

## 2 Firewood from the Murray-Darling Basin; context and issues

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### 2.1 Context

The Australian and New Zealand Environment and Conservation Council (ANZECC) have issued the document: *A National Approach to Firewood Collection and Use in Australia* (ANZECC 2001). The national approach was developed by the Joint Standing Committee on Environmental Protection (SCEP) and Standing Committee on Conservation (SCC) Taskforce on Firewood, which has State and Commonwealth representatives, including participation from CSIRO. The first of the six broad strategies of the document is to “Improve the information base”. Table 1.1 summarises the actions from Strategy 1.

Table 1.1 Summary of actions from Strategy 1 in a *A National Approach to Firewood Collection and Use in Australia* (ANZECC 2001)

Action	Appropriate Jurisdiction	Suggested Timeframe	Expected outcomes
1. Determine where and how much firewood is being collected.	All States, Territories, CSIRO and Commonwealth.	2001-2002	Better targeting of education and on-ground conservation efforts.
2. Determine the impacts of different firewood collection practices in regional forest and woodland ecosystems.	All States, Territories, CSIRO, universities, firewood industry and Commonwealth.	2001 and ongoing	Improved ability to maintain the firewood industry without over harvesting the resource.
3. Determine the impact of firewood collection on biodiversity in particular regional ecosystems, and develop management guidelines.	All States, Territories, CSIRO, universities, and Commonwealth.	Ongoing	Identification of species at risk from firewood collection. Ecosystem specific management prescriptions to prevent species' decline and extinctions of dead wood dependent species.

In order to address this strategy, Environment Australia provided funding for a number of research projects. CSIRO Sustainable Ecosystems (CSE) (Driscoll, Milkovits and Freudenberger 2000) was commissioned by Environment Australia to address the first action. Through a review of existing literature, canvassing state agencies, and surveys of firewood suppliers and Australian households estimates were made on the amounts, sources, preferred species for firewood and identified the regions in which firewood is most likely to affect biodiversity at a regional scale.

Actions 2 and 3 have been addressed by the current project entitled: *Sustainable Firewood Supply in the Murray-Darling Basin*. The project was conducted by CSE to address the following research gaps/questions identified by Strategy 1 (ANZECC 2001):

- *what are the rates of accumulation of fallen timber, and sustainable rates at which to harvest it;*
- *what are the amounts, availability, and economics of alternative firewood sources;*
- *a guideline is required for calculating a sustained yield of firewood;*

- *data is required on the dead and live wood component of vegetation communities used for firewood collection and reconciled with firewood collection levels;*
- *the rate of natural regeneration and tree mortality in vegetation communities subject to firewood collection requires assessment;*
- *primary productivity of the native forest and woodland ecosystem is a key driver for sustainability;*
- *a model is developed to guide the sustainable harvest of timber resources; and*
- *whether firewood collection is likely to cause a decline in biodiversity in particular ecosystems*

This report also contributes to Strategy 5 (ANZECC 2001) i.e. “Develop a sustainable firewood industry, encouraging plantations, sustainable management of native forest and use of residues”. This project investigates the sustainability of harvesting in native forests and presents estimates of the minimum area of plantation forests required to supply firewood assuming that there will be no harvesting from native forests.

## **2.2 Objectives**

The key objectives of the project were to:

- Develop regional exploitation criteria for sustainable harvesting of firewood from woodland and forest communities in the Murray-Darling Basin (MDB).
- Identify the location, sustainable yield of firewood from those woodland and forest communities in the Basin that meet the exploitation criteria.

The project undertook six steps to achieving these objectives:

1. Developed three future firewood harvesting scenarios;
2. Developed specific exploitation criteria for each scenario;
3. Applied the exploitation criteria using a Geographic Information System (GIS) to develop a spatially explicit database developed for the forests and woodlands of the MDB;
4. Collected field data across the MDB to provide data for a forest growth and yield model, a volume function and evaluation of ecological impacts of firewood harvesting;
5. Developed a forest growth and yield model specific to the MDB lower rainfall areas; and
6. Applied existing models to estimate the area and location of native hardwood plantations necessary to meet the existing demand.

## **2.3 Primary outcomes**

The primary outputs of the project were identified as:

1. A GIS database capable of applying exploitation criteria for three scenarios for firewood harvesting based on a grid dataset representing broad woodland or forest vegetation types on private lands;
2. Location of the source of firewood (implicit in the GIS datasets);
3. Location of the area of each broad forest type which is eligible for harvesting;
4. Data and model for forest growth and yield in the MDB.
5. The predicted sustainable yield of firewood from each scenario compared to current demand;
6. The predicted yield of firewood from each broad forest type;
7. The potential ecological impacts of harvesting regimes based on case study sites; and

8. The area of native hardwood plantations that would need to be established as an alternative source of firewood in the MDB.

## **2.4 Project Approach**

The ultimate aim of the project was to ascertain the potential supply of firewood from three harvesting scenarios and the potential ecological impacts associated with each. The approach used a combination of available literature and scientific expertise, data gathered through fieldwork across the MDB, a new model system for forest growth and yields for lower rainfall forests and woodlands developed from the field data and a GIS developed to provide data on the areas of the MDB which met the requirements of the exploitation criteria for each harvesting scenario.

## **2.5 Background**

In November 2000 CSIRO Sustainable Ecosystems (Driscoll, Milkovits and Freudenberger 2000) were commissioned by Environment Australia to report on the “Impact and Use of Firewood in Australia”. The Driscoll et al.(2000) report built upon earlier reports (FTSUT 1989, Bush et al.1999).

A number of key knowledge gaps and a research strategy were identified by Driscoll et al.(2000). The objectives of this project have their origins in the recommendations of the report of Driscoll et al.(2000) but address the actions identified in the *National Approach to Firewood Collection and Use in Australia* (20001) document.

### **2.5.1 Key Findings from Driscoll et al.(2000)**

Australian households burn between 4.5 to 5.5 million tonnes of firewood per year. With the addition of firewood for industrial use, this figure rises to between 6 – 7 million tonnes. The four most commonly burned tree species are River Red Gum (*Eucalyptus camaldulensis*), Jarrah (*Eucalyptus marginata*), Red Box (*Eucalyptus polyanthemus*), Yellow Box (*Eucalyptus melliodora*) and Ironbark (*Eucalyptus sideroxylon*).

Driscoll et al.(2000) estimated that 84% of firewood for household use is collected from private lands and that only 9.5% of firewood is collected from State Forests. The remaining firewood was classified as coming from either crown land, such as Travelling Stock Reserves and roadside reserves, or “other” ie. unknown. An important finding was that approximately half of the household firewood was collected by residents rather than purchased and this firewood was primarily fallen timber gathered on private land. The remaining households who purchase timber do so from small suppliers and friends. Established wood merchants only account for around a quarter of these purchased firewood loads.

Driscoll et al.(2000) identified that inland forests and woodlands in lower rainfall zones, i.e. in areas such as the MDB, were most threatened by firewood collection. This is because the most heavily utilised firewood species originate from the Basin, they have slow growth rates due to generally low net primary productivity (NPP) and have been extensively cleared.

### **2.5.2 Comparisons of key findings to other firewood estimates**

There have been only two previous examinations of national firewood use in Australia; FTSUT (1989) and ABARE (Bush et al.1999). Table 2.1 shows that the estimates of firewood use from both FTSUT and ABARE are similar to those of Driscoll et al. (2000).

Table 2.1 Millions of tonnes of firewood estimated by separate national reports. The ABARE data includes industrial firewood use.

<b>FTSUT 1988 estimate</b>	<b>ABARE 1987-88 estimate</b>	<b>FTSUT 2000 forecast</b>	<b>ABARE 2000-01 forecast</b>	<b>Driscoll et al.(2000) household</b>	<b>Driscoll et al.(2000) plus industrial</b>
4.38	5.75	4.25 – 6.61	6.85	4.52 – 5.54	6 - 7

Figure 2.1 presents a flowchart showing the derivation of firewood from various sources after Driscoll et al.(2000).

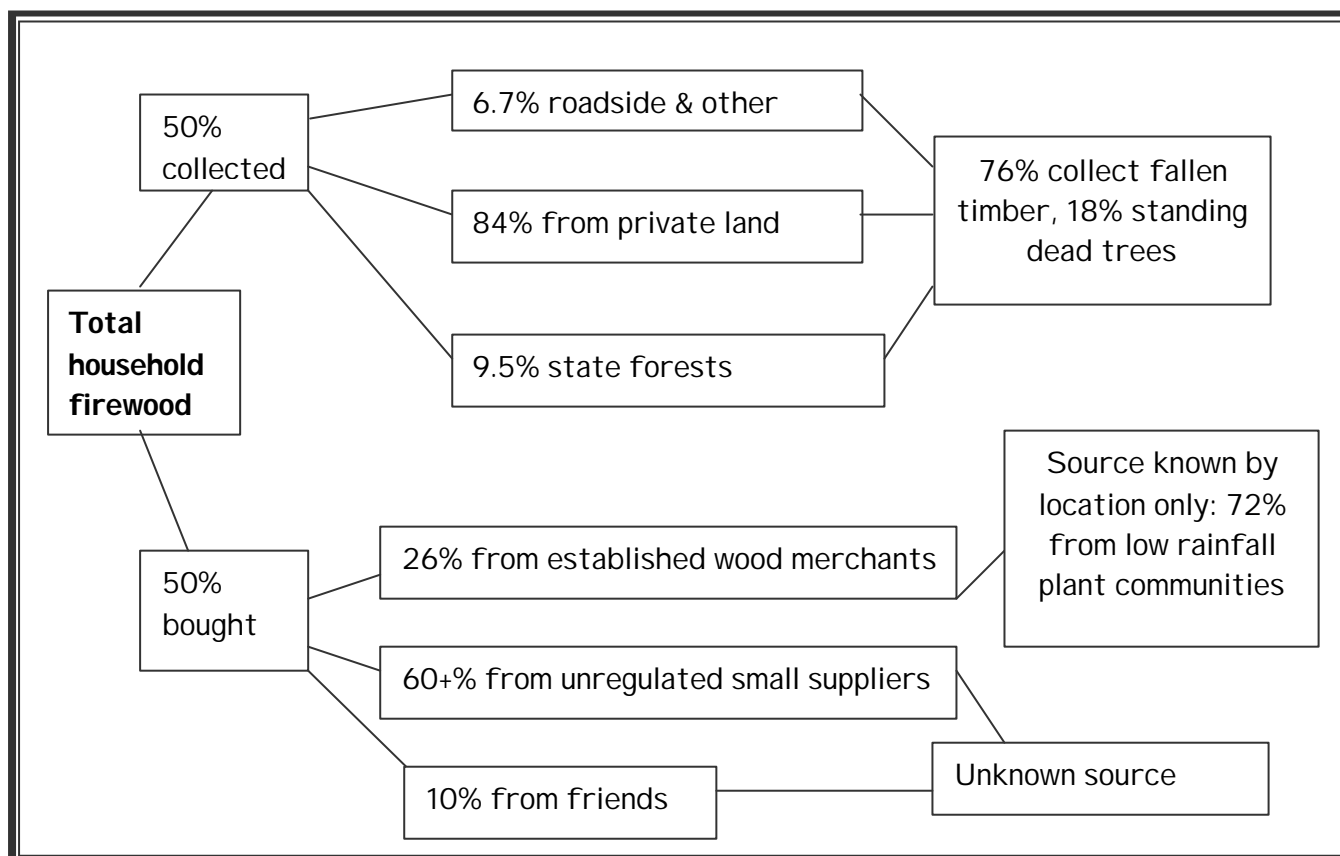


Figure 2.1 Flowchart showing the derivation of the percentages of firewood from various sources from Driscoll et al.(2000).

As part of the firewood certification system, industry workshops run by the Australian Timber Industry Certification Group (ATICG) recently provided some key results. Queensland, NSW and WA representatives state that the Driscoll estimates are too high and that the real figures for firewood consumption in these areas are between 14% and 25% of those figures.

It appears that ATICG have provided estimates based only on firewood supplied by firewood merchants. However, as detailed in Driscoll et al.(2000), only 50% of the firewood consumed is bought as opposed to collected, and of the 50% purchased, only around 25% of firewood is purchased from established wood merchants who advertise in the Yellow Pages or have business premises. Thus any estimate based only upon the figures supplied by firewood merchants is likely to significantly underestimate the actual amount of firewood sourced from the MDB.

One workshop participant/firewood merchant estimated the Armidale firewood market at 1,500 tonnes per annum. It would appear this is a significant underestimation. Julian Wall, from the University of New England, undertook a intensive research project including interviews with

households and firewood merchants. In Armidale during 1994 he estimated that 17,940 tonnes were consumed within the urban area and 13,000 tonnes in the surrounding rural areas.

### **2.5.3 Relevance to the current project**

#### **Why the Murray Darling Basin?**

Driscoll et al.(2000) indicated that the vegetation communities most threatened by firewood collection are the dry forests and woodlands in Victoria, NSW, South Australia, Tasmania and Queensland. Although there have been no assessments in Queensland, the indications are that the southern Brigalow belt could be depleted. The key species harvested for firewood occur in particular on the western slopes and plains of NSW and in the Victorian and NSW Riverina in the Box-Ironbark woodlands. These woodlands and forests have been extensively cleared for agriculture. The Yellow Box/Red Gum Grassy Woodland which was previously extensive in the intensive landuse zone has been declared a threatened ecological community. Additionally the site productive capacity of these regions is generally low, which means that the length of time required for regeneration and growth of these communities is longer than in areas of high productivity (see Section 6).

#### **Private tenure or Crown land?**

The findings from Driscoll et al. (2000) indicated that the firewood harvest from state forests is already highly regulated by the responsible agencies. Further, it comprises less than 10% of the total supply. NSW State Forests, the Victorian Department of Sustainability and Environment, Queensland Department of Primary Industries and Forestry SA each have a system of permits, fees and licences which must be purchased by those wishing to collect firewood in their precincts. It is important to note here that this type of firewood collection is limited to coarse woody debris on the forest floor and is therefore relevant to the first scenario presented in this project i.e. the “dead-wood” scenario (Section 3.2 and Section 7).

Because collection of firewood from state forests is so highly controlled they have not been considered within the scope of this project. If firewood harvesting continues under the first two scenarios presented in this project, i.e. the “dead-wood” scenario and the “green-wood” scenario (Section 3.3 and Section 8), it is the remaining native forests and woodlands on private lands which will continue to carry the impact of future demand for firewood from Australian native forests in the MDB. Therefore private lands in the MDB were identified as the particular focus for this project.

## **2.6 Workshop**

A workshop was held at the commencement of the project, in February 2002. Its objective was to scope the project’s approach, focus and design with stakeholders and obtain inputs on appropriate exploitation criteria. Twenty-one participants from land management agencies attended the workshop. These were from the NSW Department of Land and Water Conservation, Victorian Department of Natural Resources and Environment, NSW State Forests, NSW National Parks and Wildlife Service, CSIRO Forestry and Forest Products as well as the Australian Greenhouse Office, Environment Australia, Australian National University, a private fuelwood company and CSIRO Sustainable Ecosystems.

Workshop discussions were focused on decision rules for the sustainable harvesting of firewood at different scales and a number of issues emerged:

- Definitions of sustainability;
- Time and scale;
- Benchmarks and biodiversity surrogates;

- Remnant size;
- Accreditation rules;
- Policies, markets and people; and
- Harvesting and forest and woodland ecology.

There were a series of common themes throughout discussion of the above issues. The themes were:

- Planning: lack of planning and regulation in the firewood industry;
- Accreditation: research can contribute by setting benchmarks;
- Education: misinformation is common;
- Technological developments and their impacts on the firewood industry;
- State of current knowledge on environmental impacts and existing data; and
- Need for a number of scenarios to address issues of firewood supply.

The workshop provided a useful range of industry and expert contribution to the key issues at a range of scales. The full report from the workshop can be found in Appendix 1.

## **2.7 Definition of sustainable harvesting**

Our preferred definition for sustainable harvesting of firewood, developed in part through the workshop process, is: *the economic maximum sustained yield which does not impair the compositional, structural and functional attributes of the landscape* rather than a narrower definition based on the concept of maximum sustained yield ie. *removal of firewood at a rate no greater than the replacement (growth) rate.*

The *compositional attributes of the landscape* include retention of all native species and minimisation of the risk of exotic species invasion. *Structural attributes* include maintenance of adequate patch size, heterogeneous age structure and diverse understorey including fallen timber and provision of hollow logs. *Functional attributes of the landscape* include maintenance of adequate nutrient cycling and hydrological balance and minimisation of erosion. A broad definition of sustainability includes inter-generational equity, that is, maintenance of site values and opportunity for future options for use.

An unsustainable firewood harvest is one that is:

- Uneconomic;
- Unplanned;
- Extracts firewood at a rate greater than it re-generates;
- Threatens species and ecological communities;
- Results in long-term clearing;
- Reduces the heterogeneity of age structure within a stand;
- Reduces critical habitat such as understorey shrubs, hollows and fallen timber;
- Increases erosion, accelerates nutrient loss and increases the risk of salinity; and
- Reduces future values or options for use

### **2.7.1 A scenario approach to sustainability**

Definitions of sustainable harvesting will differ amongst any group of stakeholders. Some may argue that the current harvesting regime, which is reliant on standing and fallen dead wood is sustainable. Others may argue that firewood could possibly be sourced sustainably from managed native forests and woodlands. A third option might be that only firewood sourced from plantations is sustainable.

Our study examined each of these three supply strategies, or scenarios, as described in the next section. We hope these scenarios provide a basis for developing policies, regulations and management systems to reduce the impact and improve the sustainability of firewood harvesting in the MDB.

## **2.8 Report Structure**

Section 3 details the first step of this project: the development of the exploitation criteria which defined the areas of forests and woodlands of the MDB which would be eligible for harvesting under each scenario.

Section 4 describes the GIS data and methods used to produce the data (the areas of land which met the requirements of the exploitation criteria for each of the scenarios) for analyses.

Section 5 details the process of the collection the field data across the MDB. These data were used to develop a growth and yield model system for the forests and woodlands of the MDB, described in Section 6.

The results of the modelling gave us the information on the amounts of firewood which might sustainably be harvested under each scenario. Section 7 addresses the first scenario; the “dead-wood” or “status quo” scenario. Section 8 addresses the “green-wood” or “sustainable harvesting of existing native forests” scenario. Section 10 addresses the plantation scenario.

Further field data were collected to assess the ecological impacts of firewood harvesting under the green-wood scenario. The ecological impacts of The green-wood scenario are discussed in Section 9.

Section 11 provides a discussion and draws together the conclusions derived by the project.

Section 12 provides acknowledgements to the lengthy list of those who assisted and/or advised us on the methods, approaches and the carriage of the project. The references for all sections of the report have been compiled in Section 13.

The 11 Appendices accompanying this report are grouped at the end of Section 14.