not contribute to greenhouse gases.

Pellet Fires burn the pellets at a high air-to-fuel ratio, which burns off harmful gases and carbons. The fuel has a moisture content of approximately 8%, ensuring consistent and highly efficient burn quality and complying with Australia's most stringent air standards. Because of the low moisture content, emissions are consistently maintained at very low levels, producing approximately 0.8 gram of emission per 1kg of fuel burnt. People with allergies may also find pellet heaters preferable to central heating which, being closed systems circulate surprising amounts of dust. Unlike a log burner, it is not necessary to open the firebox door to add fuel (it is fed from the hopper), so no dust, ash or smoke escapes into the room.

### *Convenience*

Forget about stacking cords of wood, chopping kindling or cleaning soot from walls or ceilings. Simply turn the fire on to the desired setting, sit back and enjoy the flames and heat.

A timer that will turn the Pellet Fire on and off as required has been designed (but is not yet available in Australia).

The 20kg bags of pellets take up 1/3 of the space of the equivalent amount of wood. Average annual consumption of pellets is approximately 1 Tonne (50 bags). A hopper full of pellets (20kg) can burn for 32 hours on low and approx 16 hours on high, heating an 18-square area.

The ash content of pellets is less than 1%, so most people only have to empty their ash pan once or twice a season.

Pellet Fires have a 75mm (3") stainless-steel-lined flue. An exhaust fan maintains the flow of combustion air and gases. This feature enables a number of installation options and the flue can be touched without causing burns.

### *Efficiency*

Unlike traditional methods, the Pellet Fire minimises waste and maximises heat output. Fuel in the hopper is metered automatically at the appropriate setting and fan and radiant heat convection systems mean areas up to 18 squares can be heated quickly and evenly.

With energy efficiency of up to 94.5%, the heaters are up to 50% more efficient than most log burners and 350% more efficient than open fires. Heat output can be effectively controlled between 15% and 100% without compromising efficiency or smoke emission and the Pellet Fire can be quickly turned on or off, enabling significant fuel savings. Operating costs are less than half of gas and electricity and less than regular wood (without taking into account personal time and energy savings).

### *Aesthetics*

The firebox design and natural wood flame aim to combine the traditional appeal of wood heating with modern high-tech functionality. More and more people who want the ambience of a cosy wood fireplace are choosing pellet heat.

## Some Nature Conservation Consequences of Firewood Extraction in Tasmania

**J B Kirkpatrick, School of Geography and Environmental Studies, University of Tasmania**

Because of the recent decline in clearance of dry forests and woodlands, firewood collection is likely to place much more pressure on the remaining dry forests, which have high conservation significance. The quantity of wood removed from Tasmanian forests and woodlands for firewood rivals the amount removed for construction timber.

However, the nature conservation consequences of the extraction of firewood from native forest and woodland communities in Tasmania are not all negative.

### *Negative impacts of firewood extraction*

The extraction of firewood can reduce nesting sites and habitat heterogeneity, compact soils, introduce weeds and eliminate some types of habitat.

Firewood extraction is concentrated in dry sclerophyll forest and woodland ecosystems, rather than in the wet eucalypt forest ecosystems favoured by the industrial loggers. Firewood cutters target peppermints and she-oaks. Several of the most depleted and least well-reserved plant communities in Tasmania are dominated by peppermints, most notably inland silver peppermint (*Eucalyptus tenuiramis*) forest, inland

black peppermint (*E. amygdalina*) forest, black peppermint forest on sandstone and cabbage gum (*E. pauciflora*) forest and woodland. In Tasmania, during the period 1972–99, an average of approximately 10,000 hectares a year of native vegetation was destroyed by humans, over one quarter of a million hectares out of a total of only 6.8 million hectares. This loss was concentrated in the lowland dry sclerophyll forest and woodland ecosystems of the State, impacting disproportionately on the most conservation-significant communities. Firewood production was facilitated by this massive loss to the State, although it was not in any way a cause of it.

Between 1994 and 2001 the amount of land clearance in peppermint forest and woodland declined markedly. Most loss of native vegetation today occurs in the heaths of Flinders Island and the north-west of the State and in the shrubby and wet eucalypt forests dominated by ashes (*Eucalyptus obliqua*, *E. regnans* and *E. delegatensis*) which are being replaced by tree plantations. This decline in clearing of peppermint-dominated communities has put more pressure on the surviving peppermint forest as a source of firewood, as has the depletion of the large stock of ring-barked trees that derived from earlier partial clearance techniques.

One cubic metre per hectare per annum constitutes the wood accumulation in a typical peppermint forest. It is uneconomic to extract firewood a long way from the point of use. The main locations for firewood consumption are Hobart, Launceston, Devonport and Burnie. Therefore, continuing the present rate of use of peppermints is likely to rapidly deplete the stock of large trees within a reasonable distance of these towns/cities.

Large trees are most important for the maintenance of biodiversity in these forests, as nesting sites for birds and arboreal mammals and as creators of heterogeneity in the ground stratum. The extraction of firewood from native forests often involves the passage of heavy vehicles, which compress the soil and carry exotic organisms, such as the cinnamon fungus (*Phytophthora cinnamomi* ) and gorse (*Ulex europaeus*) which can substantially reduce native biodiversity. Fallen trees and branches on the forest floor provide habitat for a wide range of native invertebrates and vertebrates, as well as sites suitable for the establishment of new individual trees after fire.

## Positive impacts of firewood extraction

Kirkpatrick and Gilfedder (1995) found that rare or threatened plant species were more likely to be found in degraded remnants than in ones in excellent condition. They attributed this unexpected concentration to the reliance of many rare or threatened species on disturbance regimes, that are not provided by native vegetation managed for grazing of stock or by native vegetation protected from disturbance. Proportion of logged trees was one disturbance indicator for their 100 subhumid vegetation remnants that correlated with increased numbers of rare or threatened species. Although other forms of disturbance, or simply a relative lack of stock grazing, might have been critical in the survival of rare or threatened plant species, there is no doubt that the removal of firewood does considerably disturb sites, in a way which would favour many threatened species.

The maintenance of a cheap source of firewood and fence posts is one of the known motivations for the retention of bush on large agricultural properties. There is therefore some circumstantial evidence that the use of wood for domestic heating encourages the retention of some bush, that would otherwise be cleared.

As a form of heating energy, firewood has the virtue of being renewable, if the source areas are managed appropriately. Unlike the production of hydro-electric energy, firewood production does not necessarily involve the destruction of natural vegetation. Unlike fossil fuel sources of energy for domestic heating, sustainable firewood production does not add to our greenhouse gas problems, with growth of new wood taking up as much as is released in burning. Climatic change resulting from greenhouse gases may threaten surviving forests and woodlands in the dry parts of Tasmania with dieback and some obligate alpine species with extinction.

## Conclusions

The benefits of firewood extraction for nature conservation could all be achieved in other ways, thereby eliminating negative effects. However, benefits could be derived without significant negative effects if: extraction was subject to environmental controls more rigorous than the Forest Practices Code; consumption was restricted to a level of ecological sustainability in forests and woodlands; and consumption was restricted to a level that did not threaten human health in cities.

## References

Kirkpatrick, J.B. and Gilfedder, L., 1995. Maintaining integrity compared with maintaining rare and threatened taxa in remnant bushland in subhumid Tasmania. *Biol. Conserv.*, 74, 1-8.

# Impact of Clearing Old Growth Element on Tasmania's Woodland Vertebrates

**Sally Bryant, Nature Conservation Branch, Department of Primary Industries, Water and Environment, Tasmania**

## *Landscape targeted for firewood collection in Tasmania*

Over 66% of the Tasmanian population use firewood (highest per capita use); 58% of firewood collected is fallen timber (national average 76%); 33% collected is standing dead wood (national average 18%).

A CSIRO report found that in Tasmania about half of all firewood collected is from the Midlands Bioregion. The most targeted areas are dry eucalypt forests and grassy woodlands within a 50 km radius of Hobart and Launceston. This also suggests a zone of about 50 km around major population centres which would include most of the northern coast, eastern coastal half of Tasmania, the Midlands and the Central Highlands. These vegetation types are already the most heavily cleared for agriculture, nationally and in Tasmania. Firewood collection is therefore probably targeting regional remnants and fragments.

## *What ecologically is an 'old' tree?*

Old growth forests have the structural characteristics of living and dead old growth trees, logs on the forest floor, logs in streams and a build-up of litter.

Old mature trees:

- provide fissures, crevices and hollows used for nesting;
- have large and diverse trunk surfaces with exudates and sap;
- have decorticating bark, lichens and mosses, which attract invertebrates and foraging animals;
- usually have full canopies that provide shelter, camouflage, nesting and food (lerp, manna, nectar, invertebrates);
- usually accumulate large quantities of bark and litter at the base and surrounding ground which provide food, shelter and nesting habitat for a myriad of species.

## *Primary impacts of selected removal of old growth elements*

### Loss of tree hollows

Hollows are formed mainly by fire, wind, insect and fungal attack. The rate of hollow formation can vary according to landscape features (aspect, position, topography, soil type, wetness, etc.). Eucalypts generally take 100 to 400 years to form hollows. Different tree species have different rates of, and susceptibility to, hollow formation (e.g. soft wood versus hard wood). In Tasmania, it is estimated that the number of trees with hollows in native dry forest was: 9.5 trees/ha = small hollows; 1.5 trees/ha = medium hollows; 0.75 trees/ha = large hollows. The number of tree holes increases with tree stem diameter, the older the tree the more large hollows will be formed.

Different animals have different requirements and uses for hollows. For example, sugar gliders have social systems based on communal nesting in large hollows. Some species build nests in open cavities. The total number of hollows available in a patch of forest may not equal the carrying capacity of hollow-dependant wildlife, because a range of other factors influence species distribution, i.e. type of hollow, territory size, seclusion and site features (e.g. aspect) proximity to resources such as food, specific tree species, multiple den sites at different times of year, hollows on the ground. Therefore the number of hollows available may seem sufficient but other limiting factors are present.

## *Loss of large trunks, vertical branches and fallen wood*

Fallen wood often contains hollows or crevices used for nesting. It provides shelter, camouflage and a food source for most woodland small mammals and reptiles and for birds like the spotted-quail thrush. It supplies ants and invertebrates for echidna, reptiles and insectivorous birds.

A number of Tasmanian species rely on the trunk, coarse woody debris including decorticating bark, as a critical resource. Various species use vertical

branches on old growth trees including: wedge-tailed eagles, tawny frogmouths, black-faced cuckoo shrikes. Most forest bats will roost and hibernate beneath the bark of trunks.

## *Secondary impacts of firewood collection in the landscape*

### Fragmenting the fragments

The smaller the fragment the higher the rate of predation and nest failure due to increased disturbance, increased edge effects, increase in exotics and generalist predatory species. There will be a loss of regeneration and trees emerging in different age classes.

#### *Nibbling away the edge – loss of the 'paddock tree'*

- Sugar gliders can use dead trees separated by 200 m of pasture.
- Masked owls and owlet-nightjars will use isolated paddock trees.
- Paddock trees are used by generalists like brush-tailed possums, sugar gliders.
- Paddock trees are used by diurnal birds for perching or feeding e.g. eastern rosellas, small passerines.
- Paddock trees provide roost sites for bats, especially the eastern falistrelle.
- Loss of paddock trees results in a loss of a root system and shade which provides habitat for skinks and frogs.
- Loss of scattered trees means a loss of connectivity of corridors and stepping stones to the nearest large patches of forest.

## *Loss of structural diversity*

Loss of structural diversity will affect: invertebrates and food source; cover and nest sites; and regeneration. Firewood collection can cause loss of coarse woody debris and canopy cover and disturbance (e.g. roading, predators, exotic species, weed invasion). Tasmania has a group of woodland species which are intolerant of major habitat change or disturbance, e.g. Bassinian thrush, scrub tit, spotted quail thrush, yellow-tailed black cockatoo, wedge-tailed eagle and white-bellied sea eagle.

## *Results from the Birds on Farms Project (conducted by Birds Australia 1998 - 2001)*

For every 10 large old trees left standing on a property, bird diversity increased by 30% and the diversity of woodland dependant hollow-nesting birds increased by 20%. For every 10 large old trees left on the ground on a property, the diversity of ground-foraging birds increased by 30% and bark-foraging birds increased by 70%.

### Status of birds – nationally and in Tasmania

Nationally, the status of native birds includes:

- 25 extinctions
- 204 endangered or vulnerable
- 81 at risk.

Over half of these species are distributed in temperate or sub-tropical woodlands or mallee and over one third suffer from known nest failure due to lack of nest sites, including loss of hollows. Firewood collection currently threatens 21 species nationally. In Tasmania, 10 bird species are threatened by loss of old growth elements and a further five species have declining status and ranges, restricted specifically to firewood zones.

## *Recommendations*

Reduce the use of firewood by making it more expensive. Improve the standard of wood heaters. Make alternative and enviro-friendly fuels most cost effective. Phase-out firewood use in cities. Introduce mandatory insulation standards. Encourage and give tax deductions for environmentally-friendly home designs.

Firewood collection should be audited and certified as coming from areas which are not a conservation concern. Reduce and phase-out firewood collection from the eastern dry forests and woodlands of Tasmania.

Plantation forests could be established with species grown specifically for firewood. Firewood should be harvested from all commercially clear-felled forest residues instead of these being burned.

# Potential Impacts of Firewood Harvesting on Invertebrate Biodiversity

## Jeff M Meggs, Conservation Planner, Forestry Tasmania

*"Dying and dead wood provides one of the two or three greatest resources for animal species in a natural forest"* Elton (1966)

Entomologists have long understood the significance of decaying wood as a habitat for invertebrates. Papers on the subject date back to the 1920s. Yet there is a continued perception that dead wood on the forest floor is "waste", on both sides of the woodchip debate and also in relation to firewood collecting. In Australia and Tasmania in particular, rotting logs have been identified as a critical habitat component for many invertebrates including threatened species. However, our knowledge of the habitat and log-dwelling invertebrates is poor. Only a handful of studies has been conducted in Tasmania, mostly dealing with only one or a few species and focused on wet forests.

One community-based Tasmanian study, conducted by Mesibov (1988) in the southern forests, compared the occurrence of selected log-dwelling invertebrates in 20-year-old silvicultural regeneration, with that in adjacent old-growth wet stringybark forest. Only examining a selected sub-set of invertebrates, he found 67 species: 9 snails, 7 centipedes, 14 millipedes, at least 30 species of beetle and 7 groups of landhoppers.

In the second community-focused study, Todd & Horwitz (1990) investigated the occurrence of invertebrates in firewood at three Tasmanian wood yards. They recorded 57 invertebrate species including worms, spiders, crustaceans, millipedes, centipedes, wasps, bees, ants and beetles, with very little overlap between the communities found at each wood yard.

These were both low-budget, short-term investigations and hence barely scratched the surface of log-dwelling invertebrate biodiversity. Until recently there has been little additional community-focused study of this habitat. We are unlikely ever to have a complete list of invertebrates in any major habitat. Therefore, invertebrate ecologists and taxonomists have stressed the need for habitat conservation rather than putting resources into particular species.

To date there has only been one study in Tasmania, conducted during the RFA. This made it clear that the accumulation of decaying wood in Tasmania's mature wet eucalypt forests is among the highest reported for forest ecosystems in the world (Meggs 1996). Meanwhile, we know nothing about our dry forests, high-altitude forests, managed forests, remnant forests, or the dynamics of the system itself – the natural rates of input (treefall) and output (decay) in our various forest types and the impacts of different management regimes. Forest inventory data collected in Tasmania over the last 30 years should be analysed to discover patterns in accumulation and decay.

### *Potential impacts of firewood harvesting*

There has only been one study of the direct impact of firewood harvesting on invertebrate communities in Tasmania: Todd and Horwitz's 1990 study which examined the potential for the translocation of pest invertebrates from forest areas to households via firewood. It focused on potential economic problems and the dangers stinging insects pose to humans. It did not look at possible impacts of habitat loss on the diversity of non-pest insects, or of introduced alien species on resident invertebrate communities. (Translocation via firewood harvesting does not always have negative conservation outcomes. There have been recent anecdotal reports of the threatened giant velvet worm occurring in backyards in St Helens, outside its known range.)

### *Potential threats to decaying-log habitat*

Overseas studies show that intensive forestry practices pose the greatest threat to log-dwelling invertebrate communities. Specifically, short rotation lengths (leading to loss of large-diameter logs) and increases in utilisation standards (i.e. taking more wood out of the forest) causing reductions in habitat biomass, have been found to affect log-dwelling invertebrate populations dramatically. In many countries, log-dwelling invertebrates now dominate threatened species lists because of these factors. The threats are similar in Tasmania: conversion of native forest to plantation or farmland; other Intensive Forest Management (IFM) practices (e.g. thinning, short rotations); Southwood (biomass burning); and firewood harvesting. So, in relatively undisturbed forests, firewood collection on its own is unlikely to pose a significant threat to invertebrate biodiversity. However, in degraded ecosystems and areas subject to intensive land use practices, there is high potential for the cumulative effect of these

practices, followed by firewood harvesting, to pose a significant threat to invertebrate biodiversity conservation.

### *Tasmania's threatened stag beetles as a case study*

Tasmania has a rich endemic stag beetle fauna with at least 30 species described to date, roughly half of which are log-dwelling for at least a part of their life-cycle. Five species are listed under the schedules of the Tasmanian Threatened Species Protection Act 1995, including *Lissotes latidens* (broad-toothed stag beetle) and *Lissotes menalcas* (Mt Mangana stag beetle) both of which are reliant on dead wood on the forest floor.

The broad-toothed stag beetle occurs in an area of around 280 km² in south-east Tasmania, but only 43 km² of this constitutes potential habitat. It occupies a broad range of wet forest types but can also be found in riparian areas in dry eucalypt forests. It appears to require forest with a well-developed overstorey and greater than 10% ground cover of fallen dead wood. A soil-dwelling beetle, it prefers to inhabit the upper layer of soil underneath logs. The exact nature of this relationship between beetle, soil and logs is unknown. Soil moisture levels under logs are likely to be higher than in surrounding soil, preventing desiccation, perhaps allowing the beetle to inhabit drier areas and to survive wildfire. Fallen dead wood may also provide shelter from predators. Only 1,470 ha of potential habitat for the species is reserved. Over half is zoned as production forest, another 15% is private forest. The species is considered in need of special conservation measures due to this low level of habitat protection, the apparent absence of any high density populations, extremely fragmented populations in the western half of its range and its likely vulnerability to modern forestry practices. The conservation recommendations currently in place for the species aim to maximise retention of its preferred habitat throughout its range. It was also recommended that firewood harvesting should be restricted to the drier parts of the beetle's range, whilst ensuring that riparian areas are left undisturbed.

The Mt Mangana stag beetle spends almost its entire life-cycle inside rotting logs feeding on wood-rotting fungi. It has an extensive range in southern Tasmania of 1,831 km² but only a third of its range constitutes suitable habitat and only 11% of this occurs in reserves. It is dependent on a continuous supply of rotting logs. Meggs & Taylor (1999) recommended its protection under the Tasmanian Threatened Species Protection Act, due to planned expansion of IFM activities within its range and the biomass burning proposal associated with the Southwood power station.

Neither of these species is likely to be threatened by firewood collecting alone, but the activity will impact where it follows other land management practices (such as IFM) that significantly affect the continual supply of decaying-log habitat.

### *Conclusions*

Decaying wood on the forest floor is not just 'waste'. Without sufficient knowledge of the decaying-log invertebrate fauna there is an urgent need to gain some understanding of the natural dynamics of this habitat if we are to predict the consequences of various resource/habitat management strategies.

Where we know we have vulnerable or threatened species that utilise this habitat (such as the stag beetles) we need to look at the full range of threats to their habitat, including firewood collecting, to determine how to manage this habitat sustainably.

### *References*

Elton, C.H. (1966) Dying and dead wood. Ch. 14 in *The pattern of animal communities*. Methuen, London.

Meggs, J.M. (1996) Pilot study of the effects of modern logging practices on the decaying-log habitat in wet eucalypt forest in south-east Tasmania. Unpublished report to the Tasmanian RFA Environment and Heritage Technical Committee.

Meggs, J.M. and Taylor, R. J. (1999) Distribution and conservation status of the Mt Mangana stag beetle, Lissotes menalcas (Coleoptera: Lucanidae). Pap. Proc. Roy. Soc. Tas. **133**(1): 23-28.

Mesibov, R. (1988) Log invertebrate project. Unpublished report to the Forestry Commission, Tasmania.

Todd, J.J. and Horwitz, P.H.J. (1990) Spreading insects through firewood collection in Tasmania. Aust. For. **53**(3): 154-159.

# The Regulation of Firewood Harvesting in Tasmania

## Graham Wilkinson, Chief Forest Practices Officer, Forest Practices Board, Tasmania

### *Regulation under the forest practices system*

The environmental impact of firewood harvesting within forests is subject to regulation under the *Forest Practices Act* 1985 and *Forest Practices Regulations* 1997. This legislation does not regulate marketing factors (dryness, cost etc) or environmental impact arising from the use of firewood (air quality).

All firewood harvesting requires a Forest Practices Plan to be certified in accordance with the Forest Practices Code. Exemptions apply within non-vulnerable land as follows:

1. Small-scale operations that involve the use of machinery (tractors, skidders etc) may harvest up to 100 tonnes per year without a Forest Practices Plan.
2. Operations that do not involve the use of harvesting machinery may harvest any quantity of firewood without a Forest Practices Plan.

There are no exemptions for vulnerable land. Vulnerable land is currently defined within the Regulations as land that is:

- above 800 m altitude
- within 40 m of a class 1-3 stream
- steeper than 26 degrees
- high to very high erodible soils
- in a water catchment within 2 km upstream of a water supply intake
- within threatened species habitat

The Regulations are currently being amended to improve the definition of vulnerable land, by including vulnerable karst soils and any areas previously reserved from harvesting under a Forest Practices Plan. Tasmania's legislation does not currently list threatened forest communities. Once this is done, the communities could be added to the definition of vulnerable land. The proposed new Regulations will also remove the unlimited exemption for firewood gathering that does not involve the use of harvesting machinery.

The above changes to the Regulations will subject commercial firewood cutting to the same environmental planning and approval processes that apply to all other timber harvesting under the *Forest Practices Act*. Legally binding provisions could then be inserted into Forest Practices Plans for firewood harvesting to specifically protect hollow-bearing trees and other habitat values.

### *Options*

#### Commercial operators

Introduction of standards and accreditation of firewood suppliers. Accreditation should cover within-forest environmental practices, implemented through approved Forest Practices Plans and the environmental impacts of air quality, through regulation of standards for wood dryness and fair measures. As green firewood is usually less important for habitat than dry wood and is readily available as waste from commercial harvesting operations, its sale should not be discouraged. However, the required seasoning time must be taken into account. Accreditation must be accompanied by education of harvesters, land holders and firewood consumers, to encourage them to deal only with accredited suppliers and to apply best practice to the storage and burning of firewood.

#### Domestic gatherers

Small-scale domestic gatherers (100 t/property/year) are exempted from current regulations. There are two basic options, requiring a change in culture and attitudes about personal rights that are deeply held by private land holders and firewood gatherers. The behavioural changes may be brought about through legal enforcement, or through education.

#### *Legal enforcement*

Remove the 100t exemption so that all firewood harvesting is subjected to regulation under the *Forest Practices Act* or other legislation. This would require resources to police and enforce the regulation effectively. This approach is generally seen as too heavy-handed and difficult to enforce.

#### *Education*

Change the culture and attitude of landholders and firewood gatherers through education, incentives

and encouragement. Many landholders and firewood gatherers are unaware of the potential detrimental impacts of firewood harvesting on environmental values and most respond very positively when they are better informed, particularly if they are allowed to continue their practice with an emphasis on sustainable management, rather than total prohibition.

The preferred approach is one based on the training, education and encouragement of both landholders and firewood gatherers.

| | Legal requirement for an approved Forest Practices Plan under the ***Forest Practices Act*** | Formal accreditation and licensing | Education/guidelines |
|---|---|---|---|
| Vulnerable land | ✔ | ✔ | ✔ |
| Non-vulnerable land | | | |
| 1. commercial operations (>100t) | ✔ | ✔ | ✔ |
| 2. domestic gathering (<100t) | ✘ | ✘ | ✔ |

Figure 1: Summary of potential future firewood regulation.

# Firewood a Conservation and Human Health Issue

# Session 2: Household Consumer and Wood Supply Issues

## What Makes Good Firewood?

**John J Todd, School of Geography and Environmental Studies, University of Tasmania**

Firewood is easy to obtain and can be used in very simple, cheap devices. However, the physical and chemical processes that take place when wood is burnt are very complex and still poorly understood by scientists. No-one has yet designed a practical wood heater that produces no smoke. In parts of Australia, firewood collection is causing ecological damage and wood smoke is causing air quality problems. If firewood is to continue its important role as an energy supply for Australian homes it must be burnt as efficiently and as cleanly as possible.

### *What is 'dry' firewood?*

When a living tree is cut, about half the weight of the 'wood' in the stem and branches is water. The wood will be 'air dry' after about 12 months, with about 15% water by weight. Modern wood heaters are designed to operate most efficiently and emit the least smoke when burning air-dry wood. The consequences of burning wet wood affect both the heater owner and the local community. The heat needed to evaporate the water in green wood reduces wood-heater efficiency: the fire runs cooler and more wood must be burnt to heat the room, causing higher smoke emissions and creosote build-up in the flue. If creosote blocks the flue, the heater will be harder to light and the fire will smoke and burn poorly. Creosote can ignite, seriously damaging the chimney or flue – or causing a house fire if the flue is not correctly installed.

### *Testing the moisture content of firewood*

Electric moisture meters measure the electrical resistance of wood (the wetter the wood, the lower its electrical resistance). Householders can also check wood moisture at home using the following method. Select a representative sample of logs from different parts of the woodpile. Split the logs and cut several sections into small pieces about the size of a 20-cent piece. Straight away (before they dry out), weigh out exactly 250 grams of the pieces on kitchen scales. Spread them on aluminium foil and put in the oven at 100ºC for about 4 hours (no hotter or the wood will start to smoke), then re-weigh the wood. If over 200 grams, your firewood is suitable for use in a wood heater; if less than 150 grams it is much too wet. If 150 to 200 grams, leave it to dry for a few more months. Moisture content can be calculated as follows:

$$\text{Per cent moisture} = \frac{(\text{original weight of wet wood} - \text{dried weight}) \times 100}{\text{original weight of wet wood}}$$

15% = excellent; 15–20% = slightly wet but acceptable if heater used carefully (see the paper: *Good Wood heater Operation: Better Efficiency, Less Smoke* – in Session 3 of this conference).

In some states it is illegal to sell wet firewood. If you have bought firewood that seems too wet, before it dries further ask Consumer Affairs to check the moisture content.

### *Firewood storage*

Ideally, store firewood in a shed with an open (north) side. Stacks in the open should be on bricks/stone/plastic sheet, to protect the wood from moisture and insects. Cover the top (but not sides) with a metal or plastic sheet. Do not stack directly against the house because it provides a bridge for termites or other insects into the wall. Do not store wood under the house or eaves in bushfire-prone areas, as sparks could ignite it. If firewood is stored in the open, keep a few days' supply under cover so that rain-wetted wood is not used.

### *Which tree species make the best firewood?*

The energy in one kilogram (air-dry weight) of most wood species is about 16 to 17 MJ/kg and provides about the same energy as a 2.3kW plug-in electric fan heater run for two hours, but roughly 40% of the wood's heat is lost up the flue. Some wood species burn quickly and leave few coals; others burn very slowly forming a bed of glowing embers. The most important difference between species is the density.

### Dense Australian hardwoods

Include mallee roots, grey box, yellow box, red box, red ironbark and Casuarina species. These grow mainly in dry woodland areas – the areas suffering the most ecological damage from firewood collection. These popular species grow very slowly, so current demand cannot be sustained. Dense hardwoods form excellent coals and throw off few sparks as they burn, but tend to be hard to ignite (not good kindling) and difficult to split.

### Medium density firewood species

Include blue gum, peppermint, messmate, red stringybark and cotoneaster (a woody weed). These are preferred where very dense hardwoods are not available. They tend to be easier to split than very dense woods, ignite more easily and form good coals. Most also give off few sparks when they burn.

### Low density firewood species

Include pine (*Pinus radiata*) eucalypt plantation thinnings and many native species from wetter regions along the coasts or in the foothills (e.g. mountain ash). These are excellent for lighting the fire and burn very well when high heat outputs are required. They are usually easy to split but do not produce good coals so are not useful for 'overnight burning'. Some species throw off a lot of sparks.

## *Choosing your firewood species*

As demands for preferred firewood species are causing ecological problems, burn a broader range of firewood species. Medium- and low-density firewood is usually cheaper. Mixed loads of wood could provide dense hardwood for slow burning and medium- to low-density wood for lighting and high heat outputs. Store woody garden prunings for one year to dry before burning.

## *Firewood size*

Use small, dry kindling for fire lighting. Softwood species ignite easily and establish a hot fire quickly. Use smaller logs for high heat output. Species that produce more sparks are not suited to open fireplaces. Faster burning species and small logs can be used for lower heat outputs if the fire is kept small. Save dense, large logs for longer, unattended burn cycles. Do not use logs that are so large only one will fit in the heater. This leads to slow smouldering fires. Always have several logs in the firebox, as radiant heat from one keeps the surface of adjoining logs hot enough to ignite gas escaping from the wood.

## *Other types of firewood*

Logs or pellets can be made from wood-waste (sawdust, wood shavings) compressed at high pressure to bond the pieces with their natural resins (no glue needed). Extruded logs are dry and burn well in conventional wood heaters. However, they swell and disintegrate if damp. Wood pellets can only be used in purpose-built burners, not yet common in Australia.

Artificial logs bonded/impregnated with wax can cause problems in wood heaters if the wax vaporises, forming an explosive mixture. In open fireplaces wax can melt over the hearth.

Newspapers tightly rolled, or wetted down and formed into a block then dried, burn satisfactorily but are labour intensive to make and have high ash contents.

## *Never burn…*

Some building timber is treated to prevent insect infestation and rotting, e.g. CCA-treated wood is impregnated with copper, chrome and arsenic. Burning releases chemicals into the air and high concentrations remain in the ash. Arsenic becomes arsenic pentoxide which is extremely toxic and carcinogenic. Lead in many older paints is released into the atmosphere when painted timber is burnt. Never burn pine fence poles or palings, telephone poles, outdoor decking, garden furniture or painted wood for any domestic use.

**If in doubt do not burn the wood !**

# Firewood Plantations – Do They Stack Up?

## Arthur Lyons, Regional Private Forester, Private Forests Tasmania

This paper focuses on firewood use in Launceston, Tasmania and gives a detailed examination of: comparative heating energy costs and efficiency; relative dry wood volumes and drying rates; potential firewood species; tree growth rates and yields; plantation management and financial issues (including costs and returns); plantation case studies; consumer demand and supply and alternatives to firewood plantations. [Due to space restraints, case studies and analyses of plantation issues have been omitted from this summary.]

### *Consumer preferences*

A survey of persons attending the Seymour Alternative Field Days (Victoria) in 2000 showed:

- Firewood consumption is related to the cost of firewood.
- The opportunity for collection of free or low-cost firewood strongly influences choice of heating or cooking appliances.
- 90% of respondents would be prepared to buy plantation-grown firewood if it had equivalent heat content of native forest firewood.
- 66% of respondents would be prepared to buy plantation-grown firewood when the heat content and burning properties were inferior to native forest firewood.

### *Energy prices (how much does it cost to keep warm?)*

If the price of firewood rose, it would lose market share but black-market firewood operations and the number of consumers harvesting their own firewood may increase. Assuming 400MJ per day is required, the cost of heating an average home ranges from $2.80 to over $18 per day. The cheapest form of heating, Hydro Heat Electric Heater (300% efficiency) is 48 cents per day cheaper than wood. Hydro Heat Electric Heater (250% efficiency) is also cheaper but thereafter wood is cheaper than the other alternatives.

### *Firewood heat values (how good is my firewood?)*

On a weight-for-weight basis, all dry wood (moisture content about 15%) has about the same calorific value. Wood is often sold by volume or weight (green or dry). Other properties such as moisture content, rate of combustion and re-stoking period are related to density. In general, the higher the density, the better the wood as a fuel. For example, for every cubic metre of *Eucalyptus nitens* (shining gum – a plantation species) two cubic metres of *Pinus radiata* (radiata pine) or half a cubic metre of *E. amygdalina* (black peppermint - from native forests) would be required.

Trees that grow slowly produce wood of higher density. Trees grow more slowly on land with low rainfall. Slower growth also means lower volumes of wood production. For example, a 15-year-old plantation of *E. nitens* is estimated to produce 280 cm/ha with a rainfall of 1200mm/yr compared to 80 cm/ha with rainfall of 600 mm/yr. A good firewood species: has a high density and low green moisture content, thus giving a high heat content; is capable of air-drying from green to 25% moisture content in a reasonable time; and is easily split.

### *Plantation-grown firewood*

Firewood grown in plantations will be inferior to that from slower-growing native forests. Tree species most suitable for plantations within 100km of Launceston include *E. nitens* and *Pinus radiata*. There are already considerable areas of plantation established for timber production, being *E. nitens* grown predominantly for pulp wood and radiata pine grown for veneer logs, sawlogs, poles, posts and pulpwood. Factors to consider include:

#### Tree growth rate and regenerative ability

Fast tree growth is required to maximise the return on investment. If the species regenerates, the cost of establishing subsequent plantations after harvesting is considerably reduced.

#### Species suitability to available sites

Tree species must suit the soil and climatic condition of the plantation site.

#### Firewood characteristics

Dense wood which splits easily and dries relatively quickly is preferred.

#### Consumer preferences

Most firewood burnt is slow-grown from native forests, usually split and often sold dry. The extent to which consumers would accept fast-grown plantation wood, either split or unsplit, is uncertain.

**Environmental impact (environmental/ biodiversity value)**

Plantations may provide broad ecological values: sequester carbon; prevent and ameliorate dry-land salinity and erosion; and provide biodiversity benefits (mainly by reducing pressure on native forests and providing additional habitat).

**Firebox suitability**

Most local fireboxes are designed to burn hardwood. These may need to be modified to burn other species and consumers' habits may need to change so that wood heaters are not damaged by use of incompatible woods.

Although other species suitable for firewood plantations have higher heat contents, *E. nitens* is a preferred Tasmanian plantation species as it is easy to establish, is well suited to plantations and Tasmanian conditions and grows quickly with few if any pests and diseases.

## *Land suitability and tree growth*

General criteria for land to be suitable for plantations:

- Pasture or already cleared agricultural land.
- Not steep, rocky or waterlogged.
- Reasonable soil depth to 40cm.
- Desirable for rainfall to exceed 800mm per year.
- Accessible by truck, with no road construction between the farm gate and plantation.
- Make use of existing fences where possible.
- Fencing must provide protection from native browsing animals and domestic livestock.
- No Aboriginal or other sites of cultural significance.
- No rare, endangered or threatened flora or fauna.

The capacity of land to grow trees depends largely on soil type, soil depth and rainfall. Tree growth rates can be increased by careful matching of tree species to sites and sound silvicultural practices such as cultivation, weed control and fertilisation.

## *Conclusions*

Growing firewood in plantations at current prices is not an economic investment. Where farmers do not consider the cost of land and their labour, firewood can be grown on land with high potential plantation productivity at a price that just satisfies both wood merchant and current market prices. Even so, such ventures are marginal.

Current retail firewood prices would have to increase by at least 44% for investment in firewood plantations to be profitable on highly productive land. A price increase of about 75% is required before land of relatively low plantation productivity becomes economic for firewood plantation development.

When environmental services values (excluding carbon credits) were considered, the viability of firewood plantations was not significantly increased. Carbon credits did not increase investors' returns to a profitable level but farmers' returns increased considerably on moderately and highly productive land.

Electric heating already competes with firewood at current prices and increases in retail firewood prices will further increase electricity's competitiveness.

Significant areas (about 50% of the cleared private land within 100km of Launceston) would be required for firewood plantations to meet Launceston's current estimated firewood demand.

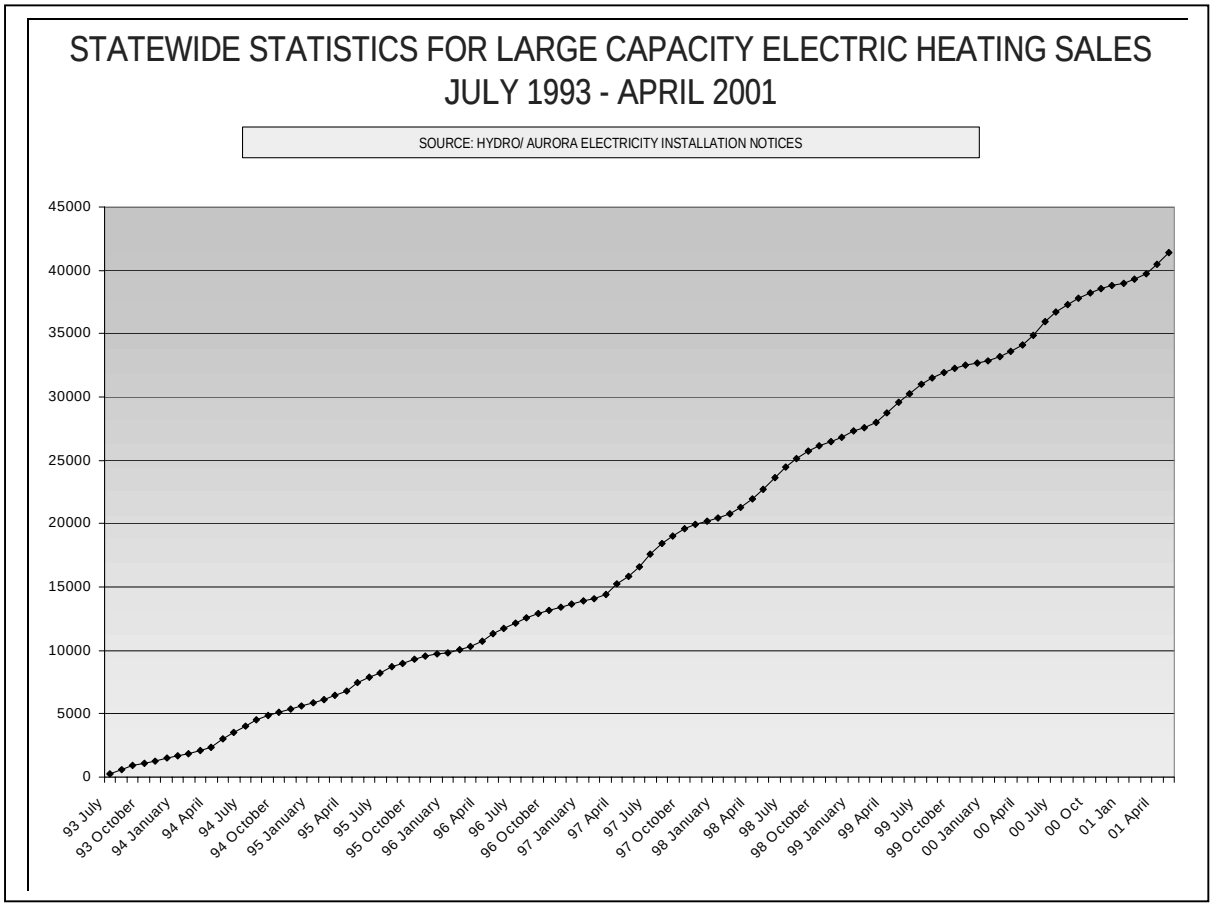
Firewood plantations to fuel wood-fired power stations may be more economic than growing wood for wood merchants. Stumpages of at least $25/cm are necessary (still not enough to compete for before-tax firewood plantation investment dollars). When Renewable Energy Certificates are taken into account, such ventures may be economic.

# After the Fire

## Rod Taylor, Marketing Services and Brand Manager, Aurora Energy

### *Heating, health, the environment*

Aurora conducts regular independent research to ensure its heating campaigns are targeted, efficient and cost-effective. It consults specialists in the field and does not use the same company for every task. Aurora conducts demographic, sociographic or psychographic research, depending on the job at hand, so as to understand customers better and provide products and services appropriate for their lifestyles..




### *Market share estimates as at end 1998*

Split-up for statistical purposes: home owners 70%; renters 28%; other 4%; (figures from SRC/Aurora stats. – main home heating source. Electricity includes off peak). 604 respondents, weighted to home ownership.

**Market split-up**

| | |
|---|---|
| Wood | 47% |
| Electricity | 43% |
| Gas | 6% |
| Oil and other | 4% |

**Preferred energy source (with costs not a consideration)**

| | Wood | Electricity | Gas | Oil |
|---|---|---|---|---|
| 1998 | 22% | 62% | 9% | 2% |
| 1996 | 22% | 61% | 13% | 1% |

Almost three times more people want to heat their homes using electricity than wood.

### *Observations/conclusions*

- Wood still has a large share of the home heating market.
- More respondents see the price of wood as expensive.

- Gas has quite a minor share of the market (opinions may be changing as to gas 'intentions' after it is brought onshore in Tasmania in 2002).
- Perceived gas price is seen to be 'about right' (although in reality it is quite expensive compared to electricity).
- Electricity is still gaining space heating market share (at around 6000 HydroHeat compliant units annually).
- Electric heating is the replacement choice of over 50% respondents.
- Electricity price is seen to be 'about right'.

### *Why do they prefer electricity?*

| | |
|---|---|
| Clean, green energy source with low pollution | (68%) |
| Convenient and easy to use | (62%) |
| Ability to heat quickly | (21%) |
| Low running costs | (12%) |

### *So where does that leave us?*

We all have a choice. It's not just about sustaining an industry, it's about:

- Looking ahead to a cleaner, greener, healthier future.
- Living life to the full and ensuring our children can too.
- Making sure Tasmania stands out as a true bastion of conservation and environmental responsibility.
- Making tough decisions.

# Energy Conservation: The Way to Stay Warm and Save Resources and Money

## Helen Pryor, Cool Communities Facilitator, Tasmanian Environment Centre, Hobart

Energy conservation does not mean skimping on the energy we use, it means skimping on the energy we don't use, such as the energy that gets wasted through poorly insulated, draughty buildings. Take full advantage of all the heat that you are producing and paying for.

### *Heating your home: banish heat loss*

As much as 35% of a home's heat is lost through an uninsulated ceiling, 20%–30% is lost through uninsulated walls and uninsulated floors lose between 15% and 20%. A further 15%–20% of the home's heat can be lost through windows.

Most of the heat loss through ceilings can be prevented by using insulation with an R rating of 3.5 or higher and ensuring that the whole ceiling area is covered well.

It is difficult to insulate walls of existing houses but wool hangings may help to alleviate some heat loss from existing cold walls. Insulation material with an R rating of over 1.5 should be used in wall cavities of new buildings or during renovation.

Heat loss through floors can be minimised by the use of insulation material under the floors, if possible, or by using wool carpets or rugs with underlay.

Double-glazing of windows should be considered when building or renovating. Windows should have close-fitting, insulated curtains or blinds, preferably with a pelmet fitted to prevent draft flow. Sealed curtains and blinds will form an airlock, which prevents cold air entering a room and warm air leaving.

Keep the heat where it is most wanted by keeping doors closed. Heat can also escape under doors, up chimneys and through vents but it is relatively cheap and simple to seal all draughty gaps.

Insulating and draught-proofing will reduce the amount of time for which the heater needs to be used and the amount of heat generated, which also reduces costs.

### Using heating wisely

The most efficient method of heating a particular home will depend on the householders' lifestyle.

In Tasmania, electric heating is currently the best option for limiting greenhouse gas emissions. However, when Basslink comes into operation some of our electricity will be generated by coal, which is one of the worst emitters of greenhouse gas.

Wood heaters emit small amounts of greenhouse gas, but it is their emission of particulate matter (very small particles) which is particularly damaging to the environment and human health. When turned down at night, wood heaters are at their most polluting. Firewood in Tasmania is regularly obtained from the State's dwindling dry eucalypt forests, where it provides important habitat for smaller marsupials and bird life. Using heaters efficiently will help to reduce adverse environmental effects and costs.

Electric heating should be turned off when the house, or the heated room, is not occupied. The thermostat should be turned to the temperature that keeps the home comfortably warm (usually 17° – 20°) for people wearing warm clothing. In houses designed to take advantage of the winter sun and incorporating insulation and draught-proofing measures, the heater will not be needed as much. In some Tasmanian houses incorporating energy-efficient design, additional heating devices are not needed at all.

Wood-heater fuel must be dry, seasoned and from a sustainable source. Use small logs that allow air to circulate between them. The fire should be burnt brightly for at least 20 minutes after first lighting and after adding logs. The flue should be well cleaned.

A simple questionnaire may help householders to decide on the forms of heating best suited to their lifestyle. For example:

- What parts of your home need to be heated?
- Do you need to heat your home all day and all night?
- Develop a timetable of when you generally need to heat your house.

If you need to heat rooms in your house selectively for periods of less than 6 hours a day, you will probably favour an electric heater attached to the cheaper Hydro Heat rate or a heat pump, which you can use for immediate heat. If you need to heat your house for longer periods you may favour a wood heater or heat pump.

### *Cool communities home energy star rating quiz*

| | | | |
|---|---|---|---|
| 1. | Does the main living area of your home face north? | Yes | No |
| 2. | Do you have large windows facing north? | Yes | No |
| 3. | Do you have small – or no – windows on the south side? | Yes | No |
| 4. | Is your home built of brick or stone? | Yes | No |
| 5. | Does your home have concrete slab floors? | Yes | No |
| 6. | Is your ceiling insulated with R3.5 insulation or better? | Yes | No |
| 7. | Are your walls insulated with R 1.5 insulation or better? | Yes | No |
| 8. | Are your floors insulated either with good insulation material underneath or by thick carpet and underlay? | Yes | No |
| 9. | Do you have double-glazed windows?<br>(If you answered yes ignore the next 2 questions) | Yes | No |
| 10. | Do you have full, well-insulated, tight-fitting curtains over all your windows? | Yes | No |
| 11. | Do you have pelmets above the curtains? | Yes | No |
| 12. | Do you use good draught-proofing measures? | Yes | No |
| 13. | Is your garden landscaped to shield your home from cold southerly winds? | Yes | No |

Now calculate your cool star rating:

| | | |
|---|---|---|
| If you answered yes to all questions | 5 stars | Extremely cool! |
| If you answered yes to 10+ questions | 4 stars | Cool |
| If you answered yes to 7–9 questions | 3 stars | Just cool |
| If you answered yes to 5–6 questions | 2 stars | Uncool |
| Any less you are wasting a lot of money and energy! | | Very uncool |

# Regulating Firewood Trading and Use: Issues and Solutions

**Phil Clark, Policy Officer, Environmental Planning and Scientific Services, Department of Primary Industries, Water and Environment, Tasmania**

## *Problems associated with the use of firewood*

### Biodiversity

Degradation of habitat caused by the collection of dry firewood. (This is not directly related to the proposed policy on Air Quality so will not be discussed further here.)

### Health problems

Health problems are associated with high particulate levels in wood smoke from burning wood with 20% or more moisture content. There is an obvious need for an approach that results in the burning of firewood with a lower moisture content. However, addressing the sale and burning of firewood is a complex issue.

## *The issues – sellers and buyers*

EA estimates that approximately 50% of all wood burned is purchased (approx. 12% wood yards, 30% itinerant – backyard, newspaper and roadside – suppliers). These figures are supported in Tasmania.

Preliminary research shows that established wood yards are selling relatively dry wood. Anecdotal evidence indicates that some itinerant suppliers:

- deliver wood too wet to burn;
- deliver after dark or when customers are absent;
- supply firewood of a lesser quality than displayed on roadside;
- sell through a mobile number advertised in the paper;
- sell to customers who are sometimes insufficiently assertive to refuse bad wood.

Consumers are forced to mix these loads of wet wood with dry wood, creating excessive emissions (or they go without heating if they cannot afford dry wood).

The main difficulty in controlling itinerant sellers is their anonymity for taxation and other economic and legal purposes. This enables them to avoid Forest Practices Code conditions for logging operations over 100 tonnes and to sell wood cheaply and hold market share.

Regulating against the sale of wet wood is not sufficient in itself. It is necessary to understand the issues within the industry, to ensure proposed regulations are equitable and efficient.

## *Response to public notice regarding proposal to regulate sale of firewood*

A blanket ban on selling wet wood would have a significant impact on business and employment (some merchants rely on selling green wood in summer) and raises a social equity issue as many people buy wood green in summer when it is cheaper, to dry it for winter. Wood offers 1kw heat energy for 1.8 cents, Hydro Heat 7.6 cents and gas 15 cents.

Both the price of dry firewood and the large market share of itinerant sellers are affected by wood yards' lack of access to sufficient wood to meet demand.

### *The issues – users and enforcers*

The moisture content of firewood is critical to smoke emissions, but even compliant wood heaters burning dry wood will generate excessive emissions if operated inefficiently. There appears to be a need to regulate wood heater operation but, according to EPA Victoria, there has not been one single prosecution in Australia for excessive smoke emission, as it is difficult to find a legally recognised and objective method for defining and measuring excessive emissions.

#### Brief overview of the issues – regulators

- To regulate against the public sale of firewood with >20% (wet) moisture content raises economic and social equity issues.
- It is not currently practical to permit some wood sellers to sell green wood during summer because of the absence of facility in existing legislation.
- Other states are searching for a methodology to develop an objective measurement for smoke emissions, but it is proving elusive.
- Would regulation address the problem associated with some itinerant sellers?
- The Department of Justice and Industrial Relations is having difficulty enforcing the statement of measure and cost/unit measurement required under the *Trade Measurements Act 1999*. Is there any reason to believe that regulating against the sale to the public of green wood would meet a better fate?
- Would regulation disproportionately disadvantage wood yards who are, by and large, doing the right thing?
- Given the current lack of structures in place for controlling wood collection, would prohibiting the sale of green wood lead to itinerant sellers having a greater impact on habitat?

### *The Department's current proposed approach*

These complexities within the firewood industry confirm Environment Australia's assertion that the regulation of the firewood industry is not a simple process and that changing people's perceptions and behaviour about using firewood is critical. The DPIWE is currently taking the first step towards addressing these perceptions through its proposed draft Environmental Protection Policy on air quality which will include:

#### An accreditation process for wood yards requiring sellers to:

- sell firewood only by measurement;
- comply with maximum 20% internal moisture content between April and August;
- include a statement of moisture content and the seller's name, address and phone number;
- when moisture of wood sold >20%, include a statement of how long the wood must be stored to dry before it will be suitable for burning;
- provide a brochure containing wood-heater operation guidelines; and
- record volumes and source of all firewood sold.

#### A formal set of guidelines for wood-heater operation, which recommends:

- buying from accredited sellers;
- burning wood with internal moisture content < 20%;
- using smaller pieces when lighting;
- burning on high for 30 minutes after lighting;
- burning on high for 20–25 minutes after adding additional wood;
- a minimum gap of 2 cm between pieces of wood;
- positioning wood from back to front in firebox;
- not overfilling heater;
- checking flue for smoke emissions; and
- keeping heater flue and cowl in good working condition.

It is anticipated that this approach will allow for further data collection and the potential future licensing of wood yards and/or regulation of the moisture content of wood sold to the public, as appropriate. It will also allow the government to manage issues other than just wood smoke.

The draft Environment Protection Policy and associated Regulatory Impact Statement will be publicly available in the near future for stakeholder comment.

# Firewood a Conservation and Human Health Issue

# Session 3: Smoke Pollution and Human Health

## Wood Smoke Reduction Scenarios for the Tamar Valley

**Michael Power, Department of Geography and Environmental Studies, University of Tasmania**

A diagnostic wind field model and Gaussian puff dispersion model were used to simulate current wood smoke dispersion in the Tamar Valley for poor dispersion conditions in winter 2000. This base scenario was modified to define the scope of Launceston's wood smoke problem and to assess the impact of different wood smoke reduction strategies, by determining:

- The number of wood heaters that the Tamar Valley can support.
- The effects (at 2008) of doing nothing extra to mitigate wood smoke levels.
- The likely effect (at 2008) of the introduction of reticulated natural gas to the Tamar Valley assuming.
  - the conversion rate from wood to gas heating is similar to that experienced in Canberra (66%);
  - the conversion rate is half that experienced in Canberra (33%);
- the effects of a ban on open fires and non-certified wood heaters;
- the extent to which Launceston emissions affect the entire valley:
  - the degree of wood smoke emissions that are advected into Launceston; and
  - the effect of Launceston alone.

### *Results*

#### The base scenario

This scenario characterises wood smoke dispersion under typical poor dispersion conditions for winter 2000. The wood smoke plume covers the entire valley axis with a mean concentration throughout the region of 3.0 μg/m$^3$. The spatial-maximum concentration was 89.7 μg/m$^3$, with many cells exceeding the national goal of 50 μg/m$^3$ and many more approaching it.

On poor dispersion days in summer, when wood heaters are not expected to be in use, values of up to 25 μg/m$^3$ have been recorded in Launceston, indicating the effect of non-wood smoke sources of particles such as diesel motor vehicles, hazard reduction burns, industrial and natural sources. Adding this to the wood smoke component gives a value of approximately 115 μg/m$^3$ suggesting that, in order to meet the national goal of 50 μg/m$^3$, the wood smoke component must be reduced to 25 μg/m$^3$ or less.

#### The carrying capacity of the Tamar Valley

Running the model twice more, assuming 10% and 30% of households are woodburners, allowed a linear relationship to be defined between the number of wood burning households and the spatial-maximum concentration within the valley. This suggests that Launceston can only support 4,890 wood heaters, operating under current conditions, before the maximum concentration exceeds 25 μg/m$^3$.

#### Maintaining the status quo

Wood heater use is currently on the decline in the Tamar Valley, with an additional trend towards the use of certified heaters. Education campaigns should result in slightly reduced emissions due to more efficiently used heaters. The prediction for 2008, allowing for these trends to continue without other wood smoke reduction measures, is a significant improvement in concentrations at the most polluted site (a 37 % reduction to 57 μg/m$^3$) but values exceeding 25 μg/m$^3$ are still frequent.

#### Introduction of natural gas

The introduction of natural gas is expected by mid-2002. In the ACT, 66% of wood-burning households had converted to gas heating within 17 years of reticulated gas arriving.

Two simulations were produced. The first assumed a 66 % reduction in the number of woodburning households. This is not realistic, given the vast social and economic differences between Launceston and Canberra. However, if it did happen it would solve Launceston's wood smoke problem, reducing the concentration at the most polluted site to 22 μg/m$^3$ (76% reduction).

The second scenario assumes that Launceston's conversion rate will be half that of Canberra, i.e.

33%. This will cause a significant improvement at the most polluted site (a 52% reduction to 43 μg/m³) however values exceeding 25 μg/m³ are still frequent.

**Banning the use of open fires and non-certified heaters**

This scenario assumes that by 2008, 50% of the banned users will convert to cleaner burning, certified heaters; 40% will convert to a non-polluting source of heating; and the remainder will fail to comply. It also assumes slightly reduced emissions as a result of education campaigns. The prediction is a 65% reduction in concentrations at the most polluted site (to 31 μg/m³). A ban would be politically difficult to implement but would come close to solving Launceston's wood smoke problem.

**Launceston's emissions**

The first scenario mirrors the "base scenario", however the Launceston equivalent source is turned off. This was to see whether concentrations at the most polluted site are the result of Launceston emissions alone, or whether smoke is advected into the region from upwind sources. This showed that only about 4% of the $PM_{10}$ concentration within Launceston is attributed to other regions.

Wood smoke from Launceston disperses throughout the entire length of the valley, however concentrations drop rapidly with distance. Elevated values (exceeding 15 μg/m³) are limited to a narrow band stretching up to 14 km from the Launceston source boundary. By the time the Launceston plume reaches the coast, concentrations are reduced to 2 μg/m³.

These two scenarios suggest that financial incentive packages should be restricted to households within the Launceston source to maximise returns.

### *Conclusions*

As public education schemes continue and non-certified wood heaters are replaced with certified heaters, Launceston's air quality will improve significantly by 2008. However the national goal will still be exceeded. The introduction of reticulated natural gas to Launceston will improve particle concentrations but they will most likely still breach the national goal. Further measures are urgently required.

Modelling results suggest that financial incentives should focus on the Launceston region rather than the entire valley. A ban on the use of open fires and non-certified wood heaters will come close to meeting the national goal but would be an unpopular measure. The best solution will probably adopt a number of different approaches simultaneously, achieving improvements wherever possible. Detailed modelling is required to assess the likely effect of any proposed combination of remediation schemes.

## Wood Smoke Harms Your Lungs

### James Markos, Chairman, Tasmanian Branch, The Australian Lung Foundation

Wood smoke creates fine particle pollution. This collects within the populated valleys of Tasmania in winter and lingers close to the ground because of temperature inversion layers.

### *Health hazards*

Fine particle pollution mostly affects those with pre-existing lung disease, especially asthma, chronic bronchitis and emphysema.

Fine particles have been reported as daily PM10 levels (particulate matter under 10 microns in diameter). The concentration of these particles is measured as micrograms per cubic metre of air per day. The levels in cities in summer are usually 1 – 20 μg/m³. The studies have shown that for every rise of 10 μg/m³ of daily PM10 there is an increase of:

- 1% in daily deaths from all causes;
- 3% in daily deaths from lung causes;

- 3% in daily admissions to hospital for lung disease;
- 3% in daily lung symptoms in the general population.

Particle pollution accounts for 1000–2000 premature deaths per year in Australia (1–2% of all deaths) and the health effects cause the loss of nine million 'activity' days (from work or pleasure) per year.

### *High particle levels in Tasmania*

Levels of wood smoke reach dangerously high concentrations in populated Tasmanian valleys such as the Tamar Valley. Measurements of particle levels in 1991–93 showed PM10 levels as high as 200 μg/m$^3$ and average annual levels of 40 μg/m$^3$. These are the highest levels recorded in Australia. The National Pollution Inventory in 1995 calculated that 96% of the particle pollution in Launceston arose from wood smoke from home heating.

### *National pollutant standards*

The National Environment Protection Measure (NEPM) was introduced in 1998. This set a standard for six major pollutants to be achieved by 2008. The six pollutants are particles, nitrogen oxides, sulphur dioxide, carbon monoxide, ozone and lead. Of these, particle pollution was recognised as the major pollutant in terms of the health effects and the cost to the community. The 'acceptable' limit for a daily PM10 concentration was set at 50 μg/m$^3$. This was a compromise between what is 'safe' according to scientific data (which show no threshold safe value above the low summer values of 1 – 20 μg/m$^3$) and what the government considered was practically achievable. For each of the six pollutants, exceeding the NEPM level is allowed up to five days per year. The Tasmanian Government signed an agreement in August 1998, undertaking to meet the NEPM standards by 2008. The only pollutant not meeting these standards at present in Tasmania is particle pollution.

### *Lowering of particle levels in Tasmania*

There has been a lowering of the PM10 levels in Tasmania since 1991 when they were first measured in the Tamar Valley. However, the falls have plateaued and the levels remain unacceptably high. The maximum daily PM10 levels were:

- 121 μg/m$^3$ in 1997;
- 122 μg/m$^3$ in 1998;
- 92 μg/m$^3$ in 1999 (a milder winter);
- 108 μg/m$^3$ in 2000.

The number of days per year when daily PM10 levels exceeded 50 μg/m$^3$ were 47 days in 1997, 45 days in 1998, 38 days in 1999 and 36 days in 2000. The improvement can be explained by a change from wood fuel to electrical heating since 1991. The proportion of Tasmanian homes with predominantly electrical heating increased from 27% in 1992 to 42% in 2000. Some of the improvement may be attributable to a more efficient burning of wood fuel. Indeed, those who wish the use of wood fuel to continue believe that the NEPM levels can be achieved simply by the use of approved wood heaters and dry wood and the correct usage of wood heaters. However, there is no evidence to support this, since high levels of PM10 persist, despite the switch to electrical heating and campaigns to educate the community about correct usage of wood heaters.

### *The future*

The current levels of particle pollution in Tasmania in winter are not safe, particularly for people with chronic lung disease (estimated at one in five Australians). Truly safe levels (daily PM10 under 20 μg/m$^3$) are not likely to be achieved unless all wood fuel usage is stopped. To meet the 'acceptable' levels set by the NEPM (daily PM10 under 50 μg/m$^3$), there needs to be a further reduction in wood fuel consumption. The improvements achieved in Tasmania since 1991 cannot be expected to continue.

Those residents who can switch to alternative heating are likely to have done so already. Education campaigns have had a limited benefit. Many residents claim they cannot afford to switch to electrical heating, because of the capital cost of an electrical heater ($1000 – $3000) and/or the annual electrical heating bill (perhaps $500 per year) compared to a reported $50 per ton for firewood (perhaps $250 per year). Some residents regard their total cost for wood fuel as $0 if they collect their own and do not consider their personal costs for chopping, transporting and storing the wood. The proposed supply of gas to Tasmania in 2002 is not likely to have a major impact on wood fuel consumption because people will make the same cost comparisons as for electricity.

The government (federal and Tasmanian) should provide incentives and assistance to switch to cleaner home heating options, especially electric heating, e.g. interest-free loans for new electrical heaters and/or a wood heater buy-back scheme. Replacement of all wood heaters in Housing Commission homes with efficient electrical heaters, coupled with lower electricity tariffs for

these heaters (e.g. 30% discount), all at taxpayers' expense, would assist the most financially disadvantaged. Financial incentives to improve the insulation of homes would reduce the cost of heating.

If the NEPM PM10 levels are not reached within the next few years, then regulations should be introduced one or two years before the 'deadline' in 2008.

At present, Tasmania provides the cleanest source of electricity in Australia, because of its current exclusive use of hydro-generated electricity. An increased supply of electricity from renewable sources would be needed to meet the demand for additional home heating in Tasmania and would lessen home heating costs in the long-term.

Additional hydro-electric energy is not available, but Tasmania is well placed to harness wind energy and solar energy for these purposes. There is a role for government to further support these options to achieve commercial viability and public availability. In turn, this will help those with lung disorders by reducing winter wood smoke pollution.

Remember the slogan of The Australian Lung Foundation:

> ***"When you can't breathe nothing else matters"*** TM

## Good Wood Heater Operation: Better Efficiency, Less Smoke

### John J Todd, School of Geography and Environmental Studies, University of Tasmania

In some areas, because of poor dispersion, the concentration of smoke particles in the air is well above acceptable levels. Using a wood heater correctly can reduce smoke emissions by 50–90%.

New wood heater models comply with Australian Standard AS 4013 and produce less than four grams of smoke particles for every kilogram of wood burnt (assuming that the heater is operated correctly) – about 1/3 of the typical emission from pre-1992 wood heaters. Some produce two grams of smoke particles or less. If buying a new heater, ask about the emission factor.

Open fireplaces produce more smoke (about 15 grams of smoke per kilogram of wood). Make sure the fire burns well rather than smouldering. If you have other forms of heating in the house, do not use the open fire if moderate or poor air quality is forecast.

Wet wood burns poorly and produces much more smoke than dry wood. Store firewood in a well-ventilated shed or other covered area. About 50% of the weight of live trees is water. The heat required to boil off the water wastes energy and means the fire is cooler, so less of the gas ignites and smoke increases. If you buy wood that seems very wet, ask Consumer Affairs to check the moisture. You may be able to get compensation/replacement. (Also see paper *What Makes Good Firewood* – see Section 2 of this conference).

All heaters smoke for 5–10 minutes after they are lit or refuelled but a post-1992 heater should not produce visible smoke after 10–15 minutes. With careful operation, even old heaters can produce almost no visible smoke once warmed up. Continuous thick white smoke means the wood is too wet and/or the heater is not being operated correctly (see the advice below).

### *How and why a heater burns cleanly*

Check the smoke from your flue to work-out how to get a clean burn from your particular heater.

Always run the heater on the high burn rate (air controls fully open) for 20–25 minutes after re-

loading, particularly before turning the heater down for overnight burning. Wood goes through three main phases when it burns:

1. The first phase is drying, which absorbs energy while the increasing temperature causes the wood to undergo chemical change and gas is released. This is when the highest concentrations of smoke are produced. If there is a vigorous flame, most of the smoke is burnt up before it gets to the flue. With little flame, gases escape unburnt and form droplets of tar and creosote as they cool.
2. In the second phase of combustion, burning kindling ignites the gases from the new wood. The fastest release of gas occurs in the first 20 minutes or so after refuelling a hot heater, when air must mix with the gas in order to burn. So the air control should be fully open for the first 20 minutes. This phase releases about half the energy in the wood.
3. In the third phase, a residue of almost pure carbon remains (charcoal). This burns with very little release of smoke so the air supply can now be reduced.

Do not over-fill the heater. Use logs that fit at right-angles to the firebox door without blocking the incoming air supply, which is usually drawn down the inside of the door (leave at least 5–10cm between the front of the logs and the door). This helps prevent creosote staining the glass. If a large log is loaded parallel to the heater door, it will stop air reaching the base of the fire. Do not force in a piece of wood that is too long for your firebox. If it is touching the window in the door, the force of latching the door might crack the glass. Also, volatile gases coming out of the end of the log will condense and leave creosote on the glass.

There must also be room above the logs for flame to develop and burn off the gases and space for gas and air to mix together in a turbulent flame. If they do not mix until they reach the flue, they will be too cool to ignite and the gas condenses into droplets of tar, causing smoke. Leave at least 2cm between each log in the firebox, to allow air to reach the hot area of the fire.

If the fire has burnt down to glowing coals, there will be enough heat to release gas from wood that is added, but not enough to ignite the gas. Add some newspaper and smaller pieces of wood when refuelling, to create a flame to ignite the gas.

Warm up a cold heater quickly by using sufficient dry kindling to establish a good fire. In a cold heater, flames cool down as heat is transferred to the cold metal. If they cool too much, they will go out. When first lighting the heater, put a few loosely crumpled sheets of newspaper on top of the fuel load (as well as newspaper or firelighters under the kindling). This will heat the flue and create the necessary draught to stimulate the fire.

Use smaller logs to establish the fire and for high heat output; use larger logs for slower burning. Smaller logs allow the flame and hot gas to circulate through the wood load in the heater, causing faster release of gas and so more flame and a hotter fire. Larger logs have less surface area for a given weight so they release gas more slowly and the fire will burn more slowly.

Check your heater flue for smoke occasionally. If there is a lot of visible smoke more than 15–20 minutes after lighting or refuelling, try moving the logs around or adding more newspaper to get the fire burning better. Use trial and error to find the best ways of loading fuel for your heater. Unburnt wood-gas condenses into droplets of tar when it cools down to 40° or 50°C. The thicker the smoke, the more particles are present. It usually has a white or faint blue appearance. Black smoke contains a lot of carbon/soot, suggesting the fire is too hot and may damage the heater or flue.

Keep your heater in good working order. The flue should be checked each year and cleaned if necessary. If the flue is partially blocked, it slows the flow of air, making the fire smoky and harder to light. If the creosote in the flue catches fire, the flue may be damaged and need to be replaced.

Wind creates complex air flows around a house. Some air is drawn down almost to ground level. If this layer of air includes the smoke from your heater it can cause serious air quality problems for your neighbours. Increasing the height of the flue may discharge the smoke into higher layers of air that pass well over neighbouring properties. Before extending the flue, make sure the heater is correctly installed because it will probably run hotter with a taller flue.

A well-operated heater should produce very little smoke. If you have tried the suggestions above but your heater is still producing too much smoke, ask the business that sold you the heater to organise an inspection because there might be something wrong with your heater.

### *Some common mistakes in operating a wood heater*

If your wood heater seems harder to light, the flue may be blocked with creosote or ash may have built up on top of the baffle to such an extent it is stopping the heater drawing well. A wire coathanger can be used to scrape the ash off the top of the baffle. If the baffle is clear, get the flue checked and swept if necessary.

Give the fire attention in the first 10–15 minutes. Add logs while the kindling is burning brightly. If the kindling has almost gone, add more kindling and paper before adding the logs.

Large logs placed directly onto kindling may smother the fire and cause it to smoulder. If you want larger logs in the fire from the start, put some at the side of the firebox and place new logs on top of these to prevent them smothering the kindling.

If there is plenty of wood still in the firebox but no flame, open the air supply then add some newspaper and light it. The resultant flame will burn most of the smoke.

When you plan to turn the fire down low (for overnight burning or when you go out) add the fuel load 20 minutes earlier so that gases can burn off quickly before the heater is turned down.

## The Direction of Regulations Applying to Air Pollution in Tasmania

**Phil Clark, Policy Officer, Environmental Planning and Scientific Services, DPIWE**

The Department of Primary Industries, Water and Environment is in the process of developing an air quality policy for Tasmania. The proposals for the policy indicate the future direction of regulation in respect of air pollution in Tasmania. A brief overview of these proposals follows.

The activities considered to be directly associated with air quality in Tasmania involve those connected with:

- industry;
- woodheater sales and operation;
- backyard burning;
- planned burning (regeneration, fuel reduction, land clearance and habit management burning); and
- firewood sale and use.

One of the main reasons for developing this policy is to provide a legal mechanism and policy for implementing the Air NEPM – the nationally agreed standard for the 6 principal air pollutants ($PM_{10}$, CO, $NO_2$, photochemical oxidants, $SO_2$ and Pb) found in the community.

However, the policy also addresses the broad spectrum of atmospheric emissions relevant to Tasmania.

### *Industry*

Industry will be required to:

- Meet the accepted criteria for BPEM.
- Comply with DGLCs (based on the standards used by the Victorian EPA).
- Meet determinations on airshed reserve capacity.
- Observe in-stack guidelines as considered appropriate by the relevant regulatory authority (based on the standards used by the NSW EPA).

### *Woodheaters*

There are a number of proposed regulations concerning the sale and operation of woodheaters. These consist of:

- A prohibition on the sale of new woodheaters not complying with the current Australian Standard AS4013 (AS 4013:99 at 1 January 2001).
- A prohibition on the sale of secondhand woodheaters not conforming to any

AS4013 (in effect those manufactured pre 1993).

- A prohibition on modifying the combustion processes of AS 4013:99+ compliant heaters.

### *Backyard burning*

By far the greatest number of smoke complaints to local governments concerns backyard burning. It is proposed to ban **all** backyard burning on blocks less than 2000m² in area. It is considered appropriate, however, to allow local councils the discretion to amend this, through by-law, according to their individual needs.

### *Planned burning*

Planned burning generates complaints across a broad range of topics. The Department is working with Forestry Tasmania, the State Fire Management Council, the Parks and Wildlife Service and the Tasmanian Fire Service to gain a better understanding of the issues associated with the smoke generated from planned burning and to try to improve the guidelines for burning vegetation.

In this respect the Department is:

- Ensuring that efficient and effective air quality monitoring programmes are carried out.
- Supporting a uniform approach to recording and assessing complaints.
- Encouraging planned burning to be undertaken in a way that minimises the generation of smoke and improves the management of the smoke that is generated in a reasonable and practical way. One of the issues being investigated, which has the potential to achieve these aims, is to require an accredited officer to plan and to supervise high and low intensity burns.

### *Firewood sale and use*

The final approach to air quality is through the intent to reduce the moisture content of firewood that is burnt in woodheaters and fireplaces. The Department's proposals in this area were covered in the talk *Regulating Firewood Trading and Use: Issues and Solutions*, in Session 2 this morning. They involve accrediting woodsellers and promoting a set of guidelines for efficient woodheater operation.

I would like to add that these measures associated with the sale and use of firewood are only intended as an initial step while a greater understanding of the issues is being gained.

The development of the draft policy has been through two public submission stages in the past 18 months and there will be a final submission stage for the draft policy and associated Regulatory Impact before the end of this year. It is intended that the Policy will be in operation early in 2002.

# Firewood a Conservation and Human Health Issue

# Outcomes and Recommendations from the Conference

## Letter to the Tasmanian Premier, Jim Bacon

Hon Jim Bacon
Premier
Parliament House
Hobart 7000

27 June 2001

Dear Premier

**OUTCOMES OF TCT FIREWOOD CONFERENCE
LAUNCESTON, 18-19 JUNE**

As we discussed on Friday evening, the TCT's recent conference on 'Firewood - a Biodiversity Conservation, Consumer and Human Health Issue' was a great success. The degree of consensus among attendees from the full range of stakeholders in the firewood industry and the issues surrounding it was quite remarkable. For your interest, I have attached a list of conference attendees. I think it was best summed up by Associate Professor John Todd who, on opening proceedings on the second day, remarked that the apparent differences between us had turned out to be just that - apparent, but not real. It was also he who best summed up the mood and feeling of the meeting when presenting his paper in saying that, after ten years of intense - but ineffective - public education campaigns, "it's time to get tough"!

In deference to the sensitivities involved in bringing so many different - and possibly differing - interests together, the TCT did not attempt to force adoption of resolutions and a communique upon attendees but, instead, scheduled substantial opportunities for all attendees to participate in discussions on the three critical issues (biodiversity conservation, consumer protection and human health impacts) culminating in a final discussion session. Nevertheless, attendees were keen to place on record the remarkable level of agreement on how these three key problem areas should be dealt with and to work together in pursuing their prompt resolution. The TCT, as host and organiser of the conference, was asked to write a letter to yourself, as Premier, setting out those matters over which there was general agreement.

I therefore have the honour and the privilege of setting out below some of the important deliberations and critical conclusions of the conference which we trust will inform and drive your government's response. Before doing so, may I express our appreciation not only of the Commonwealth's financial support for the conference by way of a Natural Heritage Trust Bushcare Program grant but also of the many presenters who went to so much trouble in preparing and presenting their papers. I have also attached a copy of the conference programme identifying these presenters.

The critical conclusions of the TCT firewood conference were as follows:

1. **We urge you to immediately establish a State Firewood Working Group, with broad representation from all relevant government agencies and non-governmental interests, to develop the State Action Plan following the anticipated adoption of a National Firewood Strategy at the forthcoming ANZECC meeting in Darwin later this week.**

   This approach has worked well in the ACT and is credited with their success in developing new and innovative measures to address consumer and health issues within the ACT and with the drive for a national approach as, incredibly, the biodiversity impacts of firewood use in the ACT occur primarily in NSW, at distances of up to six hundred kilometres.

   We are also mindful of the useful initiative taken by David Llewellyn, at the TCT's request earlier this year, to establish an interdepartmental committee, chaired by DPIWE, to coordinate a whole-of-government approach to the development of the ANZECC National Firewood Strategy. We would like to suggest that the proposed Working Group be established by expanding the membership of the existing IDC to include the identified range of experts and representatives from outside government and by providing adequate secretarial support.

In the meantime, we decided that we would establish an Interim Firewood Working Group drawn from conference attendees. Some individuals with appropriate expertise and/or representing important interests and organisations were identified at the conference while other individuals undertook to sound out their organisations with a view to securing appropriate representation.

As hosts of the conference, the TCT undertook to provide secretarial support for this Interim arrangement pending a decision of your government to formally establish a suitably constituted State Firewood Working Group. A list of the groups and individuals invited to participate in this Interim arrangement is attached.

2. **We would like to see effective controls introduced and enforced to ensure a genuinely sustainable firewood industry is established in Tasmania. Importantly, it was agreed that environmental, economic and social sustainability issues were at stake and all had to be effectively addressed. In the words of John Todd - it's time to get tough!**

We were all aware that to get general agreement on the need for a regulatory approach to firewood collection, trade and use was a remarkable achievement. We were conscious that such an approach is currently at variance with thinking within some government agencies but were adamant, nonetheless, that such controls are necessary and justifiable - and that their development and introduction should be pursued with some urgency.

**With respect to environmental issues**, a presentation by Chief Forest Practices Officer, Graham Wilkinson, set out the regulatory regime which might apply based on his experience regulating the forest industry. In summary, this involved:

- requiring all landholders and woodcutters harvesting 100 tonnes or more of timber a year to: a) comply with the provisions of the Forest Practices Act and Forest Practices Code; b) be licenced and accredited to sell wood; and c) participate in appropriate training and education programmes.
- requiring all landholders and woodcutters harvesting less than 100 tonnes/year (and thus not covered by the Forest Practices Act/Code) who sell or trade that wood to: a) be licenced and accredited to sell wood; and b) participate in appropriate training and education programmes.
- encouraging all landholders and woodcutters harvesting less than 100 tonnes/year for their own use and not for sale, to participate in appropriate training and education

It was felt that adapting the self-regulatory Forest Practices Code to establish the rules for firewood harvesting whether in conjunction with industrial forestry operations or separately could be done fairly readily. As for the issue of which areas might or might not be available for firewood harvesting, there was gratifying agreement that enforceable rules are needed. The Code already has provision for the delineation and protection of 'vulnerable land' and respect for reserves which could be adapted for this purpose.

We were particularly keen to ensure that any such controls should engage landholders as well as those engaged in forestry or firewood activities. As you will be aware, the twin issues of which areas of native vegetation should be protected from landclearing and which of those areas should be reserved are currently being debated in a number of fora across the State and, hopefully, can be resolved in a timely and appropriate manner for inclusion in a State Firewood Action Plan.

Among other matters, there was gratifying support for the idea that environmental values and impacts should be properly costed (with respect to both biodiversity and human health impacts) and reflected in landholder pricing and allocation decisions and attendees were particularly keen to pass on these concerns to both Forestry Tasmania and DPIWE.

**With respect to economic issues**, the call from wood traders for effective controls that would prevent illegal and unlicenced 'wood-hookers' from undercutting them was well received and universally supported. This was the critical point of difference between DPIWE and the rest of us. Both Katherine Maxwell from the ACT and Graham Wilkinson from the Forest Practices Board were adamant that a well-enforced regulatory system was essential to ensure equity - so that those who do the right thing are rewarded and those who do not are penalised. Voluntary codes and charters are simply unfair and counter-productive by disadvantaging the righteous.

We envisaged that controls over firewood traders would involve:

- documentation of who and where the firewood they purchased came from so that assurances with respect to biodiversity conservation can be given to government and to customers;
- compliance with dry firewood moisture content limits (15-20% by weight) so that neither wet nor overly dry firewood is sold;
- not trading without a licence or appropriate accreditation so that 'woodhookers' can readily be identified and penalised; and
- phasing in of controls to avoid disruption and disadvantage to licenced operators.

One of the firewood traders present demonstrated a $150, hand-held moisture meter which could instantly determine the moisture content of wood with the same reliability and accuracy as the more sophisticated device brought along by John Todd. Certifying such a device for general use in the trade should be straightforward.

While DPIWE was concerned that not allowing trading in wet wood would unduly upset existing trading patterns, those wood sellers present were the first to point out that selling a high quality, dry product was critical to establishing a viable industry. Meanwhile, those concerned for household consumer interests and health impacts from smoke were adamant that only dry firewood should be traded because households could not be reasonably and safely relied upon to ensure adequate drying of wet wood before burning.

**With respect to social issues**, it was recognised that firewood prices will have to increase significantly if a sustainable firewood industry is to be established. There was real concern that this could selectively impact upon the less well off in our community and we spent considerable time discussing how to reconcile the competing issues of restricting the use of firewood to prevent health and mortality problems associated with wood smoke pollution while maintaining access to firewood as the cheapest heating option currently available bearing in mind that poorly heated homes also contribute significantly to poor health.

With these concerns in mind, a number of ways forward were canvassed:

- the firewood harvesting regulatory regime proposed does not constrain those collecting firewood for themselves and their families - thus exempting many households, especially in rural areas where pollution problems are not so great, from any new controls;
- Aurora has been aggressively developing and marketing cheap home heating options which have significantly reduced the energy cost margins between firewood and electricity;
- despite evidence of human health and mortality problems presented by Launceston respiratory physician, Dr Jim Markos, we were reluctant to advocate an immediate and total ban on the use of wood heaters in Launceston or anywhere else on the understanding that the 'get tough' controls advocated by Dr Todd were immediately introduced and effectively policed;
- Bill Casey, of Pellet Fires Australia, demonstrated a wood pellet fire of the kind widely used in North America and more recently, in New Zealand, which operate at much higher energy efficiencies than wood-burning stoves, with much lower levels of pollution; and
- there may be a role for government in ensuring that all homes are adequately heated, irrespective of household income.

**3. Importantly, both Dr Todd and Dr Markos agreed that the government's current proposal before the Commonwealth asking for NHT funds to support a wood heater exchange program in Launceston was misconceived.**

It was generally felt that such a program would:

- be very poor value for money compared to other options,
- exacerbate the disadvantages already suffered by poorer people; and
- distort home heating choices by the better off.

There was a strong feeling that our proposed Firewood Working Group is the appropriate forum where these kinds of economic incentives for change should be developed and where opportunities for local commercial initiatives can best be evaluated and exploited.

We are keen to create a forum where a pooling of expertise, experience, ideas and interests can be used to develop and seek funding and other necessary support for a comprehensive package of

initiatives, pilot studies, trials and education programs to drive ongoing implementation and evolution of the Firewood Action Plan.

4. **We were all adamant that the introduction of a comprehensive control regime must be accompanied by the allocation of adequate resources to ensure effective enforcement of the new rules by all relevant agencies and especially local government.**

   As for voluntary codes and charters, ineffective enforcement of regulatory controls can disadvantage those who want to do the right thing and undermine the credibility not only of those controls but also of education programmes supporting them. We earnestly hope that the government will take note of the considered and informed advice of those from within its own jurisdiction and benefit from the experience of others.

   We were mindful of the likelihood that local government will be identified as having an important role to play, especially with respect to ensuring compliance with any rules which might be set for household smoke pollution controls, mainly in built up areas. The sensitivities of local government to having additional responsibilities thrust at them without matching offers of adequate resourcing are well understood and appreciated. We are thus keen to ensure that local government is not reluctant to participate in the development of a Firewood Action Plan on account of resourcing concerns.

5. **Woodsmoke pollution is a serious health hazard - it can ruin your health and kill you. There was considerable frustration at the apparent reluctance of the government to take smoke pollution seriously as a health issue.**

   One of the highlights of the conference was the presentation by Dr Jim Markos, Launceston's one and only respiratory physician and there are a number of points which need to be recalled in this context:

   - winter particulate air pollution in Launceston attributable to wood smoke from domestic heaters has not reduced to an extent commensurate with the reduction in the number of wood heaters. The inference being that those who are going to respond to education programmes and economic signals have done so, leaving a pool of recalcitrants.
   - evidence of a reduction in air pollution in Launceston over recent years is significantly confounded by changes in measurement and reporting methodologies - the problem remains unacceptably bad.
   - Australian governments' proposed NEPM (National Environmental Protection Measure) standard for air quality of no more than 5 exceedances a year of 50 ppm of PM10 (less than 10 microns) particulates, scheduled for implementation in 2008, will not deliver clean, safe air.
   - such small particle air pollution kills people. A number of unrelated studies in cities in other countries show a remarkable degree of agreement for the central conclusion that chronic exposure to PM10 smoke pollution will increase the rate at which people are dying by 1% for each 10 ppm increase over 10 ppm. In other words, governments' chosen 'safe' level of 50 ppm can be expected to deliver a 4% increase in human mortality.
   - a wood heater exchange programme will not ensure compliance with a 50 ppm of PM10 particulate smoke pollution standard - let alone a 10 ppm one!
   - mortality rates for people with other respiratory and cardiac complaints and diseases can be exacerbated by wood smoke to an even greater extent. For instance, people with cardiac disease could be expected to show a 15% increase in their death rate compared with the general population when chronically exposed to 50 ppm of PM10 pollution.

   As discussed above, social equity concerns made people reluctant to endorse Dr Markos' call for wood heaters to be banned in Launceston but there was complete agreement on the need to 'get tough' to ensure only dry wood was burnt and only in properly operated and suitably designed heaters. Dr Markos did agree that, if properly operated, high quality wood heaters, such as the pellet fire from North America, could be shown to be ultra-low polluting, then perhaps wood heating might have an ongoing role in Launceston's home heating market.

6. **The manufacture, sale, installation and use of woodheaters (and the fuel they use) needs to be regulated to ensure design specifications for emissions of wood smoke (and other**

**pollutants) are met in practical operation and that controls exist to ensure that households which cannot or will not meet such specifications can be restrained from using such heaters.**

Dr Markos' forebearance - and that of the rest of the community - cannot be expect to last for long. If firm and prompt action is not taken and, if it does not deliver large and adequate decreases in air pollution, then banning wood heaters in Launceston will become inevitable.

Particular note was taken of the results of one study reported on by Associate Professor Todd which revealed that many, if not most, accredited low-pollution wood heaters have been disabled, often prior to delivery and installation. This is done to allow them to be damped down sufficiently to allow them to stay in overnight - even if they smoke excessively! Amazingly, accreditation applies only to the manufacture a low-pollution stove and it is not an offence to interfere with or improperly operate an accredited heater.

As Associate Professor Todd discussed on Hobart ABC Radio on Thursday morning, if a household continues to operate its wood heater incorrectly or to continue to use a poorly performing model, despite having been warned several times, government must have the power to prevent its continued use.

The sad reality is that, like passive cigarette smoke, one person's indulgence is another person's health problem. The wider community, especially those living in low-lying suburbs, are entitled to expect government to protect them from others, especially those in hillside suburbs.

As discussed above, insofar as local government is likely to be identified as the most appropriate level at which such household regulations should be applied and enforced, it is important that any Action Plan makes adequate provision for the resources necessary to implement such a control regime.

**7. Experience over the last 10 years, in both Tasmania and the ACT, has shown that voluntary programmes have not worked. It's time to move on.**

There was a strong sense that this is the last chance for the firewood industry to clean up or be closed down. We very much want to take this opportunity to work with you and your government to develop a package of measures which can be adopted not only by government but also by every other stakeholder as a Firewood Action Plan for Tasmania.

It was particularly pleasing to note the extent to which those of us particularly concerned for biodiversity or human health impacts were keen to recognise each other's concerns and readily agreed on the necessity to develop a single Action Plan which would deal effectively with all concerns over the use of firewood in Tasmania.

In developing such an Action Plan, it has to be recognised that the uniquely Tasmanian habit of itinerant traders selling wood of dubious provenance and quality through mobile phones and roadside displays will be adversely impacted. Indeed, it would be fair to say that one of the principal objectives of such a Plan is to force such itinerant roadside traders to stop 'wood-hooking'.

**8. Lastly, it needs to be remembered that a sustainable firewood industry is one which does not remove oldgrowth and standing dead trees and fallen wood, from forests and woodlands but, instead, relies on regrowth and plantation-grown wood.**

An excellent series of presentations on the importance of dead wood for biodiversity conservation in dry forests and woodlands at the end of the first day of the conference not only triggered some important discussions but also facilitated general agreement that a sustainable firewood industry would be one which stopped removing old growth and dead wood from forests and woodlands. This led to a critical realisation - that the environmentally and economically viable firewood industry of the future will be dramatically different to the one we have today.

It was most gratifying to see the extent to which people from all interests and perspectives were persuaded that retaining old growth trees and standing dead and fallen wood is a 'good thing'. While the arguments in favour of retaining old growth trees where hollows provide nesting sites for many vertebrate species are well known, the extent to which dead wood is a source of food and shelter for countless fungi and insects which provide food for those reptiles, birds and marsupials was less well understood.

An excellent paper by Arthur Lyons of Private Forests Tasmania indicated that dedicated firewood plantations on private land have poor commercial prospects except on more productive sites. It would seem that firewood may have a role to play as a secondary market for plantations grown for timber and pulp, especially thinnings, but cannot compete directly with pulpwood at present residual stumpage prices. This situation could change if retail prices were to increase significantly. Meanwhile, the bulk of acceptably sourced firewood is likely to come from regrowth forests in suitable areas.

The significance of this change in approach and attitude cannot be underestimated. Traditionally, removal of standing and fallen dead wood for firewood has been regarded as an appropriate complement to 'tidying up' paddocks and encouraging regrowth to improve farm productivity. Persuading people that this material should be left behind for the sake of the local biodiversity is going to be no simple matter.

Also, trade in regrowth, rather than old growth or dead wood, is going to make it much more important to ensure that harvested wood is properly seasoned - for up to 18 months - before it will be dry enough to sell and burn. While the larger firewood traders can be expected to adopt this approach fairly readily, fully half the wood used in Tasmania is collected by small-time 'woodhookers' who can be expected to be harder to persuade to change their ways.

With good enforcement of controls supported by a determined education campaign, however, we are optimistic that those 'woodhookers' who want to operate sustainably can be welcomed into a new firewood industry while those who do not can be forced out of the trade. As above, it was felt that such a regulatory approach was fully justified where firewood is being traded and where biodiversity was in need of protection.

**In conclusion**, can I reiterate how exciting and rewarding it has been for the TCT to have organised a conference on such important environmental issues and to have elicited such a remarkable degree of consensus on what to do about the problems identified - which are frustratingly well known and understood. Copies of this letter are being sent to all attendees of the conference, not only to ensure that their views and interests have been fairly represented but, more importantly, to remind them that we all agreed to make separate representations to Ministers with a view to precipitating prompt and effective action by government.

As for how we take things forward from here, it was very much the strong conclusion of the conference attendees that, given that the important health, consumer and biodiversity issues cover several ministerial portfolios, the prompt establishment of a Firewood Working Group by you, as Premier, with an unimpeded mandate to advise Ministers on the adoption of a Firewood Action Plan is the most important place to start. As a courtesy, I have copied this letter to the three Ministers involved and to Senator Hill.

Yours sincerely,

Alistair Graham

cc: Hon David Llewellyn, Minister for Primary Industry, Water & Environment
Hon Judy Jackson, Minister for Health & Community Services
Hon Peter Patmore, Attorney-General
Senator the Hon Robert Hill, Minister for Environment & Heritage

encl: List of Attendees of TCT Firewood Conference
Programme of Speakers at TCT Firewood Conference
Proposed Membership of Interim Firewood Working Group

# Interim Firewood Working Group

## (Initially established at TCT Firewood Conference, Launceston, 9 June 2001)

At the conclusion of the Firewood Conference, attendees were adamant that the prompt establishment of a State Firewood Working Group, as had been done in the ACT, involving both agency and non governmental interests was essential if the problems associated with the firewood industry are to be adequately addressed. In anticipation of a government decision to establish such a Working Group **and** to encourage that decision, the conference agreed to establish an Interim Firewood Working Group.

### *Membership*

The following individuals, groups and organisations were canvassed for initial membership of the Interim Firewood Working Group:

| | |
|---|---|
| Greg Middleton | (DPIWE, Chair, ANZEC Firewood Strategy IDC) |
| Phil Clark | (DPIWE, Policy Officer, Air Quality Policy) |
| Graham Wilkinson | (Chief Forest Practices Officer, Forest Practices Board) |
| Associate Professor John Todd | (Dept. of Geography and Environmental Studies, University of Tasmania |
| Dr Jim Markos | (President, Tasmanian Branch, Australian Lung Foundation) |
| Alistair Graham | (Tasmanian Conservation Trust) |
| Peter McGlone | (Threatened Species Network) |
| Nick Jones | (Launceston firewood cutter and trader) |
| Arthur Lyons | (Private Forests Tasmania) |
| Rosemary Norwood | (Tamar Natural Resource Management Strategy) |

For those following organisations where no representative could be identified at the meeting, appropriate individuals were identified and asked to solicit the participation of each of them.

- Someone from the Nature Conservation Branch of DPIWE
- Someone from Forestry Tasmania (FT)
- Someone from the Tasmanian Farmers and Graziers Association (TFGA)
- Someone from the Local Government Association of Tasmania (LGAT)
- Someone from Launceston City and West Tamar Councils
- Someone from the Home Heating Association
- Someone from the Tasmanian Council of Social Services (TasCOSS)
- Someone from Anglicare Tasmania
- Someone from the Australian Consumers Association (ACA)

Rod Taylor (Marketing Manager, Aurora) agreed to participate as an advisory observer only.

# Firewood a Conservation and Human Health Issue