



GUIDELINES FOR PLANTATION FORESTRY IN SOUTH AUSTRALIA 2009



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Foreword

Since plantation forestry began in the late 19th century in South Australia, the forest industry has been a leader in managing ecologically sustainable plantation forestry. The industry has maintained high standards of land management, environmental protection and viability of the forest estate. The resource has created many down stream jobs and underpinned regional economic activity.



In recent years, the Commonwealth and State Governments have made a commitment to the plantation forest industry, with the aim of reducing the amount of timber imports and the nation's reliance on products sourced from native forests. This has seen an expansion in areas established to plantation forests across the higher rainfall regions of South Australia. Further potential also exists in medium to low rainfall regions with the emergence of carbon off-set programs and forestry established for natural resource and bio-energy management benefits.

Concurrently, the issues of water and food security, sustainable land management, impacts of climate change and environmental protection are at the forefront of community thinking. In addition, consumers demand that primary producers can demonstrate their ability to sustainably manage production systems, natural resources and relationships within regional communities. The forest industry, therefore, has a responsibility to engage with all stakeholders, and participate in multi-sectorial decisions at a local, regional and state level.

The timing of the review of guideline documents for the South Australian Forest Industry is therefore appropriate and necessary. The Guidelines for Plantation Forestry in South Australia 2009 will supersede previous state forest industry guidelines and provides a framework for the establishment and management of the forest estate, including mandatory requirements and additional forest industry practices.

Implementing forest management practices consistent with the Guidelines for Plantation Forestry in South Australia 2009 will ensure that the South Australian Forest Industry continues to demonstrate to the wider community its capacity to be part of a sustainable future, while operating in a commercial framework.

In South Australia, the Forest Industry is the only primary production group to have its own guidelines that address environmental, social and economic expectations that have been developed in consultation with relevant stakeholders.

As Minister for Forests, I endorse these guidelines, and look forward to supporting the sustainable growth of the South Australian Forest Industry.

A handwritten signature in black ink that reads "Paul Caica". The signature is written in a cursive, flowing style.

PAUL CAICA
MINISTER FOR FORESTS

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1.

Introduction

1.1 BACKGROUND

The forest industry in South Australia has long been a national leader in sustainable plantation forest management. In 1997, the *Environmental Management Guidelines for Plantation Forestry in South Australia* were developed in conjunction with the forest industry, but a need to update and improve this document has been identified.

Broader considerations need to be addressed including interactions between the physical environment, community expectations, and the efficiency and viability of forestry businesses.

The new guidelines have been developed in consultation with the forest industry, government agencies and other relevant stakeholders. This consultation process has updated and refined forest industry best practice in South Australia.

1.2 AIM

The aim of the guidelines is to present a document that summarises mandatory requirements along with forest industry practices that deliver appropriate environmental, social and economic outcomes.

The guidelines encourage forest owners and managers to be leading primary producers and continuously improve how they plan, implement and monitor their operations, their impact on the environment and relations with the community in which they operate.

The guidelines promote planning, establishment, management and harvesting of forest plantations in accordance with the principles of ecologically sustainable forest management, as outlined in the *National Forest Policy Statement (Commonwealth of Australia, 1992)*.

1.3 SCOPE AND INTENDED AUDIENCE

This document applies to operations carried out in public and private plantation forests. For the purpose of this document, the term 'forestry' or 'plantation forestry' relates to both large-scale and farm forestry plantations, unless stated otherwise.

While the guidelines do not document standard practices for environmental (revegetation) or amenity tree plantings, the standards could equally be considered when planning these types of plantings.

This document has not been written to provide in-depth planning advice for potential forest plantation owners and managers. Anyone considering purchasing or developing land for a commercial forest enterprise should contact their relevant local council to seek planning advice, and consider consulting with appropriate government agencies, industry development advisers or regional forest industry groups.

The intended audience for the guidelines are:

- public and private forest plantation owners and managers operating in South Australia
- landowners establishing and managing farm forestry in South Australia
- relevant planning authorities assessing development applications for commercial forest plantations in South Australia
- government agencies developing policy or commenting on the planning, establishment and management of forest plantations in South Australia
- other relevant stakeholders (including community groups and neighbours) who have an interest in the planning, establishment and management of forest plantations in South Australia
- auditors certifying forest management systems in South Australia.

1.4 ENFORCEMENT AND LIABILITY

The guidelines do not constitute a legal or statutory document, but have been prepared to complement relevant Commonwealth and state legislation, standards, codes of practice and guidelines in respect to the planning, establishment, management and harvesting of forest plantations.

It is the responsibility of every person potentially affected by applicable legislation to determine the rights and responsibilities pertaining to their particular circumstance. It is worth considering obtaining individual specialist advice for further details.

Forest owners and managers are expected to comply with these guidelines and are encouraged to utilise them when developing their own forest and land management operating standards which reflect individual objectives and circumstances.

1.5 CERTIFICATION OF FOREST MANAGEMENT

The majority of forest plantation managers in South Australia demonstrate their commitment to sustainable forest and land management through systems that are independently audited. This is achieved through voluntary participation in internationally recognised certification programs such as ISO 14001 Environmental Management Systems, the Australian Forest Certification Scheme and the Forest Stewardship Council.

These certification programs have the similar intention of verifying individual forest operations and management systems in addition to that required by legislation or regulation. This includes identifying the potential impact of forest operations on the environment, associated communities or the viability of the business; developing forest operation plans that accommodate these potential impacts; developing systems for mitigating environmental damage; monitoring the effectiveness of the management system and commitment to continuous improvement; and transparent, triple bottom line reporting.

As consumers increasingly demand evidence of sustainable production, the forest industry has embraced this challenge, and leads the way amongst primary producers in providing this evidence. This is further demonstrated through the involvement of manufacturers and retailers in chain of custody programs certifying forest products as sourced from sustainably managed forest plantations.

1.6

HOW TO USE THIS DOCUMENT

For each of the forest operations detailed, the content is presented as:

- Relevant Guiding Principles – the content of this document is based upon a series of ‘Guiding Principles’.
- Mandatory Requirements – forest plantation owners and managers must observe or undertake all relevant mandatory requirements. The mandatory requirements include Commonwealth and state law that may be relevant to a particular forest operation or activity. This list may not be comprehensive and changes may occur during the life of this guideline.
- Industry Practices – industry practices have been documented after consultation with the forest industry and stakeholders. They describe current practices that achieve appropriate environmental, social and economic outcomes.
- Relevant references that provide the necessary details in relation to ‘Mandatory Requirements’ and ‘Industry Practices’ are listed in *italics* throughout the guidelines, and further detail or internet references can be found in the Appendices.

If accessed electronically, hyperlinks are included to assist navigation through the document, or allow ready access to those available on the Internet. Highlighted word(s) in GREEN identify a link to another page in this document and highlighted word(s) in BLUE identify a web link.

1.7

DOCUMENT REVIEW

This document will be reviewed every five years to reflect industry and scientific developments or changes in stakeholder expectations. Regular but minor updates may occur to ensure current legislation, standards, codes of practice or guidelines are referenced.

The current version can be accessed from the PIRSA Forestry website (www.pir.sa.gov.au/forestry). Any changes or updates will be communicated via the website and through relevant stakeholder networks.

2.

Guiding Principles

The guiding principles for these guidelines follow the *Forest Practices Related to Wood Production in Plantations: National Principles 1996*. The national principles have been developed in accordance with the *National Forest Policy Statement 1992*, and set the framework for a consistent and scientific basis for sound plantation management.

The South Australian forest industry's contribution to delivering optimal environmental, social and economic outcomes is consistent with the national principles. The importance of 'good neighbour relations' is also recognised, so a 9th principle has been included.

- 1. Principles of Environmental Care**
- 2. Safety**
- 3. Planning**
- 4. Access**
- 5. Establishment and Maintenance**
- 6. Timber Harvesting**
- 7. Forest Protection**
- 8. Monitoring and Review**
- 9. Good Neighbour Relations**

Throughout this document there are references and links to the relevant guiding principles for each section. Details of principles 1–8 are provided in [Appendix 1 – Forest Practices Related to Wood Production in Plantations: National Principles 1996](#), and principle 9 in [Chapter 11 – Good Neighbour Relations](#).

3.

Planning

Planning considerations need to include the objectives of the business, the physical and social environment in which the business will be operating, as well as the intended forest operations. Details on plantation design are covered in [Chapter 4 – Plantation Design](#).

» **Relevant Guiding Principles: Planning, Monitoring and Review, Good Neighbour Relations**

MANDATORY REQUIREMENTS

- Change of land use in South Australia requires a development application to be submitted through local council. Generally, new plantation forestry development is considered a change of land use.
 - » *Development Act 1993*
 - » *Development Regulations 1993*
- Development applications are assessed against planning guidelines by the relevant planning authority. Development applications may be referred to state government agencies or other stakeholder groups for comment and direction. Planning authorities can impose additional plantation design requirements upon the developer of a site.
 - » [Appendix 3 – Region Specific Issues](#)
 - » *Development Act 1993*
 - » *Development Regulations 1993*
 - » *Local Council Development Plans*
 - » *Natural Resources Management Act 2004*
 - » *Natural Resources Management (General) Regulations 2005*
 - » *River Murray Act 2003*
 - » *Guide for Applicants: Commercial Forestry (Including Farm Forestry/Agroforestry)*
- The replanting of an existing site does not require development approval as land use for forestry is already approved. However, the specific techniques used to replant and manage a forest must meet the legal requirements and industry practices that prevail at the time.
- Restrictions may be in place regulating the impact of plantation forestry on water resources. This can be through regional Water Allocation Plans or Natural Resources Management Plans by declaration of plantation forestry as a water affecting activity that requires a permit for development.
 - » [Appendix 3 – Region Specific Issues](#)
 - » *Natural Resources Management Act 2004*
 - » *Natural Resources Management (General) Regulations 2005*

- The creation, management and protection of public owned state forests are covered under:
 - » *Forestry Act 1950*
 - » *Forestry Regulations 2005*
 - » *Local Government (Forestry Reserves) Act 1944*

INDUSTRY PRACTICES

- Refer to state and regional forest industry strategies.
- Consider environmental, social and economic impacts of the forest plantation and planned operations. Consult with neighbours and other stakeholders where necessary.
- All forest owners and managers are encouraged to plan their operations in consultation with relevant external documents and resources, and internal policies and procedures. Forest owners and managers are encouraged to document plans and maintain records of forestry operations. Forest management plans need to reflect the size and nature of the business.
- An appropriate internal monitoring and improvement program should be implemented to assist forest owners and managers to ensure forest operations are being implemented in accordance with management plans, internal policies and procedures, and external mandatory and industry requirements.
- Forest owners and investors are encouraged to establish forest plantations that produce timber or non-timber products that optimise commercial viability and long-term social and economic benefits.
- An opportunity exists to separate ownership of land, forest vegetation and carbon rights for improved investment security and transferability. Provisions for harvest security through commercial forest plantation licences are also available.
 - » *Forest Property Act 2000*

4.

Plantation Design

Plantation design is a key component of planning. It is site specific, and requires an understanding of intended forest operations and potential impacts on forest productivity, the environment and neighbouring land.

» **Relevant Guiding Principles: Planning, Principles of Environmental Care, Access**

4.1 NATURAL RESOURCES MANAGEMENT

4.1.1 Soil Resources

Management of a soil resource includes consideration of the physical, chemical and biological properties of the soil.

MANDATORY REQUIREMENTS

- All landowners have an obligation to manage and protect soil resources and prevent the degradation of land. This includes any change in the quality of land, or any loss of soil that has an adverse effect on water, native vegetation or other natural resources associated with, or reliant on, that land.

» *Natural Resources Management Act 2004*

INDUSTRY PRACTICES

- Identify the suitability of a site for plantation forestry by assessing soil characteristics and classifying land capability class or classes. One method for assessment is detailed in [Appendix 5 – Plantation Forestry Land Capability Classification System](#)

- Forest plantations should not occur on land with a slope exceeding 20 degrees.

» *Planning SA's Forestry Module*

- Identify appropriate management tools to protect, maintain and improve, where practicable, the physical, chemical and biological properties of the soil. Some options are detailed in [Appendix 5 – Plantation Forestry Land Capability Classification System](#), and can be incorporated in forest management plans.
- Consider soil resources management issues for the region. Priorities are detailed in regional Natural Resources Management Plans. Contact the relevant Natural Resources Management Board (www.nrm.sa.gov.au) for further information.

4.1.2 Water Resources

The protection of water resources includes a consideration of water quality and water quantity. Surface water and groundwater systems are managed to varying degrees in South Australia.

For the purpose of protecting this natural resource during forest operations, three broad categories are identified:

- drainage lines
- watercourses (1st & 2nd order), sinkholes (no-direct connection to aquifer)
- watercourses (3rd & 4th order), lakes, reservoirs, wetlands and sinkholes (direct connection to aquifer).

MANDATORY REQUIREMENTS

- It is the duty of the landowner, whose land contains or is adjacent to, a watercourse, wetland or lake, to take reasonable measures to prevent or minimise harm to the resource. This includes damage to the bed and banks of the watercourse, wetland or lake and the ecosystems that depend on them. There are specific regulations for 'water protection areas' as declared under the *Environment Protection Act 1993* and *River Murray Act 2003*, 'water protection zones' as declared under the *Development Act 1993*, and prescribed water resources as declared under the *Natural Resources Management Act 2004*. The appropriate government authority should be contacted for further information.

» *Development Act 1993*

» *Environment Protection Act 1993*

» *Natural Resources Management Act 2004*

» *River Murray Act 2003*

» *Waterworks Act 1932*

» *Environment Protection (Water Quality) Policy 2003*

- The erection, construction or enlargement of any structure that collects or diverts water flowing over land in a prescribed 'surface water area', requires authorisation in the form of a water licence or permit.

» *Natural Resources Management Act 2004*

- Regional Water Allocation Plans or Natural Resources Management Plans may impose plantation design restrictions on new or subsequent plantings. The appropriate regional Natural Resources Management Board (www.nrm.sa.gov.au) should be contacted for further information.

» *Natural Resources Management Act 2004*

» *Natural Resources Management (General) Regulations 2005*

INDUSTRY PRACTICES

- The natural drainage or surface flow of a site should be maintained.
- Artificial drains (i.e. culverts, run-offs and constructed drains) should be incorporated into natural drainage lines to manage water flows onto or away from plantation areas.
- Forest operations should be planned and conducted in such a manner as to avoid the entry of soil and other pollutants into a water resource.
- Appropriate management tools should be identified to protect water resources, dependent on the assessment of risk for each site.

- Management tools may include the use of buffer or filter zones, temporary or seasonal restrictions on the timing of forest operations, road closures, and where required, remedial or engineering works. Details can be incorporated into forest management plans.
- Guidance for use and details of buffer and filter zones are available in [Appendix 6 – Buffer and Filter Zones for Forest Operations](#).
- Monitoring programs for the effectiveness of management tools and other off-site impacts should be implemented.
- The retention of existing native vegetation and re-establishment of indigenous native vegetation adjacent to water resources is encouraged.
- Consider regional water resources management issues. Priorities are detailed in Natural Resources Management Plans or Water Allocation Plans. Some information is provided in [Appendix 3 – Region Specific Issues](#), otherwise contact the relevant Natural Resources Management Board (www.nrm.sa.gov.au) or water management authority for further information.

4.1.3 Biodiversity

The management of biodiversity values within and surrounding the plantation estate includes the plants, animals and other organisms, and the ecosystems and processes of which they are a part.

MANDATORY REQUIREMENTS

- Forest owners and managers must identify biodiversity assets and protect and manage them in accordance with relevant acts, regulations and with reference to regional Natural Resources Management Plans.

COMMONWEALTH

- » *Environment Protection and Biodiversity Conservation Act 1999*
- » *Species Profile and Threats Database for species and ecological communities listed under the Environment Protection and Biodiversity Conservation Act 1999*

STATE

- » *National Parks and Wildlife Act 1972*
- » *Native Vegetation Act 1991*
- » *Natural Resources Management Act 2004*
- » *Natural Resources Management (General) Regulations 2005*
- » *Wilderness Protection Act 1992*

- [Refer to Appendix 3 – Region Specific Issues](#) for specific items.

INDUSTRY PRACTICES

- A plantation should not occur within a separation distance of 50 metres from a reserve gazetted under the *National Parks and Wildlife Act 1972* or *Wilderness Protection Act 1992*. Firebreaks and access tracks may be included within these areas.
 - » *Planning SA's Forestry Module*
- Forest plantations should not be established where they will either cause or require the clearance of valued trees or substantially intact strata of vegetation.
 - » *Planning SA's Forestry Module*
- To minimise damage to the root zone of individual or clumps of scattered native vegetation, a 10 metre buffer zone from native vegetation is recommended. A wider buffer zone may be required to allow vehicle access between the plantation and larger clumps of scattered native vegetation.
- The identification, protection, management and, where possible, enhancement of biodiversity assets should be included when developing forest management plans.
- Engage with the community and government agencies involved in biodiversity conservation projects and initiatives.
- Consider biodiversity management issues relevant for the site and region with reference to relevant documents and communication with stakeholders. Regional priorities are detailed in relevant Natural Resources Management Plans and are available from regional Natural Resources Management Boards (www.nrm.sa.gov.au).
- Refer to national, state and regional plans and strategies for biodiversity conservation.
 - » *No Species Loss: A Nature Conservation Strategy for South Australia 2007–2017*
 - » *State Natural Resources Management (NRM) Plan 2006*
 - » *Species Profile and Threats Database for species and ecological communities listed under the Environment Protection and Biodiversity Conservation Act 1999.*

4.2

UTILITIES, DWELLINGS AND CULTURAL/HERITAGE VALUES

The presence of utility infrastructure, dwellings and sites of cultural or heritage value, on or adjacent to the plantation estate, may impact on the design of the plantation.

MANDATORY REQUIREMENTS

- It is the landowner's responsibility to ensure that any trees planted near powerlines are not a hazard to life and property.
 - » *Electricity Act 1996*
 - » *Electricity (Principles of Vegetation Clearance) Regulations 1996*
- Forest operations carried out near live electric conductors (i.e. powerlines) must adhere to safe work practices.
 - » *Electricity (General) Regulations 1997*

- Forest owners and managers must identify archaeological, palaeontologic and heritage sites or values, and determine any protection and/or notification requirements.

COMMONWEALTH

» *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*

STATE

» *Aboriginal Heritage Act 1988*

» *Heritage Places Act 1993*

INDUSTRY PRACTICES

- Manage appropriate clearance easements along powerlines. Further details are available in [Appendix 4 – Trees and Clearance from Powerlines in South Australia](#).
- Liaise with power utilities to understand risk management protocols on days of extreme fire danger.
- The plantation boundary and forest operations associated with establishment, management and harvesting must be set back by 50 metres from dwellings (including those on adjoining allotments). Firebreaks and access tracks may be included within set back areas. Further fuel modification measures may be required based on a risk assessment.
 - » [Planning SA's Forestry Module](#)
 - » [Forest Owners Conference Plantation Design Guidelines 2003](#)
- Identify cultural and heritage values, and protect and enhance where possible, in consultation with stakeholders and with reference to relevant documents.
- Notify the appropriate department about significant Aboriginal sites, or if any items are found during the course of development.
 - » *Overview – The Aboriginal Heritage Act 1988, March 2007*

4.3 ROAD, TRACK AND FIREBREAK DESIGN

INDUSTRY PRACTICES

- When planning roads, tracks and firebreaks consideration should be given to an efficient network that meets multiple objectives, is safe and minimises impact on the environment.
- Forest industry requirements for firebreaks and vehicle access for fire trucks are detailed in:
 - » [Forest Owners Conference Plantation Design Guidelines 2003](#)
 - » [Plantation Design Guidelines – Farm Forestry 2006](#)
- The location and design of roads and tracks needs to:
 - Minimise the number of watercourse crossings and interference with natural drainage lines.

- Minimise the disturbance of watercourses, drainage lines and other site values through the use of drains, culverts, fords and bridges.
- Facilitate drainage by following ridge tops, avoiding steep and unstable slopes and minimising earth works.
- Allow for appropriate drainage that directs surface run-off into buffer zones before entering watercourses and wetlands.
- Include vegetated buffer zones when adjacent to any nearby watercourses and/or wetlands.
- Avoid dead ends where possible. If it is necessary to create a dead end road/track, it must be signposted and a turnaround suitable for a standard fire truck provided at the end.
 - » *Forest Owners Conference Plantation Design Guidelines 2003*
 - » *Plantation Design Guidelines – Farm Forestry 2006*
- Design for permanent roads should be based on site conditions, traffic volume, seasonal use and access around buffer and filter zones and set back areas.
 - » *Unsealed Roads Manual: Guidelines to Good Practice. Revised August 2000. ARRB Group*
- Consult with public road management authorities regarding the location and nature of access points onto the local road network.
- Further detail on road construction and maintenance is provided in [Chapter 8 – Roading](#).

5.

Environmental Care

Forest and land managers have a responsibility for the environment in which they operate, including a commitment to harm minimisation and damage mitigation.

» **Relevant Guiding Principles: Principles of Environmental Care, Monitoring and Review**

Potential environmental harm (or nuisance) that may result from forest operations include:

- air pollution—noise, dust, smoke, chemical spray drift and fumes
- water pollution—soil sediment, chemical, fuel, sawdust and ash
- soil contamination/structural degradation—chemical spill, chemical trespass, fuel, erosion event and compaction
- impact on non-target flora and fauna species—on-site or off site chemical trespass
- waste—escape off site, inappropriate disposal
- impact on native vegetation—partial or total destruction, invasion by pest plants and insects/animals, and plant disease
- impact on neighbouring land—chemical trespass, invasion by pest plants and insects/animals.

MANDATORY REQUIREMENTS

- Forest operations must be managed to minimise impact on water quality.
 - » *Environment Protection (Water Quality) Policy 2003*
- Burning operations must be carried out in a manner that seeks to minimise the risk of spread of fire, smoke movement and impact on neighbouring land users or communities.
 - » *Environment Protection (Burning) Policy 1994*
 - » *Environment Protection (Air Quality) Policy 1994*
 - » *Fire and Emergency Services Act 2005*
 - » *Fire and Emergency Services Regulations 2005*
- Forest operations must be managed to minimise the generation of unreasonable noise and dust that may impact on neighbouring land users or communities.
 - » *Environment Protection (Air Quality) Policy 1994*
 - » *Environment Protection (Noise) Policy 2007*
- If environmental harm (or nuisance) occurs and is a breach of legislation, the situation must be rectified, attempts made to remediate the site and appropriate notification procedures followed.
 - » *Agricultural and Veterinary Products (Control of Use) Act 2002*

- » *Agricultural and Veterinary Products (Control of Use) Regulations 2004*
- » *Biological Control Act 1986*
- » *Controlled Substances Act 1984*
- » *Controlled Substances (Pesticides) Regulations 2003*
- » *Controlled Substances (Poisons) Regulations 1996*
- » *Dangerous Substances Act 1979*
- » *Environment Protection Act 1993*
- » *National Parks and Wildlife Act 1972*
- » *Native Vegetation Act 1991*
- » *Natural Resources Management Act 2004*
- » *Plant Health Act 2009*
- » *River Murray Act 2003*
- » *Wilderness Protection Act 1992*
- » *National Environment Protection (Assessment of Site Contamination) Measure 1999*
- » *Guidelines for reporting chemical trespass incidents 2005. Fact sheet FS01/02. Primary Industries and Resources South Australia*

INDUSTRY PRACTICES

- Processes should be developed and implemented to prevent or minimise environmental harm. Regional Natural Resources Management Plans detail regional priorities for all land managers. This information should be reflected in forest management plans or internal policies and procedures.
 - » *Regional Natural Resources Management Boards (www.nrm.sa.gov.au)*
- The risk of weeds or diseases entering or leaving a site via vehicles, equipment and machinery should be identified, and appropriate hygiene management strategies implemented.
 - » *Phytophthora Management Guidelines 2006*
 - » *Regional Natural Resources Management Boards (www.nrm.sa.gov.au)*
- Cultivation techniques should be planned and conducted in such a manner as to not compromise soil stability, and to prevent mass movement and/or sedimentation of waterways.
- Chemical use should be appropriate to the operation and location, and be carried out safely and effectively. More detail is provided in **Section 6.5 – Chemical Use**.
 - » *EPA Guidelines for Responsible Pesticide Use 2005*
 - » *Safe and Effective Herbicide Use: A Handbook for Near Water Applications 2007. EPA*

- » *Safe and Effective Pesticide Use: A Handbook for Commercial Spray Operators 2007. EPA*
- » *Voluntary Code of Practice for Spreading. Australian Fertiliser Services Association*
- Chemical, fuel or oil mixing, refilling/refuelling, or machinery maintenance should occur in an appropriate area away from watercourses, wetlands, native vegetation, neighbours and public use areas.
 - » *EPA Guidelines for Responsible Pesticide Use 2005*
 - » *Safe and Effective Pesticide Use: A Handbook for Commercial Spray Operators 2007. EPA*
- Waste material produced from forest operations should be minimised, recycled, or disposed of at appropriate, licensed waste disposal stations.
- A risk assessment for plantation forest species may assist in developing longer term genetic impact and weed management strategies:
 - Consideration should be given to the potential for genetic impacts on the surrounding native vegetation.
 - If a plantation species invades adjacent remnant vegetation, roadsides, streams, neighbouring land, or other areas where there is a risk of environmental impact and further spread, it should be controlled.
- » *The Environmental Weed Risk of Revegetation and Forestry Plants. DWLBC Report 2003–02*
- A monitoring program should be implemented to determine any impacts from forest operations on the environment, other site values or neighbouring land. Evaluation of outcomes can be used to develop a continuous improvement system for the business.

6.

Establishment and Management

Establishment and management operations in forest plantations include site preparation, planting, competition control and plant nutrition.

» **Relevant Guiding Principles: Establishment and Maintenance, Principles of Environmental Care, Safety**

6.1 SITE PREPARATION

Site preparation activities will be determined by previous land use (agriculture or forest plantation), and may include slash management, burning and cultivation.

MANDATORY REQUIREMENTS

- If the removal of any native vegetation is required, it can only proceed following approval by the Native Vegetation Council. Appropriate government authorities should be contacted for further information.

» *Native Vegetation Act 1991*

» *Native Vegetation Regulations 2003*

- If burning of waste/slash material is necessary, operations must be planned. Risks such as fire spread, scorching of existing vegetation and smoke movement must be considered and managed. Operations need to comply with the Country Fire Service (CFS), local government and Environment Protection Authority (EPA) requirements.

» *Environment Protection Act 1993*

» *Environment Protection (Burning) Policy 1994*

» *Environment Protection (Air Quality) Policy 1994*

» *Fire and Emergency Services Act 2005*

INDUSTRY PRACTICES

Slash Management

- Techniques for retaining organic matter and nutrients, and minimising soil disturbance should be adopted where practical.
- Slash retention techniques such as chopper rolling or low residue harvesting are preferred.
- Fire as a site preparation tool is avoided where practicable.
- Avoid pushing debris into a drainage line, watercourse, lake, reservoir, wetland or sinkhole, or damaging existing native vegetation. For further details, refer to [Appendix 6 – Buffer and Filter Zones for Forest Operations](#).
- Windrows or heaps should generally follow contours in undulating country, while on steep ground alternatives to windrowing should be used to avoid the risk of soil erosion.

- Burning operations should be carried out in a manner that seeks to minimise the risk of the spread of fire and smoke movement. For further information on fire prevention and management, refer to [Section 7.2 – Fire Prevention and Management](#).

Cultivation

- Cultivation may be necessary to facilitate tree growth.
- Cultivation and soil disturbance operation techniques should be planned and conducted in such a manner as to maximise soil structure and stability, and to minimise the risk of an erosion event.
- Disturbance to water resources should be minimised through the use of buffer and filter zones. For further details, refer to [Appendix 6 – Buffer and Filter Zones for Forest Operations](#).
- Existing native vegetation should be protected from forest operations. For further details, refer to [Section 4.1.3 – Biodiversity](#).
- Cultivation operation (broad-acre, strip or spot) will be dependent on the site conditions:
 - Strip cultivation along the contour should be used on hilly or undulating country.
 - Ripping should be used on rocky, shallow, hard pan or heavy soils.
 - Mounding is appropriate in areas with poorly drained soils, seasonally high water tables or shallow soils.
 - Spot cultivation can be used where minimum site disturbance is required.

6.2

PLANTING MATERIAL

MANDATORY REQUIREMENTS

- Quarantine requirements may be in place affecting the movement of planting stock (and soil) from international, inter- and intra-state destinations. Appropriate Plant Health Certificates must be made available from supplying nurseries, and good internal hygiene practices should be implemented to stop the spread of any disease. If the introduction of an exotic agent is suspected, the Australian Quarantine and Inspection Service (AQIS) must be informed.

COMMONWEALTH

» *Quarantine Act 1908*

STATE

» *Plant Health Act 2009*

» *South Australian Biosecurity Strategy 2008–2013*

6.3

COMPETITION CONTROL

The control of perennial and annual weeds is used to achieve high survival, good growth rates and plantation access.

MANDATORY REQUIREMENTS

- Declared plants must be controlled in accordance with regional Natural Resources Management Plans.

» *Natural Resources Management Act 2004*

INDUSTRY PRACTICES

- Where practicable, non-chemical alternatives should be investigated for the control of weeds.
- Soil cultivation or mechanical (e.g. slashing, rolling, stump cutting) disturbance of weeds, and pesticide application are the most common competition control techniques.
- Grazing may be used for pre-establishment weed control on ex-pasture sites.
- On sites with loose soil structure and little soil surface protection, strip weed control may be considered to minimise the risk of soil erosion.
- Ongoing monitoring and control of woody weeds is encouraged to prevent further invasion, maintain access and reduce fire risk in and around the plantation.
- If appropriate, work with neighbouring land or forest owners to develop combined weed control strategies.
- Information on chemical use is detailed in [Section 6.5 – Chemical Use](#)

6.4

NUTRITION

The nutritional requirements of a plantation will be site specific and can be managed to maximise productivity.

INDUSTRY PRACTICES

- The application of fertilisers can help address tree nutritional requirements that are not being met by the site.
- Excessive use of fertiliser should be avoided as it may not result in optimal tree growth and it increases the chance of leaching through the soil profile or moving off site.
 - » *Voluntary Code of Practice for Spreading. Australian Fertiliser Services Association*
- Information on chemical use is detailed in [Section 6.5 – Chemical Use](#)

6.5

CHEMICAL USE

The following information is in reference to the use of pesticides and fertilisers in forest operations. Additional information on the issue of environmental care can be found in [Chapter 5 – Environmental Care](#).

MANDATORY REQUIREMENTS

- Chemicals must be stored, used and disposed of according to product registration and label specifications, appropriate off-label permits as provided by the Australian Pesticides and Veterinary Medicines Authority (APVMA), and the provisions of relevant legislation. All reasonable and practical measures must be taken to prevent or minimise contamination of any land, plant or animal outside the target area; harm to the health or safety of human beings; and other unintended environmental harm.
 - » *Agricultural and Veterinary Products (Control of Use) Act 2002*
 - » *Agricultural and Veterinary Products (Control of Use) Regulations 2004*
 - » *Controlled Substances Act 1984*
 - » *Controlled Substances (Pesticides) Regulations 2003*
 - » *Dangerous Substances Act 1979*
 - » *Environment Protection Act 1993*
 - » *Occupational Health, Safety and Welfare Act 1986*
- Some chemical product restrictions may apply for 'water protection areas' as declared under the *Environment Protection Act 1993* and *River Murray Act 2003*. The appropriate government authority should be contacted for further information.
 - » *Environment Protection Act 1993*
 - » *River Murray Act 2003*
- Contractors appointed to apply pesticides are required to have a Pest Controller or Pest Management Technicians Licence.
 - » *Controlled Substances (Pesticides) Regulations 2003*
- To purchase or use certain pesticides, ChemCert accreditation (or equivalent) or a Pest Controllers Licence is required.
 - » *Controlled Substances (Pesticides) Regulations 2003*
 - » *Agricultural and Veterinary Products (Control of Use) Regulations 2004*
- A licence is required for the mixing and use of ammonium nitrate. If it is stored overnight, a licence to store on premises or in a magazine is required.
 - » *Explosives Act 1936*

INDUSTRY PRACTICES

- Care should be taken with chemical use to ensure that no off-target impact or chemical trespass occurs.
- Prior to chemical use, set back areas should be identified and marked. These distances should be consistent with label or off-label permit instructions, or [Appendix 6 – Buffer and Filter Zones for Forest Operations](#), whichever is greater. Appropriate supervision and monitoring for off site impacts is recommended.
- Use trained and competent operators to apply chemicals.
- For further information on chemical use, storage, disposal and neighbour notification see:
 - » *EPA Guidelines for Responsible Pesticide Use 2005*
 - » *Guidelines for Reporting Chemical Trespass Incidents 2005. Factsheet FS01/02. Primary Industries and Resources South Australia*
 - » *Safe and Effective Herbicide Use: A Handbook for Near-Water Applications 2007. EPA*
 - » *Safe and Effective Pesticide Use: A Handbook for Commercial Spray Operators 2007. EPA*
 - » *Voluntary Code of Practice for Spreading. Australian Fertiliser Services Association*

7.

Forest Protection

Risks to plantation health such as pests, diseases and fire are managed to protect the ongoing viability of the forest plantation and minimise adverse impacts on the environment and surrounding community.

» **Relevant Guiding Principles: Forest Protection, Principles of Environmental Care, Safety**

7.1

PESTS AND DISEASES

MANDATORY REQUIREMENTS

- A landowner must control declared animals and plants using accepted and lawful methods and having regard to their environmental impact.
 - » *Natural Resources Management Act 2004*
 - » *Declared Pest Species Policies. Department of Water, Land and Biodiversity Conservation*
- If the introduction of an exotic pest in a forest plantation is suspected, or any activity that contravenes South Australian quarantine laws, PIRSA Plant Health and Quarantine must be notified via the Emergency Plant Health Hotline: 1800 084 881
 - » *Plant Health Act 2009*
 - » *South Australian Biosecurity Strategy 2008–2013*
- Native fauna that has a severe impact on the productivity of plantations can be controlled in accordance with the Department for Environment and Heritage's *Permit to Destroy Wildlife*.
 - » *National Parks and Wildlife Act 1972*

INDUSTRY PRACTICES

- Routine inspections of plantations, native vegetation and the remaining property should be conducted to monitor impacts from pests (insects and vertebrates) and disease.
- Integrated strategies for the prevention of pests, and disease becoming established or spreading, should be formulated and appropriate control measures put in place. This may include implementing integrated pest management strategies with neighbouring land or forest owners.
- Hygiene management practices and equipment movement plans should be considered when equipment and machinery are brought onto a property and again prior to its removal.
 - » *Phytophthora Management Guidelines 2006*
- When pests or disease cause significant damage, decline or death of trees, PIRSA Forestry should be notified (www.pir.sa.gov.au/forestry).
 - » *Forestry and Timber – Pests and Disease Watch List. Department of Agriculture, Fisheries & Forestry*

Insects

- Plantation assessment is commonly undertaken to record insect numbers, developmental stage and level of damage to the plantation prior to implementing any control measure. The presence of other insects (particularly predatory species) should be noted.
- Insecticides may be extremely toxic to non-target insects, fish and crustaceans.
- For information on chemical use, refer to [Section 6.5 – Chemical Use](#).

Vertebrate Pests

- Damage by vertebrate pests is usually confined to newly established plantations. Management of these pests is best done prior to plantation establishment.

Disease

- Disease control in plantations is rarely necessary and, while diseases do impact on tree growth, their control is generally not practical or economic.
- The occurrence of Phytophthora is restricted to certain areas in this state. For prevention and mitigation of Phytophthora damage, see [Phytophthora Management Guidelines 2006](#).
- Timber salvaging operations following damage from wind, lightning, insects, hail or fire should be considered to maintain plantation health and prevent the spread of disease.

7.2

FIRE PREVENTION AND MANAGEMENT

A risk assessment should be undertaken to evaluate the potential impacts that fire may pose to business objectives, surrounding environments and communities. Fire prevention and management plans should be developed and implemented to mitigate the risks.

MANDATORY REQUIREMENTS

- A landowner must take reasonable steps to protect property on the land from fire.
- A landowner or occupier must take reasonable steps to prevent or inhibit the spread of fire through the land.
- All forest operations carried out, and vehicles, machinery and equipment used, must be done so in accordance with the *Fire and Emergency Services Act 2005* during the fire danger season.
- Fire control activities must comply with provisions of the *Fire and Emergency Services Act 2005*.
- A person who comes across an unattended fire must take reasonable steps to notify an emergency services agency.
 - » *Fire and Emergency Services Act 2005*
 - » *Fire and Emergency Services Regulations 2005*

- ‘Controlled’ or ‘cool’ burns in native vegetation are considered clearing and require approval by the Native Vegetation Council. Exemptions under the *Native Vegetation Act 1991* may be sought for fire prevention and protection actions such as fuel breaks for fire control.
 - » *Native Vegetation Act 1991*
 - » *Native Vegetation Regulations 2003*

INDUSTRY PRACTICES

- Appropriate firebreaks, roads and tracks should be maintained for necessary access, fire prevention and control.
 - » *Forest Owners Conference Plantation Design Guidelines 2003*
 - » *Plantation Design Guidelines for Farm Forestry 2006*
- Fuel-modified zones may be used as part of a combined fire protection strategy.
 - » *Forest Owners Conference Plantation Design Guidelines 2003*
- Vehicles, machinery and equipment to be used in the forest during the fire season should be routinely maintained and tested, and carry appropriate fire suppression equipment.
- All reasonable precautions should be taken to reduce the likelihood of fire ignition and to actively control fires in the event that they occur.
- Companies should develop procedures and plans for risk mitigation and fire management in accordance with Country Fire Service (CFS) requirements and Regional Bushfire Prevention Plans.
- Information on a company’s or individual’s forest resources and fire management plan should be communicated to the Country Fire Service (CFS) and other relevant stakeholders.
- The plantation manager should consider the provision of fire suppression equipment and resources to reflect the risk of fire to the plantation and the scale of the business, including the appropriate reaction to predicted weather conditions.
- All employees or contractors with a fire management, detection or suppression role should be appropriately trained to national fire competency standards.
- Regional forest industry fire management arrangements may exist and forest owners and managers should be familiar with these systems.
- Following a fire, consideration of water quality protection is necessary for follow-on rain events. Appropriate government agencies can provide management recommendations.
 - » *Environment Protection (Water Quality) Policy 2003*

8.

Roading

The primary objective for a plantation access network is the extraction, storage and transport of harvested forest product. Other objectives may include recreation activities (where relevant) and the facilitation of fire suppression activities.

» **Relevant Guiding Principles: Access, Principles of Environmental Care, Safety**

For information on road and track design, see [Section 4.3 – Road, Track and Firebreak Design](#)

8.1

ROAD CONSTRUCTION AND MAINTENANCE

MANDATORY REQUIREMENTS

- Roads are constructed and maintained to a standard that allows vehicles to use the road safely.
 - » *Occupational Health, Safety and Welfare Act 1986*
 - » *Occupational Health, Safety and Welfare Regulations 1995*
- In forests where harvesting operations are taking place, passing bays must be constructed and maintained, and bridges fitted with curb rails.
 - » *Occupational Health, Safety and Welfare Regulations 1995*
- The construction of stream or watercourse crossings is considered a water affecting activity and the need for a permit should be investigated with the appropriate government authority.
 - » *Natural Resources Management Act 2004*
- During the construction and maintenance of roads or drainage structures, the removal, burning or pruning of any existing native vegetation requires appropriate approval from the Native Vegetation Council.
 - » *Native Vegetation Act 1991*
 - » *Native Vegetation Regulations 2003*
- Water resources and native vegetation must be protected from soil erosion events.
 - » *Environmental Protection Act 1993*
 - » *Natural Resources Management Act 2004*

INDUSTRY PRACTICES

- Construction of a plantation road network will generally not occur until the first harvesting operation. Planned road easements may be left unplanted, or planted with the intention to clear trees and stumps prior to road construction.

- Roads should be constructed and maintained for their given purpose and to accepted industry standards.
 - » *Unsealed Roads Manual: Guidelines to Good Practice. Revised August 2000. ARRB Group*
- Erosion control measures should be constructed where appropriate, including adequate earth stabilisation and drainage management systems.
- Ensure adequate surface drainage to maintain road condition. This may include lateral barring where the road or track runs directly down slope.
- Drainage structures need appropriate location and spacing to handle concentrated water flows.
- Drainage structures need to feed into filter strips or a buffer to minimise sediment entering a watercourse or wetland.
- Cuts, fills and other disturbed surfaces should be stabilised and maintained.
- Watercourse crossing
 - The crossing should be appropriate to the size and flow characteristics of the watercourse and the expected traffic usage.
 - Incorporate drainage structures (such as culverts) to minimise ponding.
 - During construction, there should be minimal disturbance of watercourse beds/banks and existing vegetation.
 - Disturbed areas should be stabilised and debris cleared so watercourses are not obstructed.
- Processes should be in place to ensure a regular maintenance program for all roads and drainage structures, in particular following significant rainfall events and prior to/following changes in traffic flow. It is important that drainage structures are not blocked or impeded, and are able to maintain water flow.

8.2 QUARRIES AND PITS

MANDATORY REQUIREMENTS

- Ensure quarries and pits are planned, established and managed as per permit and licence requirements where applicable. A mining lease is only required if a landowner is moving the material off site or making it available for sale.
- Topsoil from quarries and pits must be stockpiled and respread when the quarry is no longer required. The site must then be revegetated using appropriate vegetation as per the permit and licence requirements.
 - » *Mining Act 1971*
 - » *Mining Regulations 1998*

INDUSTRY PRACTICES

- Quarries and pits should be located away from watercourses, wetlands and native vegetation. For further information refer to [Appendix 6 – Buffer and Filter Zones for Forest Operations](#).
- Water run-off must be managed to prevent the pit filling with water and adverse impacts on water flow, environmental and other site values.
- Quarries and pits should be located to minimise soil erosion events.
- Hygiene practices should be implemented to prevent the spread of pest plants and disease from the material sourced.
- The site should be rehabilitated when no longer required or in use.
 - » *Unsealed Roads Manual: Guidelines to Good Practice. Revised August 2000. ARRB Group*

8.3

PLANTATION ROAD CLOSURE

MANDATORY REQUIREMENTS

- Protect water resources and native vegetation from pollution caused by soil erosion.
 - » *Natural Resources Management Act 2004*
 - » *Environment Protection Act 1993*

INDUSTRY PRACTICES

- Roads should be closed in wet conditions when unacceptable damage and/or water run-off that can result in the sedimentation of drainage structures and watercourses will occur.
- Plantation road closure should occur if conditions are considered to be unsafe for the traffic flow and road users.

9.

Harvesting

Harvesting operations may be carried out at one or more stages during the life of a plantation. This may include several thinning operations, or clearfelling the original plantation in one operation.

» **Relevant Guiding Principles: Timber Harvesting, Principles of Environmental Care, Safety**

MANDATORY REQUIREMENTS

- Heritage values are to be protected during harvesting operations.

COMMONWEALTH

- » *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- » *Environment Protection and Biodiversity Conservation Act 1999*

STATE

- » *Aboriginal Heritage Act 1988*
- » *Heritage Places Act 1993*
- Endangered and vulnerable plants and animals in areas adjacent to plantations are to be protected during harvesting.
 - » *National Parks and Wildlife Act 1972*
- Native vegetation is to be protected from damage during the felling of plantation trees.
 - » *Native Vegetation Act 1991*
 - » *Native Vegetation Regulations 2003*
- Water resources and native vegetation are to be protected from soil erosion events.
 - » *Natural Resources Management Act 2004*
 - » *Environmental Protection Act 1993*
 - » *River Murray Act 2003*
- Fire risk must be identified and managed during harvesting operations.
 - » *Fire and Emergency Services Act 2005*
- Harvesting must be carried out in a safe manner, by competent operators that have received the appropriate certificate of proficiency, and with safe equipment and machinery.
- If harvesting could endanger the safety of any person working or utilising the area or internal roads/tracks, clearly visible signs are required to be erected.
- Harvested material must be loaded, transported and unloaded in a safe manner.
 - » *Occupational Health, Safety and Welfare Act 1986*
 - » *Occupational Health, Safety and Welfare Regulations 1995, Division 5.7 – Logging*
 - » *Road Traffic Act 1961*

INDUSTRY PRACTICES

Planning

- Sequencing of harvest events through the year requires forward planning to manage operations, logistics and business objectives for processing and marketing.
- Planning must occur well in advance and consider:
 - location and boundaries of the area/s to be harvested
 - specifications of buffer and filter zones, and other set back areas ([Appendix 6 – Buffers and Filter Zones for Forest Operations](#))
 - location of roads (internal and public), tracks and log landings to be used
 - potential period during which harvesting is to occur (season/time of year)
 - soil disturbance and waterflow management
 - neighbour/other forest user considerations (systems for warning of hazards from harvesting and heavy vehicle traffic, noise, dust)
 - type of harvesting operation and equipment (felling) operation, tree marking)
 - any communication requirements with other stakeholders.
- Consideration should be given to second rotation management options prior to harvesting to ensure appropriate systems are put in place to meet the objectives of the business.

Operation

- Machinery, equipment and harvesting systems appropriate to the site and the production requirements should be used.
- Appropriate haulage systems and roading networks with linkages to existing external roads should be developed.
- Appropriate machinery and equipment should be used to load and transport harvested material from the site.

» *Approved Code of Practice for Logging Stanchions and Bulkheads 1991*

Soil and Water Resources

- There should be minimal soil disturbance, soil compaction and impact on water run-off as a result of harvesting operations. Some factors to be considered include:
 - timing (season) of harvesting operation
 - site characteristics (slope, soil type and watercourses)
 - extraction and haulage routes
 - load sizes
 - machinery movements.

- Extraction and haulage operations should be suspended when the soil has become saturated with water, and when there is likelihood of off site impact on water quality.
- Determine unacceptable levels of soil damage caused by wheel tracks prior to the harvesting operation. Soil damage that exceeds this level should be stabilised and repaired as soon as possible.
- Extraction of harvested product should cease whenever water is running in extraction wheel tracks.
- Once harvesting operations are completed, steps should be taken to ensure water flow is not concentrated down wheel ruts.
- Culverts or drains should not be blocked or water flow impeded during harvesting operations. Routine maintenance of culverts and drains should be scheduled.
- During harvesting operations, precautions must be taken to minimise the number of trees that are felled into drainage lines, watercourses, lakes, reservoirs, wetlands and sinkholes. Treetops should be removed if they do fall into these areas.
- Machinery must not enter watercourses and wetlands except at properly constructed crossings, and movement across drainage lines should be minimised.
- There may be cases where forest plantations have historically been planted in a buffer zone. In such cases these trees may be felled following an appropriate risk assessment for the protection of soil and water quality.

Harvest Management

- Harvesting managers should:
 - Ensure adequate track and site access at all times.
 - Ensure that operators are aware of their environmental care responsibilities during harvest operations.
 - Monitor the impact of the operation on the remaining plantation, including the impact of soil compaction on productivity and the affect of wheel rutting on tree stability. This may result in the suspension of harvesting operations.
 - Consider impacts on neighbours and other relevant stakeholders regarding hours of operation, noise, dust, traffic movements and possible changes to public road surfaces where trucks or machinery enter and exit.

Post Harvest

- Consideration should be given to slash management to maintain appropriate organic matter levels in the soil, prevent soil erosion events and manage fire risk. For further information see [Section 4.1.1 Soil Resource](#) and [Section 7.2 Fire Prevention and Management](#).
- Progressive rehabilitation of tracks, roads, landings, and other earth works associated with the harvesting operation is required. For further information see [Section 8.1 Road Construction and Maintenance](#).

10. Safety and Training

Forest operations can pose a risk to the safety of forest owners, managers, employees and contractors due to the nature of the environment and equipment used.

» Relevant Guiding Principles: Safety

MANDATORY REQUIREMENTS

- All potential hazards must be identified.
 - » *Occupational Health, Safety and Welfare Act 1986*
- Plantation operations must be carried out in a safe manner.
 - » *Occupational Health, Safety and Welfare Act 1986*
 - » *Occupational Health, Safety and Welfare Regulations 1995*

INDUSTRY PRACTICES

- Plantation managers, employees and contractors should be appropriately trained, licenced or deemed competent.
- Safe systems of work should be developed, implemented and monitored for employees and demonstrated by contractors.
- The safety of all forest users should be considered and the risk managed, when planning and conducting forest operations.

11.

Good Neighbour Relations

Companies or forest owners/managers are encouraged to be good neighbours and adopt regional Good Neighbour Charters where they exist.

INDUSTRY PRACTICES

- Develop and maintain channels of communication to inform stakeholders of issues of mutual interest with respect to forest operations.
 - » *Good Neighbour Charter for Commercial Tree Growing in the Green Triangle Region of South East South Australia and South West Victoria. 2004. Green Triangle Regional Plantation Committee*

12. Appendices

Appendix 1.	Forest Practices Related to Wood Production in Plantations: National Principles 1996
Appendix 2.	Legislation and other relevant documents that may apply to plantation forestry in South Australia
Appendix 3.	Region Specific Issues
Appendix 4.	Trees and Clearance from Powerlines in South Australia
Appendix 5.	Plantation Forestry Land Capability Classification System
Appendix 6.	Buffer and Filter Zones for Forest Operations

Appendix 1.

Forest Practices Related to Wood Production in Plantations: National Principles 1996

Preamble

Wood production is an accepted major commercial use of Australia's forests and is the primary purpose for establishing and managing plantations. In addition, plantations can provide a range of commercial, environmental and aesthetic benefits to the community.

In pursuing a vision of ecologically sustainable management of Australia's forests, Australian Governments, through the National Forest Policy Statement, have enunciated a national goal for plantations:

'to expand Australia's commercial plantations of softwoods and hardwoods so as to provide an additional, economically viable, reliable and high quality wood resource to industry.'

In this context, the establishment of plantations for wood production should be determined on the basis of economic viability and international competitiveness, and market forces should determine the extent of resources use and the nature of industry operations. In essence, plantations established for wood production should be treated in the same way as any agricultural productions.

To achieve greater investment in plantations, it will be necessary to ensure that the impediments to plantation development are minimal, that clear and consistent policies for resources development are established across all levels of government and that there is security of access to established resources. Provided that social and environmental objectives are met, Governments will keep regulations to a minimum. For example, the Commonwealth will remove controls over the export of unprocessed public and private plantation wood subject to the application of codes of practice to protect environmental values. Furthermore, it is not intended that controls be imposed on the plantation industry that would not apply to other agricultural activities.

In accordance with the National Forest Policy Statement, the Ministerial Council on Forestry, Fisheries and Aquaculture, representing the State's and the Commonwealth's forestry authorities, has prepared this statement of national principles to be applied in the management of plantations.

These principles set the framework for a consistent and scientific basis for sound plantation management to which all States and Territories subscribe. Codes of practice for plantations, conforming to the national principles, will be developed by the States and Territories taking into account the range of plantation types, conditions and situations applying due to natural and cultural variations. Several States and Territories already have such codes in place.

The principles have been structured into several sections relating to different activities associated with plantation production. The principles apply to both public and private plantations.

1. Principles of Environmental Care

1.1 Native forest should not be cleared for plantation establishment where this would compromise regional conservation and catchment management objectives. In some circumstances it may be appropriate to clear forests that have been severely degraded by impacts such as disease, weed invasion, wind and fire so as to enable rehabilitation through replanting.

1.2 Values such as intensive recreation, high scenic quality, significant geomorphic, biological, or cultural heritage sites, should be recognised in the planning of plantation forest operations.

- 1.3 Plantation management should comply with State and regional conservation and catchment management objectives, relevant planning schemes and legislation.
- 1.4 Water quality (physical, chemical, or biological) should be protected by measures controlling change resulting from plantation activities.
- 1.5 Water yield should be managed as required by careful planning of operations.
- 1.6 Soil stability should be protected by measures, which regulate site disturbance.
- 1.7 Soil, water catchment, cultural and landscape values should be protected by the careful location, construction, and maintenance of roads and tracks, and regulation of their use.
- 1.8 Fauna, floristic, and landscape values should be protected by the careful planning of plantation layout establishment operations and the reservation and protection of appropriate areas of native vegetation; such values should be recognised in subsequent plantation management.
- 1.9 Plantations and adjacent native forests should be protected from the adverse effects of fire and from the introduction and spread of plant, insect and animal pests and plant diseases.
- 1.10 Operators will be trained in the Principles of Environmental Care.

2. Safety

- 2.1 All plantation establishment, management and utilisation activities will be conducted to comply with relevant occupational health and safety legislation and policy. In particular, all operators should be trained to designated standards in the safe and efficient use of equipment and machinery, and be responsible for safe working practices.

3. Planning

- 3.1 State and Local Governments should, with appropriate public involvement, pursue planning policies that provide secure zoning for commercial planting with the objective that tree planting and subsequent harvesting for commercial wood production should be an 'as of right' use.
- 3.2 State Governments will establish a sound legal basis for separating the forest asset component from the land asset for tree plantings. The Commonwealth Government will consider similar action re taxation, capital valuation etc.
- 3.3 Plantation strategic planning should be developed in conjunction with regional development plans.
- 3.4 The environmental, social and economic effects of all plantation operations envisaged for an area will be considered during the planning process.
- 3.5 Individual plantation operations will be conducted in accordance with relevant codes of practice.

4. Access

- 4.1 Planning of road systems in plantations will be based on both the economic principle of minimising the combined cost of roading and extraction and on the Principles of Environmental Care.
- 4.2 Road design will be to standards consistent with the purpose for which the road is to be used, and capable of carrying the anticipated traffic with reasonable safety.

- 4.3 Construction and maintenance of roads and associated works will be undertaken in a manner, which will ensure compliance with the Principles of Environmental Care.
- 4.4 Roads will be closed in wet conditions when unacceptable damage would occur or when such other conditions may warrant.

5. Establishment and Maintenance

- 5.1 Plantation establishment methods should be economically and environmentally appropriate for the particular requirements of the species to be planted and the specific site conditions.
- 5.2 Establishment of plantations may involve introduction of selected species, provenances or populations to increase productivity or value. However management of these plantations should aim to constrain or prevent the introduction of these species into surrounding areas.
- 5.3 Intensive management practices, such as site preparation, fertilising, weed control, pest and disease control and other operations will be carried out in accordance with codes of practice, and consistent with the Principles of Environmental Care.

6. Timber Harvesting

- 6.1 Timber harvesting will be planned and carried out under codes of practice to meet the Principles of Environmental Care.
- 6.2 The harvesting plan will consider factors such as harvesting unit size, slope and location of harvesting units; design and location of landings and snig tracks; harvesting equipment; areas excluded from logging; and areas specified for protection and reforestation.
- 6.3 Harvesting operations should not be conducted in a manner which compromises the Principles of Environmental Care, or where the safety of workers is at unacceptable risk.
- 6.4 Soil and water values should be protected by progressive rehabilitation and drainage of snig tracks, temporary roads, log dumps and any other earthworks associated with harvesting operations.

7. Forest Protection

- 7.1 Fire protection planning should be undertaken on a regional basis in co ordination with relevant land management agencies and with local bush fire control organisations.
- 7.2 Plantation health surveillance should be undertaken on a regular basis.
- 7.3 Where weeds, pests or diseases cause significant damage, decline, or deaths of trees, prompt specialist advice should be sought to address the problem.
- 7.4 Use of chemicals, such as herbicides and pesticides, and other pest control methods in plantation operations will be in accordance with State policies, procedures and approved usage.

8. Monitoring and Review

- 8.1 Where practicable, plantation operations should be supervised and monitored by qualified persons and be subject to audit.
- 8.2 The National Principles should be reviewed and evaluated after three years.

Appendix 2.

Legislation and other relevant documents that may apply to plantation forestry in South Australia

Commonwealth Legislation (www.comlaw.gov.au)

Legislation	Agency	Purpose	Most relevant sections
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Department of the Environment, Water, Heritage and the Arts	<p>The purpose of the Act is to preserve and protect areas (including Australian waters) and objects of particular significance to Indigenous people in accordance with their tradition.</p> <p>The Act provides for Indigenous people to apply to the Minister for the Environment, Heritage and the Arts to protect significant areas and objects under threat of injury or desecration, when there is no effective protection under a state or territory law. The states and territories retain the primary role to protect significant areas and objects, with the Australian Government Act providing for protection in the last resort.</p>	<p>S.9 S.10 S.11 S.20</p>
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Department of the Environment, Water, Heritage and the Arts	<p>The EPBC Act is Australia's key environmental law, which protects matters of national environmental significance. It regulates any activity that is likely to have a significant impact on nationally threatened species and ecological communities, World Heritage properties, National Heritage places, Ramsar wetlands, migratory species protected under international agreements, the Commonwealth marine environment and nuclear actions.</p> <p>The EPBC Act also regulates actions taken on or affecting Commonwealth land and activities of Commonwealth agencies.</p> <p>The EPBC Act promotes the conservation of biodiversity by providing protection for:</p> <ul style="list-style-type: none"> • listed species, including migratory and marine species, and ecological communities in Australian areas • protected species in the Territories of Cocos (Keeling) Islands, Coral Sea Islands and Christmas, Lord Howe and Norfolk Islands • protected areas (World Heritage properties; National Heritage places, Ramsar wetlands; Biosphere reserves; Australian reserves; and conservation zones). <p>The EPBC Act provides for the development and endorsement of conservation advice and recovery plans for nationally listed threatened species and ecological communities.</p>	<p>S.12 S.16 S.18 S.20</p>

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Legislation	Agency	Purpose	Most relevant sections
<i>Quarantine Act 1908</i>	Department of Agriculture, Fisheries and Forestry	The Act with its subordinate regulations and proclamations provides the comprehensive system of control to prevent the introduction into Australia of diseases or pests affecting human beings, animals or plants.	S.4 S.54

State Legislation (www.legislation.sa.gov.au/browseActs.aspx)

Legislation	Agency	Purpose	Most relevant sections
<i>Agricultural and Veterinary Products (Control of Use) Act 2002</i>	Primary Industries and Resources SA	This Act regulates the use of agricultural and veterinary chemicals in South Australia. It contains a general duty, when using agricultural products, to prevent the product from escaping the target area and causing harm. This duty can be enforced by the issue of a compliance order. There are a number of offences relating to the storage, use and disposal of agricultural chemical products and standards prescribed for the sale of fertilisers.	S.5 S.6 S.7 S.8 S.30
<i>Aboriginal Heritage Act 1988</i>	Department of the Premier and Cabinet	Provides for the protection and preservation of all Aboriginal sites, objects and remains and pursuant to Section 23, it is an offence to damage, disturb or interfere with any site, object or remains without the Minister's authorisation.	S.3 S.20 S.21 S.23 S.24 S.25 S.26 S.30 S.36
<i>Biological Control Act 1986</i>	Primary Industries and Resources SA	Provides for the biological control of pests, involving the control of organisms by the release of live organisms of another kind – primarily aimed at agricultural pests. This Act essentially provides the procedures to be followed. Regulates the actions of the Biological Control Authority and prevents the release of agent organisms before sufficient research is completed.	S.4
<i>Controlled Substances Act 1984</i>	Department of Health	Regulates or prohibits the manufacture, production, sale, supply, possession, handling or use of certain poisons and other substances including pesticides.	S.12 S.22 S.25 S.26 S.27
<i>Dangerous Substances Act 1979</i>	SafeWork SA	Regulates the storage and use of substances declared to be dangerous substances, including fuels, gases and flammable liquids.	S.5 S.11 S.12 S.14 S.18
<i>Development Act 1993</i>	Department of Planning and Local Government	Regulates all development in SA by providing specific assessment and approval processes for all actions that fall within the definition of 'development', including plantation developments with regard to conformity to council development plans.	S.4 S.32 S.49

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Legislation	Agency	Purpose	Most relevant sections	
<i>Electricity Act 1996</i>	Department for Transport, Energy and Infrastructure	Regulates the electricity supply industry; to make provision for safety and technical standards for electrical installations; and for other purposes.	S.55	
<i>Environment Protection Act 1993</i>	Environment Protection Authority (SA)	Promotes the principles of ecologically sustainable development based on sound environmental practices and policies that protect, restore and enhance the quality of the environment. Includes provisions for pollution control, licences covering prescribed activities and general duty of care requirements to minimise harm to the environment.	S.3 S.5 S.25 S.34 S.59 S.61 S.64	S.79 S.80 S.82 S.83 S.84 S.93 S.99
<i>Explosives Act 1936</i>	SafeWork SA	Regulates the mixing, using and storing of ammonium nitrate.	S.52	
<i>Fire and Emergency Services Act 2005</i>	Country Fire Service	Provides for a country fire service to provide for the prevention, control and suppression of fires.	Pt 4 Div 8	
<i>Forestry Act 1950</i>	ForestrySA (South Australian Forestry Corporation)	Provides for the creation, management and protection of state forest reserves including conservation, development and management of 'native forest reserves'. Note: the Act is not applicable to freehold land.	S.3 S.8 S.9 S.10 S.11	S.13 S.16 S.17 S.18
<i>Forest Property Act 2000</i>	Primary Industries and Resources SA	Provides for the separation of ownership of land, forest vegetation and carbon rights for improved investment security and transferability. Provides for the granting of commercial forest plantation licences.	S.3 S.5 S.6 S.7 S.16	
<i>Plant Health Act 2009</i>	Primary Industries and Resources SA	Provides for the protection of plants from pests, the regulation of the movement of plants into, within and out of the State, and the control, destruction and suppression of pests.	S.3 S.11 S.13 S.14 S.20	
<i>Heritage Places Act 1993</i>	Department for Environment and Heritage	Provides for the protection and preservation of non-Aboriginal heritage.	S.16 S.17 S.36	
<i>Local Government (Forestry Reserves) Act 1944</i>	Primary Industries and Resources SA	Provides for the establishment and management of forests by municipal and district councils.	S.3-6	
<i>Mining Act 1971</i>	Primary Industries and Resources SA	Provides for the conduct of mining activities in South Australia by requiring proponents obtain licences and leases for all stages of the mining activity. The Act sets out the conditions for those leases, over what land they may be granted and what rights are conferred by such leases.	S.5 S.7 S.35	

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Legislation	Agency	Purpose	Most relevant sections
<i>National Parks and Wildlife Act 1972</i>	Department for Environment and Heritage	Provides protection measures for rare and threatened plant and animal species. Provides for the establishment of reserves for public benefit and recreation.	S.28 S.37 S.47 S.65 S.68
<i>Native Vegetation Act 1991</i>	Native Vegetation Council and Department for Water, Land and Biodiversity Conservation	Provides for the preservation of native vegetation and includes legislative controls for native vegetation clearance.	S.23 S.26 S.27
<i>Natural Resources Management Act 2004</i>	Natural Resources Management Council and Department of Water, Land and Biodiversity Conservation.	Promotes sustainable and integrated management of the state's natural resources and makes provision for the protection of the State's natural resources.	S.9 S.121 S.122 S.124 S.151 S.182 S.192
<i>Occupational Health Safety and Welfare Act 1986</i>	SafeWork SA	Provides for the health, safety and welfare of persons at work. In addition, serves to protect the public against risks to health or safety arising out of work related activities, including the use and operation of plant and equipment.	S.3 S.4 S.24
<i>Prevention of Cruelty to Animals Act 1985</i>	Department for Environment and Heritage	Act aims to achieve prevention of cruelty to any animals. Trapping of animals may occur subject to constraints.	S.44
<i>River Murray Act 2003</i>	Department of Water, Land and Biodiversity Conservation	Provides for the protection and enhancement of the River Murray and related areas and ecosystems	S.23
<i>Road Traffic Act 1961</i>	Department for Transport, Energy and Infrastructure	This Act applies to vehicles and drivers, riders, passengers, and pedestrians on roads.	Pt 4
<i>South Eastern Water Conservation and Drainage Act 1992</i>	Department of Water, Land and Biodiversity Conservation	Provides for the conservation and management of water and the prevention of flooding of rural land in the south-east of the state	S.41-44
<i>Waterworks Act 1932</i>	SAWater	Relates to water supply	S.56 S.57 S.58
<i>Wilderness Protection Act 1992</i>	Department for Environment and Heritage	Protects areas of pristine habitat throughout South Australia. Provides for the declaration of wilderness protection areas. Wilderness areas are those areas that have been minimally subjected to modern technology, exotic plants, animals or other organisms.	S.25 S.26

State Regulations (www.legislation.sa.gov.au/browseRegulations.aspx)

Regulations	Most relevant sections	
	<i>Agricultural and Veterinary Products (Control of Use) Regulations 2004</i>	R6
<i>Controlled Substances (Pesticides) Regulations 2003</i>	R6 R16 R17	R18 R20
<i>Controlled Substances (Poisons) Regulations 1996</i>	R6 R16 R17	R20 R21
<i>Dangerous Substances Regulations 2002</i>	R4	R5
<i>Development Regulations 1993</i>	Schedule 8 Schedule 10 Schedule 14	
<i>Electricity (General) Regulations 1997</i>	Pt 4 Div 3	
<i>Electricity (Principles of Vegetation Clearance) Regulations 1996</i>	Schedule 1 Pt C	
<i>Fire and Emergency Services Regulations 2005</i>	Pt 3 Div 4	
<i>Forestry Regulations 2005</i>	R17	
<i>Mining Regulations 1998</i>	R13 R14	R15
<i>Native Vegetation Regulations 2003</i>	R5 R6	R9
<i>Natural Resources Management (General) Regulations 2005</i>	Schedule 2	
<i>Occupational Health, Safety and Welfare Regulations 1995</i>	Division 4.1 Division 5.7	

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Approved Code of Practice for Logging Stanchions and Bulkheads. 1991.

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Policies

Declared Pest Species Policies.

Department of Water, Land and Biodiversity Conservation.

www.dwlbc.sa.gov.au/biodiversity/apc/policy.html

Environment Protection (Air Quality) Policy 1994

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Environment Protection (Burning) Policy 1994

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Environment Protection (Noise) Policy 2007

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EPA Guidelines for Responsible Pesticide Use. 2005.
Environment Protection Authority South Australia.
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Forest Owners Conference Plantation Design Guidelines. 2003.
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Good Neighbour Charter (2004). Good Neighbour Charter for Commercial Tree Growing in the Green Triangle Region of South East South Australia and South West Victoria.
Green Triangle Regional Plantation Committee.
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Phytophthora Management Guidelines. 2006.
Phytophthora Technical Group, Government of South Australia.
www.environment.sa.gov.au/biodiversity/pdfs/pc_management_guidelines.pdf

Plantation Design Guidelines – Farm Forestry. 2006.
Country Fire Service South Australia.
www.pir.sa.gov.au/_data/assets/pdf_file/0017/54413/CFS_Farm_Forestry_Guidelines_V3.pdf

Safe and Effective Herbicide Use – A Handbook for Near Water Application. 2007.
Environment Protection Authority South Australia.
www.epa.sa.gov.au/pdfs/pesticide_water.pdf

Safe and Effective Pesticide Use – A handbook for commercial spray operators. 2007.
Environment Protection Authority South Australia.
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Office of the Technical Regulator, Department for Transport, Energy and Infrastructure.
www.energy.sa.gov.au/_data/assets/pdf_file/0005/20975/trees_and_powerlines.pdf

Unsealed Roads Manual: Guidelines to Good Practice. 2000.
ARRB Group. Copies available from ARRB Group Ltd
www.arrb.com.au/index.php?option=com_content&task=view&id=1&Itemid=3

Planning Documents

Local council development plans.

www.planning.sa.gov.au/go/development-plans/development-plans-online

Planning SA's Forestry Module – can be found in the BDP Planning Policy Library and Guides.

www.planning.sa.gov.au/go/development-plans/better-development-plans-project/bdp-practitioner-information/bdp-policy-library-and-guides

State Natural Resources Management (NRM) Plan 2006.

Department of Water, Land and Biodiversity Conservation, Government of South Australia.

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Planning Strategy for the Outer Metropolitan Adelaide Region (December 2007). Planning SA.

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South Australian Biosecurity Strategy 2008–2013 Primary Industries and Resources SA.

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Forestry and Timber – Pests and Disease Watch List.

Department of Agriculture, Fisheries and Forestry.

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Appendix 3.

Region Specific Issues

Green Triangle

- Water use is prescribed in the Lower Limestone Coast Prescribed Wells Area. This has an impact on plantation forestry and further information is available in the Water Allocation Plan and/or from the South East Natural Resources Management Board. (www.senrm.sa.gov.au/)
 - » *Natural Resources Management (General) Regulations 2005*
- Clearance of dead trees capable of providing habitat for Red-tailed Black-Cockatoo (listed under the *Environment Protection and Biodiversity Conservation Act 1999*) are not automatically exempt and require approval of the Native Vegetation Council.
 - » *Native Vegetation Regulations 2003*
 - » *Species Profile and Threats Database for species and ecological communities listed under the Environment Protection and Biodiversity Conservation Act 1999*

Mount Lofty Ranges

- Outer Metropolitan Adelaide Region (OMAR)

Forestry development applications are to be assessed by the Development Assessment Commission (DAC) when:

 1. the development involves a change in use of land for the purposes of establishing or expanding a commercial forest; and
 2. where the area to be planted equals or exceeds 20 hectares within:
 - A. the areas of any of the following councils:
 - i. Adelaide Hills Council
 - ii. Alexandrina Council
 - iii. The Barossa Council
 - iv. The District Council of Mount Barker
 - v. City of Victor Harbor
 - vi. The District Council of Yankalilla; or
 - B. any part of the area of the City of Onkaparinga outside Metropolitan Adelaide; or
 - C. any part of the area of the City of Onkaparinga within Metropolitan Adelaide that is in Policy Area 61 (Primary Production) or Policy Area 62 (Watershed) in the Rural Zone delineated by the relevant Development Plan.
 - » *Development Regulations 1993*
 - » *Planning Strategy for Outer Metropolitan Adelaide December 2007*
- Water use is prescribed in the Western Mount Lofty Ranges. This has an impact on plantation forestry and further information is available from the Adelaide and Mount Lofty Ranges Natural Resources Management Board. (www.amlrnrm.sa.gov.au/).

- Water use is prescribed in the Eastern Mount Lofty Ranges. This has an impact on plantation forestry and further information is available from the South Australian Murray-Darling Basin Natural Resources Management Board.
(www.samdbnrm.sa.gov.au)

Fleurieu Swamps Buffer Requirements

- For the purposes of protecting water quantity, forestry plantations should incorporate a minimum separation distance of:
 - 50 metres between forestry plantations and Fleurieu Swamps identified in the *Environment Protection and Biodiversity Conservation Act 1999*
 - 20 metres between forestry plantations and the top banks of streams above Fleurieu Swamps identified in the *Environment Protection and Biodiversity Conservation Act 1999*
 - 2.5 metres between forestry plantations and the centre line of drainage lines above Fleurieu Swamps identified in the *Environment Protection and Biodiversity Conservation Act 1999*
- » *PlanningSA's Forestry Module*
 - » *The Swamps of the Fleurieu Peninsula. Nationally Threatened Species and Ecological Communities Information Sheet 2003*

Kangaroo Island

- Clearance of dead trees capable of providing habitat for Glossy Black-Cockatoo (listed under the *Environment Protection and Biodiversity Conservation Act 1999*) are not automatically exempt and require approval of the Native Vegetation Council.
 - » *Native Vegetation Regulations 2003*
 - » *Species Profile and Threats Database for species and ecological communities listed under the Environment Protection and Biodiversity Conservation Act 1999*

Appendix 4.

Trees and Clearance from Powerlines in South Australia

The clearances listed below apply to planting trees with an expected mature height over six metres near uninsulated powerlines (lesser distances apply to fully insulated conductors) in Bushfire Risk Areas as defined in regulations under the *Electricity Act 1996*. These areas include lands suitable for afforestation in the Upper and Lower South East, Northern and Mount Lofty Ranges regions and Kangaroo Island.

Voltage of the line	Towers or poles	Minimum planting distance from centreline of powerline
500kV	Towers	38 metres
275kV	Towers	25 metres
132kV	Towers	30 metres
132kV	Single pole	20 metres
66kV	Single pole	13 metres
<66kV	Single pole	12 metres

» *Electricity Act 1996*

» *Electricity (Principles of Vegetation Clearance) Regulations 1996*

» *Trees and Powerlines Issue 07/2008*. Office of the Technical Regulator, Department for Transport, Energy and Infrastructure

Industry Practices

- Where a powerline adjoins or crosses an area to be used for plantation forestry with an expected mature height over 6 metres, a minimum clearance of 20 metres from the centreline of all uninsulated powerlines (132 kV—single pole or less) is recommended. This minimises the need for pruning or premature clearance due to edge trees encroaching into minimum clearance areas.

» *Planning SA's Forestry Module*

Appendix 5.

Plantation Forestry Land Capability Classification System

A key component in selecting suitable land for plantation forestry is conducting a land capability assessment.

- Land capability refers to the ability of land to support a type of land use without causing damage. Land capability assessments are, to some extent, subjective depending on the nature of the intended land use.
- The land capability classes identified in this appendix are based on water and wind erosion as the principal limiting factors. This is an appropriate reflection of the soil types found in South Australia's existing forestry regions.
- For forestry development in non-traditional forest growing regions (e.g. lower rainfall climates), or forestry development with additional objectives such as natural resources management, the land capability classes and assessment system, while generally applicable, may not be appropriate. Users of this guideline are encouraged to refer to more comprehensive land capability assessment literature, or to seek professional advice.

» *Soil and Land Information for SA, Fact Sheet 12.*

Department of Water, Land and Biodiversity Conservation

- The following Plantation Forestry Land Capability Classification System has been adapted for forestry use from *Assessing Agricultural Land: Agricultural Land Classification Standards Used in South Australia's Land Resource Mapping Program* (Maschmedt 2000;) and *Australian Soil and Land Survey Field Handbook* (McDonald RC, Isbell RF, Speight JG, Walker J & Hopkins MS 1984, Inkata Press, Melbourne).
- The system derives eight plantation forestry land capability classes that are based on soil drainage, texture, structure and depth, and slope. Table 1 further summarises land use options and associated management practices.

Table 1. Plantation Forestry Land Capability Class, Land Use and Management Practices

Erosion based plantation forestry land capability class	Capability	Land use options	Management practices
I	Very high	Plantation forestry	Standard practice
II	Very high	Plantation forestry	Standard practice
III	High	Plantation forestry	Standard practice with slight modification
IV	Average	Plantation forestry	Standard practice with some modified practices
V	Fair	Plantation forestry	Modified practices required
VI	Low	Non-plantation forestry	Intensive modified practices
VII	Very low	Non-plantation forestry	Very intensive modified practices
VIII	Nil	Non-plantation forestry	Soil conservation only

- Further details on standard or modified management practices are summarised below:
 - Standard practice includes:
 - soil cultivation in the form of ripping, ploughing and/or mounding, and spot cultivation
 - competition control to reduce competition from weed species
 - application of fertiliser when required.
 - Modified practices are variations on the standard practices with the intention to manage or overcome site limitations. The modified practices used depend on the limiting factors. Following are some suggested management tools:
 - Water erosion risk—consider strip cultivation (if required) with gaps to allow for drainage, maintain grass cover between planting lines, design for upslope run-off to prevent soil movement, consider herbicide application post planting.
 - Wind erosion risk—consider strip cultivation and weed control, maintain grass cover between planting lines.
 - Poorly drained soils—consider mounding planting lines, restrict harvesting operations when soil becomes saturated.
 - Rockiness—can usually be managed with ripping.
 - Infertile soil—can be managed with applications of fertiliser.
- A flow chart summarising the process of determining the erosion based plantation forestry land capability class is provided below.

Flow Chart – Plantation Forestry Land Capability Class

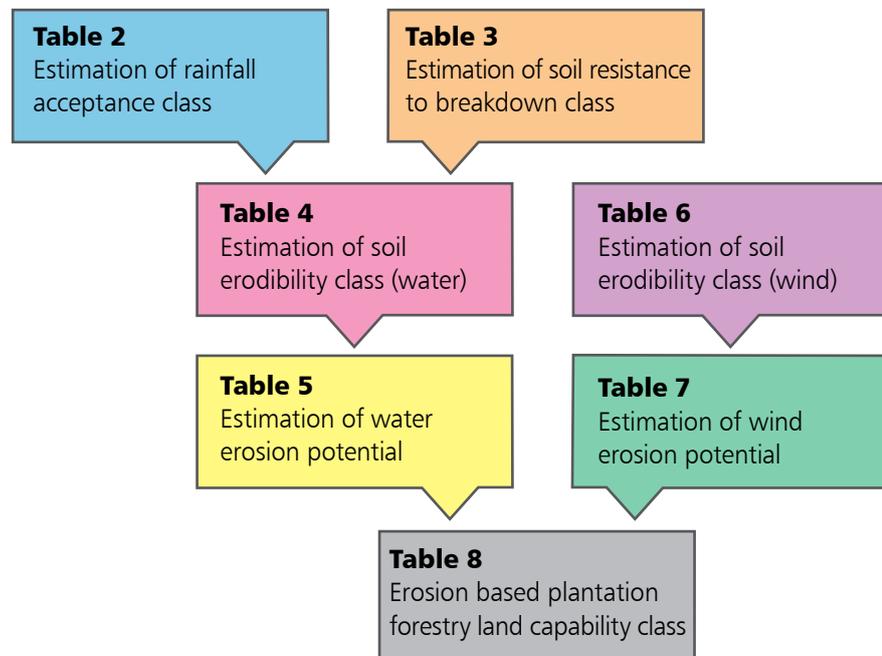


Table 2. Estimation of Rainfall Acceptance Class

Work (left to right) across the table to estimate the Rainfall Acceptance Class.

Drainage class	Depth to impermeable layer	Permeability class above permeable layer	Rainfall Acceptance Class
Rapidly drained – soil is never wet for more than several hours OR Well drained – soil is never wet for more than several days	>100 cm	Highly permeable – sand	Very high
		Moderately permeable – loam	Very high
		Impermeable – clay	High
	50–100 cm	Highly permeable – sand	Very high
		Moderately permeable – loam	High
		Impermeable – clay	High
	<50 cm	Highly permeable – sand	High
		Moderately permeable – loam	High
		Impermeable – clay	High
Moderately well drained – soil is wet for up to one week OR Imperfectly drained – soil is wet for several weeks OR Imperfectly drained – soil is prone to saturation very early in the season	>100 cm	Highly permeable – sand	High
		Moderately permeable – loam	High
		Impermeable – clay	Moderate
	50–100 cm	Highly permeable – sand	High
		Moderately permeable – loam	Moderate
		Impermeable – clay	Moderate
	<50 cm	Highly permeable – sand	Moderate
		Moderately permeable – loam	Low
		Impermeable – clay	Low
Poorly drained – soil is wet for several months OR Very poorly drained – soil is wet for most of the year OR Inundated – land is permanently under water	>100 cm	Highly permeable – sand	Low
		Moderately permeable – loam	Low
		Impermeable – clay	Very low
	50–100 cm	Highly permeable – sand	Low
		Moderately permeable – loam	Very low
		Impermeable – clay	Very low
	<50 cm	Highly permeable – sand	Very low
		Moderately permeable – loam	Very low
		Impermeable – clay	Very low

Table 3. Estimation of Soil Resistance to Breakdown Class

Work (left to right) across the table to estimate the soil resistance to breakdown class.

Texture of 'A' horizon	Structure/consistency	Soil resistance to breakdown class
Sand	Loose, soft, single grained	Very low
Loamy sand	Non coherent, single grain	Very low
	Soft, poorly structured	Very low
	Hard, massive	Low
Sandy loam	Non coherent	Very low
	Soft, firm/weak structure	Low
	Hard, massive	Moderate
Loam	Soft, weak structure	Low
	Firm, hard, massive	Moderate
Clay loam	Friable/strong crumb	High
Loamy clay	Hard, poor structure	High
	Soft, firm/self mulching	Moderate
Clay	Cracking	High

Table 4. Estimation of Soil Erodibility Class (Water)

Work (left to right) across the table to estimate the soil erodibility class (water).

Rainfall acceptance class from Table 2	Soil resistance to breakdown class from Table 3	Soil erodibility class: water
Very High	High	Low
	Moderate	Low
	Low	Low
	Very low	Moderate
High	High	Low
	Moderate	Low
	Low	Moderate
	Very low	Moderate
Moderate	High	Low
	Moderate	Moderate
	Low	Moderate
	Very low	High
Low	High	Moderate
	Moderate	Moderate
	Low	High
	Very low	Very high
Very Low	High	Moderate
	Moderate	High
	Low	Very high
	Very low	Very high

Table 5. Estimation of Water Erosion Potential

Work (left to right) across the table to estimate the water erosion potential.

Water soil erodibility class from Table 4	Slope range	Water erosion potential
Low	0–1°	Low
Moderate/high	0–1°	
Very high	0–1°	
Low	1–5°	Moderately low
Moderate/high	1–4°	
Very high	1–3°	
Low	5–10°	Moderate
Moderate/high	4–8°	
Very high	3–4°	
Low	10–18°	Moderately high
Moderate/high	8–12°	
Very high	4–6°	
Low	18–25°	High
Moderate/high	12–20°	
Very high	6–15°	
Low	25–45°	Very high
Moderate/high	20–35°	
Very high	15–25°	
Low	45+°	Very high
Moderate/high	35+°	
Very high	25+°	
Moderate/high	45+°	Extreme
Very high	45+°	

Table 6. Estimation of Soil Erodibility Class (Wind)

Work (left to right) across the table to estimate the soil erodibility class (wind).

Texture of 'A' horizon	Dry coherence	Soil erodibility class: wind
Sand	Loose	High
Loamy sand	Loose	High
	Weakly coherent	Moderate
Sandy loam	Weakly coherent	Moderate
	Firm to hard	Low
Light sandy clay loam	Weakly coherent	Moderate
	Firm to hard	Low
Sandy loam	Weakly coherent	Moderate
	Firm to hard	Low
Loamy	Any	Low
Clay	Any	Low

Table 7. Estimation of Wind Erosion Potential

Work (left to right) across the table to estimate the wind erosion potential.

Rainfall	Soil erodibility class: wind – from Table 6	Topography	Wind erosion potential
250–350 mm	Low	Flats, rises	Low
	Moderate	Flats, rises	Moderate
	High	Flats, rises	High
		Low sandhills (<5m)	High
		Moderate sandhills (5–10m)	Extreme
High sandhills (>10m)	Extreme		
350–450 mm	Low	Flats, rises	Low
	Moderate	Flats, rises	Low
	High	Flats, rises	Moderate
		Low sandhills (<5m)	Moderate
		Moderate sandhills (5–10m)	High
High sandhills (>10m)	Extreme		
450–600 mm	Low	Flats, rises	Low
	Moderate	Flats, rises	Low
	High	Flats, rises	Moderate
		Any sandhills	High
More than 600 mm	Low	Flats, rises	Low
	Moderate	Flats, rises	Low
	High	Flats, rises	Low
		Any sandhills	Moderate

Table 8. Determination of Erosion Based Plantation Forestry Land Capability Class.

Work (left to right) across the table to determine the erosion based plantation forestry land capability class.

Water erosion potential from Table 5	Wind erosion potential from Table 7	Erosion based plantation forestry land capability class
Low	Low	I
	Moderate	I
	High	III
Moderately low	Low	II
	Moderate	II
	High	III
Moderate	Low	III
	Moderate	III
	High	IV
Moderately high	Low	IV
	Moderate	IV
	High	V
High	Low	V
	Moderate	V
	High	VI
Very high	Low	VI
	Moderate	VI
	High	VII
Extreme	Low	VIII
	Moderate	VIII
	High	VIII

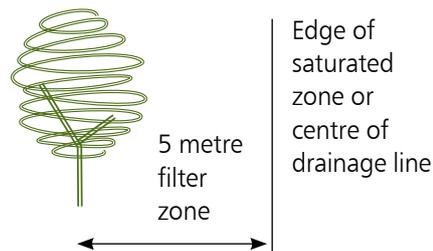
For management practice recommendations for erosion based plantation forestry land capability classes refer to Table 1. Plantation Forestry Land Capability Class, Land Use and Management Recommendations.

Appendix 6.

Buffer and Filter Zones for Forest Operations

To protect water resources the following buffer and filter zones are recommended. Additional measures to protect a water resource, which may include increasing the width of the buffer or filter zone, may be adopted where high local risk is identified.

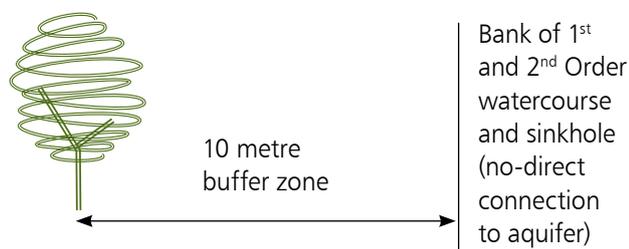
Drainage line



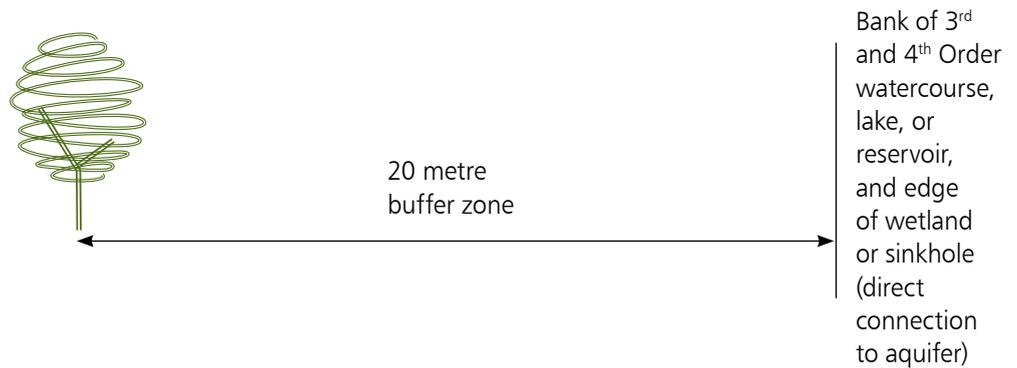
FILTER ZONE

- An undisturbed and vegetated area adjacent to a drainage line retained to minimise soil disturbance, compaction and erosion.
- Plantation trees may generally be planted and harvested subject to a risk assessment for the protection of soils and water quality.
- Cultivation, competition control and planting are limited to 'spot' operations.
- Machinery access should be minimised.
- The filter zone width is defined as the ground distance from the tree line to the edge of the saturated zone or centre of the drainage line.

Watercourse (1st and 2nd Order) and sinkhole (no-direct connection to aquifer):



Watercourse (3rd and 4th Order), lake, reservoir, wetland and sinkhole (direct connection to aquifer):



BUFFER ZONE

- A non-plantation area that is generally undisturbed and vegetated, providing a separation distance between a water resource and forest operations, for the purpose of protecting the water resource from potential detrimental impacts.
- Access is limited to fire protection and fire management equipment.
- Irregular, minor machinery access is permitted following an appropriate risk assessment for the protection of soil and water quality.
- The buffer zone width is defined as the ground distance from the tree line to the bank of a watercourse, lake, reservoir, or edge of wetland or sinkhole.
- There may be cases where forest plantations have historically been planted in a buffer zone. In such cases these trees may be felled following an appropriate risk assessment for the protection of soil and water quality.

For forest plantations being established near Fleurieu Swamps in the Mount Lofty Ranges region (and as identified in the *Environment Protection and Biodiversity Conservation Act 1999*), see [Appendix 3 – Region specific issues](#)

For forest operations adjacent to constructed or gazetted drains, a drainage easement is generally defined and the appropriate government authority should be contacted regarding permitted activities within these zones.

The Department for Environment and Heritage (SA) have completed a series of wetland inventories at a regional scale in South Australia. Details of these projects and copies of the documents are available from the department and their website.

www.deh.sa.gov.au/biodiversity/wetlands.html.

Glossary

biodiversity (biological diversity)

The variety of life forms represented by plants, animals and other organisms and micro-organisms, the genes that they contain, and the ecosystems and ecosystem processes of which they form a part.

Natural Resources Management Act 2004.

bridge

A structure spanning and providing passage over a gap or barrier, such as a river or roadway.

buffer zone

A non-plantation area that is generally undisturbed and vegetated, providing a separation distance between a water resource or native vegetation and forest operations, with the aim of protection from potential detrimental impact. The buffer width is defined as a ground distance from which various operations are excluded. Access is limited to fire protection and fire management equipment. Irregular, minor machinery access is permitted following an appropriate risk assessment for the protection of soil and water quality. There may be cases where forest plantations have historically been planted in a buffer zone. In such cases these trees may be felled from within a buffer zone following an appropriate risk assessment for the protection of soil and water quality.

clearfelling

Final harvesting operation in an area of plantation forest involving the cutting down of all trees.

chopper rolling

The physical breakdown of waste plantation material by a chopper roller being driven over the material.

competition control

The management of unwanted vegetation in a forest plantation.

culvert

A drain/pipe crossing under a road or embankment

debris

The branches and defect logs that remain on-site after a clearfelling operation.

drain

A constructed depression or channel designed to remove water from a site with discharge linkages to watercourses or wetlands. Normally drains will be part of a larger gazetted drainage network. Minor paddock scale drains designed to facilitate forest establishment that do not discharge into watercourses or wetlands, are not considered in this definition.

drainage line

A drainage line is a lower category of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall, and riparian vegetation may or may not be present.

establishment

The planting of seedlings or cuttings to produce a tree crop. It also encompasses the immediate pre- and post-planting phases of site preparation, competition control and fertiliser application.

extraction

The removal of logs from within a forest area to an adjacent roadside or firebreak.

farm forestry

The combination of forestry activity with cropping and/or livestock production. The focus of the forestry activity is primarily commercial, although there may also be other objectives including shade and shelter for stock or crops, natural resources management including soil and water protection, habitat conservation, landscape, and amenity values. Farm forestry can take many forms, including plantations on farms, woodlots, timber-belts, alleys, wide-spaced tree plantings and sustainably managed private native forests. Farm forestry plantations are predominantly of a smaller scale than industrial plantations and may have less emphasis on timber or fibre production as primary outputs.

Importantly, farm forestry is practiced by farmers and other landholders, using the resources and knowledge available to them. The farmer or landholder makes the critical decisions, from establishment and management to marketing of products and services.

Farm Forestry National Action Statement, August 2005

filter zone

An undisturbed and vegetated area adjacent to a drainage line retained to minimise soil disturbance, compaction and erosion. Plantation trees may generally be planted and harvested subject to a risk assessment for the protection of soil and water quality. Cultivation, competition control and planting are limited to 'spot' operations. The filter zone is defined as the ground distance from which various operations are excluded.

firebreak

An effectively fuel-reduced area primarily managed to retard or prevent the spread of fire.

Fleurieu swamp

The swamps of the Fleurieu Peninsula are localised wetlands occurring in high rainfall areas in the local catchment areas of Tookayerta, Hindmarsh, Parawa, Myponga, Yankalilla, Onkaparinga, Currency Creek and Finnis.

ford

A shallow place in a watercourse where vehicle crossing is possible.

forestry

See plantation forestry.

groundwater (underground water)

Water occurring naturally below the ground surface.

harvesting

The felling of trees; the cutting, snigging, preparing, sorting, loading or carting of plant material from trees which have been felled or which are fallen.

haulage

The transport of logs or woodchips from the forest edge to a wood processing plant or port.

heap/windrow

Debris from previous farming and forestry activities (usually tree branches and defect log left on-site after a clearfelling operation) heaped into rows, ready for disposal (usually by burning).

lake

A natural lake, pond, lagoon, lagoon, wetland or spring (whether modified or not) and includes:

- part of a lake; or
- a body of water designated as a lake by an Natural Resources Management Plan or Development Plan (under the *Development Act 1993*).

Natural Resources Management Act 2004.

land capability

The ability of land to accept a type and intensity of use with minimum risk of permanent damage to the soil resource

land capability classification system

A planning system that enables land uses to be allocated to appropriate landscapes according to the risk of soil erosion, and other forms of land degradation.

logging

See harvesting.

log landing

This includes log dumps, roadside bays, log yard or other area used for cutting up, debarking, measuring, sawing, storing and the loading of logs.

mounding

Planting row with a continuous raised bed (mound) often centred over a rip line.

plantation forestry

A forest plantation where the forest vegetation is grown or maintained so that it can be harvested or used for commercial purposes (including through the commercial exploitation of the carbon absorption capacity of the forest vegetation).

Natural Resources Management (General) Regulations 2005.

saturated zone

The zone associated with the drainage line where the soil is muddy or permeated with water. The zone ends where moisture is no longer visibly present in the soil.

sinkhole (doline, swallow hole)

Steep-sided, enclosed depression formed through collapse in a limestone region. It is normally located at a site of increased joint density, which focuses drainage passing vertically through the rock. It enlarges by solution (carbonation) and by collapse. A shaft may lead from its floor to a cave system.

Oxford Dictionary of Geosciences 1991

In this guideline, sinkholes are further delineated by the potential for draining surface water to have no-direct or direct connection with an aquifer.

site preparation

The range of activities undertaken to prepare an area for the planting of a tree crop. This can include a combination of activities including slash treatment, heaping and burning, and cultivation (ripping, ploughing, mounding and spot cultivation).

slash management

The management of waste material from a farm or previous plantation. This may include chopper rolling or other forms of breaking down the waste material.

spot cultivation

Soil tillage at the planting site for each seedling.

stream

See **watercourse**

strip cultivation

Soil tillage (including any combination of ripping, ploughing and mounding) in a line across an area of land in preparation for planting seedlings.

strip weed control

Weed control method applied in the direction of plantation rows, leaving untreated strips between rows, usually applied in the form of herbicide.

surface water

1. Water flowing over land (except in a watercourse):

- after having fallen as rain or hail or having precipitated in any other manner;

or

- after rising to the surface naturally from underground

2. Water of the kind referred to in 1. that has been collected in a dam or reservoir.

3. Water of the kind referred to in 1. that is contained in any stormwater infrastructure;
Natural Resources Management Act 2004.

watercourse

A river, stream, creek or other natural watercourse (whether modified or not) in which water is contained or flows whether permanently or from time to time and includes:

- a dam or reservoir that collects water flowing in a watercourse
- a lake through which water flows
- a channel into which the water of a watercourse has been diverted
- part of a watercourse
- an estuary through which water flows
- any other natural resource, or class of natural resource, designated as a watercourse for the purposes of the *Natural Resources Management Act 2004* by a Natural Resources Management Plan.

Natural Resources Management Act 2004

In this guideline, watercourses are further defined as first, second, third or fourth order watercourses, according to the Horton-Strahler rules. The ordering of watercourse begins at the source and increases as further branches are added to the network.

A first order watercourse has no tributaries; a second order watercourse is the confluence of two first-order watercourses. Third, fourth and higher order watercourses are major watercourses.

wetland

An area that comprises land that is permanently or periodically inundated with water (whether through a natural or artificial process) where the water may be static or flowing and may range from fresh water to saline water, and where the inundation with water influences the biota or ecological processes (whether permanently or from time to time) and includes any other area designated as a wetland by a Natural Resources Management Plan or by a Development Plan under the *Development Act 1993*, but does not include a dam or reservoir that has been constructed by a person wholly or predominantly for the provision of water for primary production or human consumption or an area within an estuary or within any part of the sea.

Natural Resources Management Act 2004.