

### 3 The Exploitation Criteria

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This study examined the potential firewood yield, extent of harvesting and potential environmental impacts of three different harvesting scenarios:

1. The “dead-wood” scenario: this scenario represented the *status quo* of the current harvesting approach i.e. continued reliance on standing and fallen dead wood;
2. The “green-wood”: scenario: this scenario addressed the supply of firewood from selective harvesting of live native non-mallee forests and clear-felling of vegetation in mallee forests; and
3. The plantation scenario: this scenario addressed the supply of firewood from native hardwood plantations.

These scenarios, and the exploitation criteria (ECs) that drive them, are described in this section. The exploitation criteria were defined with direct reference to the context and objectives of the project (Section 2). Spatially explicit exploitation criteria were used to limit our study area to specific geographic locations, in order to exclude areas from harvesting for a range of reasons, explained under each scenario heading.

The first step was to develop exploitation criteria for the study area as a whole i.e. explicitly define the fundamental geographic context for the project and the broad focus area within it. When that had been achieved, the exploitation criteria for each scenario were developed.

#### 3.1 Overall exploitation criteria

The overall project exploitation criteria served to define the study area and limit the analyses to only those areas in the study area relevant to the project objectives. The following exploitation criteria applied to all three Scenarios.

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|------|--|
| EC 1 | Defined the boundaries of the study area. All scenarios were based on a single study area so the results for each scenario would be comparable. The study area was defined as the whole MDB.   |
| EC 2 | Addressed the top level constraint of economic feasibility, imposed by distance to markets. This criterion constrains the collection of firewood only to those parts of the MDB within an economically feasible distance from the major population centres in and around the MDB. Driscoll et al.(2000) concluded that the majority of firewood burned in the major capital cities (Adelaide, Brisbane, Canberra, Melbourne, Sydney) comes from a mean maximum distance of 450 km from those cities. Firewood burned in the smaller population centres is more likely to come from the local area. Therefore, taking a conservative approach, parts of the MDB which are further than 500km from any capital city are likely to be of minimal importance for firewood production and harvesting and were not included in any analyses conducted by this project. |
| EC 3 | Focused on private lands only. Firewood supply from public lands is actively regulated by the relevant agencies (see Section 2.5.3) and was not the subject of this project. Further, most firewood comes from privately managed land (Driscoll et al. 2000 and Figure 2.1). All land not leasehold or freehold was excluded from further analysis.  |

Table 3.1 describes the overall exploitation criteria which define the study area as a whole and the areas of interest within it, referencing by number the original datasets relevant to each (see Appendix 2, page 1 and Appendix 3, Section 1).

Table 3.1. Overall project exploitation criteria linked to the relevant datasets (see Appendix 2, page 1 and Appendix 3, Section 1).

Exploitation Criteria	Assumptions	Rationale	Dataset
1 The Boundary of the Murray-Darling Basin (MDB) limits the whole study area.	The MDB supplies the majority of the firewood for the capital cities and for the towns in the Basin.	Driscoll et al.(2000).	1
2 Only consider areas within 500km of a capital city.	Collection of firewood is not economical at any further distance from a major population centre.  Regional centres take their supply from the same area.	Driscoll et al.(2000) Table 2.2.5, Fig. 2.2.1  Driscoll et al.(2000)	4
3 Private land only (exclude State Forests, National Parks, crown lands etc.)	1. The majority of firewood comes from private lands.  2. 70% of purchased firewood (35% overall) comes from unregulated small operators. Of this, the majority is collected from private land; see Figure 3.1.  3. States' estimations that only a small percentage of firewood comes from public lands.	1. Driscoll et al.(2000) pages 11, 23 24; 70% plus of firewood is sourced from private lands, and 30% from public lands; see Figure 2.1.  2. Emerging state Firewood Action Plans will throw the burden back to legal collection from private lands.  3. Victorian Firewood Strategy Discussion Paper May 2002, and Neagle (1994).	2

### 3.2 The dead-wood scenario

The dead-wood scenario examined the consequences of continuing a "business as usual" approach to firewood harvesting. It assumed that dead standing and fallen timber would continue to be collected from all native woody vegetation remnants from the lands defined by exploitation criteria 1-5. The objectives of the dead-wood scenario were:

1. To elucidate the regional exploitation criteria which are the current drivers for the harvest of firewood from native open forests and woodlands based on the extraction of all standing or fallen dead trees likely to be available over the next 10-50 years.
2. To identify location, yield and regeneration potential of standing or fallen dead timber from the native open forests and woodlands covered by the exploitation criteria.

The dead-wood scenario built upon the overall exploitation criteria (Section 3.1, exploitation criteria 1-3), with two additional exploitation criteria.

(The numbering of the exploitation criteria continues from the previous list.)

EC 4 Focused on land covered by native forests and woodlands and native hardwood plantations. All land not having woody cover was excluded from further analysis.

EC 5 Focused only on naturally occurring native woody remnants so all plantations were excluded from this scenario.

Table 3.2 describes the exploitation criteria for the dead-wood scenario, showing the relevant dataset (see Appendix 2, page 1 and Appendix 3, Section 1).

Table 3.2. The dead-wood scenario exploitation criteria linked to the relevant dataset (see Appendix 2, page 1 and Appendix 3, Section 1).

Exploitation Criteria		Assumptions	Rationale	Dataset
4	All gridcells assigned to native hardwood vegetation types within the study area.	<ol style="list-style-type: none"> <li>Historically box woodlands are the preferred source for firewood.</li> <li>With the continuing reduction in box woodlands, other forest types will increasingly be sourced for firewood.</li> </ol>	<ol style="list-style-type: none"> <li>Driscoll et al.(2000)</li> <li>National Land and Water Audit for percent area of box woodlands cleared; anecdotal evidence.</li> </ol>	2
5	Exclude land already put down to private plantations	Firewood is not currently a major product from plantations.	These lands will be examined in the plantation scenario.	2

### 3.3 The green-wood scenario

The green-wood scenario assumed that the codes of practice currently being developed by the Commonwealth and the States will be put into place, so that only firewood harvested from native forests and woodlands managed under forestry best practices and ecologically sustainable practices will be accepted into the market place. The objectives of the green-wood scenario were:

- To develop regional exploitation criteria for the sustainable harvesting of a standing crop of native forest/woodland (e.g. thinning of green trees).
- Identify location, sustainable yield and regeneration potential of green tree firewood from the native open forests and woodlands which meet the exploitation criteria.

The green-wood scenario included exploitation criteria 1-5 (Sections 3.1 and 3.2), with four additional exploitation criteria. The exploitation criteria for the green-wood scenario were based on a set of criteria which apply best management practices employed by the various State forestry agencies (exploitation criteria 6 and 7) and two additional exploitation criteria (exploitation criteria 8 and 9) which addressed ecological sustainability.

(The numbering of the exploitation criteria continues from the previous list.)

EC 6 Focused on best management practices for forestry which exclude riparian zones from disturbance.

EC 7 Focused on best management practices for forestry which exclude steep slopes = 15° from harvesting.

EC 8 Addressed ecological sustainability with regard to the percentage of the landscape which has woody cover.

EC 9 Addressed ecological sustainability with regard to the maximum size of remnants/patches which might be considered for harvesting.

Table 3.3 describes the exploitation criteria for the green-wood scenario, showing the datasets relevant to each(see Appendix 2, page 1 and Appendix 3, Section 1).

Table 3.3. The green-wood scenario exploitation criteria linked to the relevant datasets (see Appendix 2, page 1 and Appendix 3, Section 1).

Exploitation Criteria		Assumptions	Rationale	Datasets
6	Exclude areas 50m either side of streams and rivers.	The risk of ecological damage is too high in riparian zones.	NSW State Forest Ecologically Sustainable Forest Management Plans: "Broad riparian corridors with high value for wildlife conservation".	5
7	Exclude slopes = 15° .	Too expensive/difficult to harvest on steep slopes. Soil erosion hazard	NSW State Forests Ecologically Sustainable Forest Management Plans; Victorian Ecologically Sustainable Development policy, National Forest Policy Statement (1995) signed by all states and territories.	3
8	Exclude parts of the study area where woody cover = 30% of the land area.	Harvesting from areas where woody cover = 30% is not likely to be ecologically sustainable.	Bennett and Ford (1997) 10% cover is a minimum to prevent loss of birds. Andren's (1994) review of case studies reports 30% in most landscapes. Reid (1999, 2000) Declining Woodland Birds: decliners drop out where native cover is <30% of the landscape. McIntyre et al.(2000) minimum 30% woodland cover to maintain ecological sustainability on grazed properties	1, 2, 4
9	Exclude remnants < 100 ha in area.	It is not likely to be ecologically sustainable to harvest from remnants smaller than 100 ha.	Certain remnants may not be able to be harvested sustainably for ecological reasons; Watson et al.(2001): remnants < 100 ha do not support the same composition or diversity of woodland birds as those larger than 100 ha.	1, 2, 4

### 3.4 The plantation scenario

The plantation scenario examined the potential contributions of firewood which could be provided from native hardwood plantations in the MDB and focused on areas of the MDB which might be suitable for plantation forestry. The objectives of the plantation scenario were:

1. To develop regional exploitation criteria for the sustainable harvest of firewood from native plantation forests.
2. Identify location and potential yield of firewood from existing plantations in the Basin. Additionally, estimate the extra area required to supply all demand for firewood from plantation sources and estimate the time before the firewood from these areas would become available. We compared the projected quantities needed versus what could be available over time from the establishment of plantations.

The plantation scenario employed the overall exploitation criteria 1-3 (Section 3.2) and also the best forestry management practices employed in the green-wood scenario (Section 3.3, exploitation criteria 6-7), plus three additional exploitation criteria.

(The numbering of the exploitation criteria continues from the previous list.)

EC 10 Focused only on non-forested areas of the MDB.

EC 11 Focused only on land with an elevation < 650 metres.

EC 12 Focused only on land with a net primary productivity index of at least 5 t ha<sup>-1</sup> yr<sup>-1</sup>.

Table 3.4 describes the exploitation criterion for the plantation scenario, showing the relevant datasets (see Appendix 2, page 1 and Appendix 3, Section 1).

Table 3.4. The plantation scenario exploitation criteria linked to the relevant datasets (see Appendix 2, page 1 and Appendix 3, Section 1).

Exploitation Criterion	Assumptions	Rationale	Dataset
10	Include gridcells with "non-native" vegetation cover.	land with non-native vegetation may be eligible for plantations.	2, 4
11	Exclude areas where the elevation ≥ 650m	Multiple benefit plantations are needed to reduce dryland salinity and provide wood for a variety of purposes.	3
12	Only include land with an NPP index of at least 5 t ha <sup>-1</sup> yr <sup>-1</sup>	It is considered that sites with a productive capacity lower than this would not be viable for plantation establishment (see Section 10.5)	6

### 3.5 Application of the exploitation criteria

The spatial exploitation criteria were applied within the geographic information system (GIS) constructed for the project. This process is described in the next section (Section 4). The growth and yield model which used the data resulting from the application of the exploitation criteria is described in Section 6. The estimates of firewood yield for each of the three scenarios are described

in Section 7 (the dead-wood scenario), Section 8 (the green-wood scenario) and Section 10 (the plantation scenario).