

CHAPTER 4

SOCIAL AND ECONOMIC PROJECT SUMMARIES

SOCIAL/COMMUNITY

Introduction

The social assessment for the South-East Queensland CRA phase consists of four assessment projects. Collectively the four projects provide a general introduction to and overview of the ‘social landscape’ of the RFA region. They include regional social demographic data, scoping (a process for identifying and defining issues), profiling of stakeholder interests and the identification of timber-resource-dependent communities. The four projects include:

- SE 5.1 Post-Impact Studies Analysis
- SE 5.2 Regional Social Profile
- SE 5.3 Case Study Areas
- SE 5.4 Business Dependency Survey.

The Post Impact Studies Analysis report is a literature review of previous forest-use decisions and social impact assessments. The Regional Social Profile report provides baseline socio-demographic profile for the region including service delivery capacity and stakeholder identification and profiling. The Case Study Areas report focuses on communities that are dependent on the use of State forests for production purposes. The report provides additional baseline social data to assist in predicting the potential impacts on a range of communities to a change in forest use and management. The Business Dependency Survey report outlines the linkages between State forests, industry use and local communities. The report identifies (i) the social catchments based on current forest use patterns, and (ii) forest-user business employee household expenditure and forest-user business expenditure.

The social assessment reports gather baseline data that can be used in the ‘integration and option development’ phase of the RFA process. Further to this, some of the baseline data collected in the CRA phase will also be used in the ‘social impact assessment phase’ after the development of RFA options.

POST-IMPACT STUDIES ANALYSIS

SE 5.1

Project objectives

The objectives of the Post-Impact Studies Analysis project were to:

- review relevant social impact studies and social research which assess the positive and negative impacts of changes in the use of native forests and comparable resources on individuals and communities
- document and discuss issues arising from past social impacts
- explore and clarify the main theories relating to social impact assessment, change management and impact mitigation to inform the current impact context
- analyse three case studies of the social impacts of the cessation of logging in native forests to inform the current impact context
- highlight the fundamental principles and accepted good practices of social impact assessment, mitigation and monitoring to inform the current impact context

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- present a range of issues that will form a conceptual framework for the development of an effective and appropriate mitigation and monitoring program for the South-East Queensland RFA process.

Methods

This project achieved its aims through the presentation of secondary research on:

- key social impact assessment, including mitigation and monitoring theory and principles
- case studies of decisions regarding the cessation of logging
- change management, including implementation theory and practice.

Key results

Social impact assessment

An analysis of the social impact assessment identified the following broad functions:

- identifying social issues and potential social impacts relevant to particular proposals for particular communities and circumstances
- assessing those impacts, in terms of their magnitude, duration and the probability of their occurrence
- achieving better planning outcomes by influencing decision-making, leading to monitoring, mitigation and management strategies that reduce the negative impacts and enhance the positive ones.

The essence of social impact assessment is to understand the distribution of the social costs and benefits of imposed change and to seek to mitigate or minimise the negative impacts and enhance positive ones.

Mitigation, monitoring and change management

Mitigation is the management of both the positive and the negative impacts of an imposed change on a community and on the individuals involved in that community. Monitoring is the ongoing process that reviews the accuracy of the original predictions made in the social impact assessment and the validity and effectiveness of mitigation strategies that have been implemented. Participation of government and the community is essential if mitigation and monitoring are to be successful. Change management is examined as a series of steps that aim to deal with change as smoothly as possible. The steps are (1) planning, (2) diagnosis and (3) strategy development.

Case studies

The case study areas for the cessation of logging and post-impact analysis were Fraser Island, the Wet Tropics World Heritage area in north Queensland, and the Northwest Forest in Oregon, North America.

The key findings from these case studies concerning the social impact assessment and mitigation programs were:

1. Collaboration between government, stakeholders and the local people is essential.
2. Structural adjustment packages need to be locally specific and long term if they are going to be sustainable.
3. Professional social scientists need to be engaged for the development, implementation and evaluation of plans for the management of imposed structural change.
4. The timber workers, particularly those with no other vocational experience, suffered the highest costs of logging cessation.
5. Local employment is vital.
6. Implementation of change management strategies is crucial if the structural adjustment packages are to be successful.
7. Change management and economic development rely on collaboration between federal, State and local government and the local people.
8. The willingness of local people to accept and manage change is a factor that will influence the success of implemented programs.

In relation to World Heritage Listing of the Wet Tropics some of the key findings were:

1. The cessation of logging had negative social and economic impacts in areas of the region most dependent on the timber industry.
2. Areas with a small number of timber industry workers and mixed economies experienced the least impacts.
3. Although the impact on individuals and their families could be quantified, it was difficult to assess the impact of a single policy decision on towns and communities already experiencing a range of negative impacts (high interest rates, rural decline etc.).
4. At the community level the impacts differed for areas within the region, with some towns (especially in the Tableland regions) least able to maximise the positive impacts and minimise the negative impacts.

5. At the individual level, irrespective of location, affected individuals reported similar impacts such as fear and stress regarding financial security, family life and future employment prospects, and loss of self-esteem.
6. The people most affected by the changes were often removed from major regional employment centres and therefore had the least chance of local re-employment.
7. The key factors affecting re-employment were:
 - Age. Older workers (>50) were less able to consider future job prospects and were thus reluctant to relocate.
 - Life stage. Workers with family responsibilities and high financial obligations (typically ages 25-50) did not view relocation favourably.
 - Experience in the industry. Workers with mixed employment history were more likely to find employment than those who had only timber industry experience.

In relation to the cessation of logging on Fraser Island, some of the key findings were:

1. The social impact assessment was undertaken after the decision to cease logging had occurred.
2. The main centres affected, apart from Fraser Island, were Maryborough and to a lesser extent Hervey Bay.
3. There were significant levels of local community anger and frustration at outside involvement and imposed government decisions and a feeling that the region would become another Ravenshoe (a town greatly affected by the World Heritage Listing of the Wet Tropics).
4. There was a degree of cynicism regarding the effectiveness of the compensation program, which was influenced by the perceived failure of the compensation package for Ravenshoe.
5. The main impacts on timber workers (including the threat of unemployment and uncertainty about the future) combined to create an immense amount of stress. The amount of stress was related to five variables:
 - the worker's age
 - whether the worker had dependent children
 - number of years the worker had been employed in the timber industry
 - other employment or industry experience
 - the mill that employed the worker.

In relation to the northwest forest cessation of logging in Oregon, impacts on timber workers and on particular communities included such things as:

- increased unemployment
- impacts hardest on the 55 year+ age group, who were not able to adjust to changes
- increased pressure on social services
- broken families
- forced migration for work
- city funding shortages
- increased ageing of population in towns as young people leave to look for other work.

The impacts were very reliant on the age, ability to adapt to change, and location of the individual, and on the geographical and regional context of the town. Towns closer to regional arterial routes have not been as badly impacted because of their locational advantage in terms of access and attraction to alternative industries. Towns with a more diverse local economy have also been able to adjust to the changes much more readily and, with government support, have been able to begin to flourish.

Issues arising from the Post-Impact Studies Analysis

The project generated a list of issues regarding the RFA. These issues, outlined below, provide a conceptual framework for the development and implementation of effective mitigation, monitoring and change management strategies.

1. Mitigation strategies should be developed to enhance opportunities and to address disadvantages caused by the RFA decisions in a manner that is responsive and appropriate to the local environment and local community.
2. Governments should involve local community members and groups in the development, implementation and monitoring of all mitigation strategies, and provide the necessary resources.
3. Ongoing, locally appropriate and managed monitoring strategies should be developed, resourced and implemented as an integral part of the RFA mitigation program. This provides for the evaluation of the accuracy of the initial impact assessment predictions and allows for further recommendations regarding strategies required to address any gaps in the initial mitigation measures.
4. Mitigation strategies should be part of broad-based and integrated programs that focus on the capacity-building of individuals and particular communities, which include, but are not restricted to, the provision of financial compensation.

5. Capacity-building programs should be developed for each local area in full collaboration with the local council and community members and groups affected by the RFA decisions.
6. Existing community, regional and local economic development programs should be investigated by the State and Commonwealth governments, and where appropriate should be applied to support the local capacity-building mitigation program.
7. Any structural adjustment program should be developed by a committee of Commonwealth and State government officers, social and economic technical professionals and community and industry representatives, and should outline criteria for the development and implementation of the package.
8. Any structural adjustment program should be applied locally with full participation by local government and community members and organisations affected by the RFA decisions.
9. The criteria for involvement in any structural adjustment program should attempt to ensure that the non-organised or non-represented groups and individuals affected by the RFA decisions are considered and involved.
10. Local implementation teams should be developed to work within local communities, particularly with local individuals affected by the RFA decisions, in order to implement and monitor the mitigation program.
11. The local implementation teams should, where possible, incorporate a cross-section of technical and professional skills, and include local representatives and community members. Such a group would involve people with a background in local government, forestry, conservation, counselling and support, and local economic development. Where possible, existing local workers should be resourced and involved.

REGIONAL SOCIAL PROFILE

SE 5.2

Project objectives

The Regional Social Profile project provides a broad-scale regional social profile of the South-East Queensland RFA region which contains:

- baseline socio-demographic data
- a social profile of service sectors in the region
- social values and community perceptions about forest use and management
- a profile of stakeholder issues.

A social profile is important because it provides a social context for decision-making by taking a 'snapshot' of the regional social landscape.

Methods

The project examined a range of demographic indicators that are generally accepted as indicators of sensitivity to change. The indicators examined were age, education, vocational qualifications, income, housing, occupation, employment and employer sectors, SEIFA values (socio-economic index for areas) and population trends. The indicators were examined at a regional, sub-regional and local government level using 1996 Australian Bureau of Statistics (ABS) census data and 1991 census data when the 1996 figures were not available. A map of the 44 local government areas (Figure 2) is provided in Chapter 2 of this report.

The regional social profile examined service delivery capacity across the region. Health services (including doctors and hospitals), educational services (including primary, secondary and tertiary education) and housing (including public and private) were of particular interest. The data for service capacity came from Education Queensland, the Integrated Regional Database (IRDB 1996) and ABS census data.

The social values study undertaken was based on a random sample of 2000 respondents drawn from 10 sub regions. The 10 sub regions were Beaudesert, Brisbane, Builyan, Bundaberg, Esk, Gladstone, Kingaroy, Maryborough, north-east coast and the north coast. The structure of the sampling frame allowed comparisons to be made across each of the 10 sub regions, and through proportional weighting of the total sample, inferences could be drawn in relation to the population throughout the region. Structured telephone interviews were used to assess perceptions of forest values, the use of State forests and national parks and attitudes towards management planning in native forests.

The methods used to collect information about stakeholders included surveys of:

- hardwood mill managers and their employees

- hardwood logging contractors and their employees
- forest graziers and beekeepers and their employees
- local governments in the region
- farm foresters.

These surveys included 'open ended' questions, which encouraged general comments and qualitative statements from respondents. In addition to these surveys, several community meetings were held and focus groups conducted involving individuals from different stakeholder groups including tourism and recreation stakeholders. A forum of the Local Government Association of Queensland also contributed to the process of scoping issues. Further data were collected through interviews.

Key results

Population

Census figures suggest that South-East Queensland's population growth is likely to be more gradual in the years ahead than in the rapid growth phase of the late 1980s. Overall, the very high growth is mainly in the coastal shires or places adjacent to the coast. Shires undergoing a population decline are entirely in the northern inland group.

Employment

Employment in labouring occupations is highest in inland shires. With the exception of Miriam Vale, a high proportion of employment in agriculture and forestry was in inland western shires in 1991.

Age

An ageing child population suggests that in-migration and family formation occurred earlier in the 1980s. Coastal shires show both high growth rates and high proportions of the elderly. There are two types of ageing population: inland stagnant or slow-growing areas where the ageing population is contributed to by the out-migration of younger people; and coastal shires where the ageing population is comprised of in-migration of retirees.

Aboriginal and Torres Strait Islander people

The proportion of people who identify as Aborigines or Torres Strait Islanders is low in most shires, with concentrations of high proportions in inland rural areas, and highest actual numbers in major urban areas.

Income

Low-income categories are more coastal in distribution, related to retirees, but are also in many of the inland shires and significant proportions of low-income earners are lowest in the extreme south-east and the major urban areas. The high-income ranges are all in the south-east corner with the exception of the Gold Coast where retirees probably account for the lower range.

Socio-economic index for areas

The highest socio-economic index for areas (SEIFA) values (i.e. areas of socio-economic advantage) are in the extreme south-east coastal shires, declining northwards and especially north-westwards inland.

An analysis of these indicators shows marked differences across the region. The divide tends to correspond to geographical position, with the western shires demonstrating lower levels of education, income, youth population, SEIFA values, house values and population growth. The western shires also have higher levels of aged people and higher levels of employment in agricultural, forestry and labouring positions.

Service capacity

On a per-capita basis, the eastern or coastal shires and particularly the southern coastal shires have higher rates of service delivery capacity. The north-western shires have the lowest rates of service delivery capacity.

Health

The number of doctors per 1000 people in 1995 was highest in the major urban and coastal areas. The rapidly growing populations of Yarraman/Toowoomba/Gatton have been poorly serviced, although there was some improvement by 1995. Coastal areas are increasing their facilities, especially the Brisbane region and the north coast. Some interior shires such as Murgon and Mundubbera had an increase in health services despite a population decline and small numbers of people.

Housing

The highest proportions of rental accommodation are all in major urban areas. In all major urban areas dwelling occupancy rates are high, with the exception of the Gold Coast and Maryborough. Very low average house prices occur in the northern inland shires. Highest prices are in the Brisbane region.

Forest management concern

Beliefs associated with forest management concern, which focused primarily on concern with the management and use of native forests, were highest in the north coast sector and lowest in the Esk, Kingaroy and Builyan sectors (see Figure 5). A significant association was also found between the age of respondents and forest management concern, with respondents between 20 and 29 years of age having the highest levels of concern and with levels of concern gradually reducing among respondents over 30 years of age. Forest management concern was high in households both with and without employees in forest and forest-related industries. However, those respondents who were members of households with no forest industry employees had comparatively higher levels of concern.

Non-use forest values were held by most sectors of the community, especially in the north coast and north-east coast sectors. However, households without members employed in forest-related industry were more inclined to hold non-use values than households with members employed in forest-related industries. These latter households were inclined to hold higher human use, employment-related values.

Intrinsic value

The intrinsic value orientation relates to belief statements associated with the intrinsic non-use value of forests, including their inherent and aesthetic values and the importance of protection and conservation. In the South-East Queensland RFA region, high levels of intrinsic value were found within the population, with these values being relatively higher in the north coast and north-east coast sectors when compared with other sectors (see Figure 6). Although intrinsic values were high in households with and without household members employed in forest-related industries, respondents from households with no forest industry employees had relatively higher levels of intrinsic value than respondents from households with forest industry employees.

Extrinsic value

The extrinsic value orientation relates beliefs associated with the value of forests for human use and consists of beliefs associated with the importance of employment over the protection of native forests, and the economic value of native forests through timber production. This value orientation was found to be highest in the Builyan and Kingaroy sectors and lowest in the north coast, Brisbane and Beaudesert sectors (see Figure 7). As might be expected, respondents from households with forest industry employees reported relatively higher levels of this value orientation than respondents from households with no forest industry employees.

Forest user profile

In general, people who are dependent on the forests for their livelihoods tend to have comparatively lower levels of education, have worked in the industry for a long time, live in rural areas where they have strong social networks, place high extrinsic values on forests and are more sensitive to change in forest use and management.

Stakeholder issues

The key stakeholder groups in the South-East Queensland RFA have a variety of concerns:

Timber industry and employees

1. The timber industry is concerned about continued access to the forest for timber production, the possibility of job losses in the industry, and the flow-on effects of unemployment, including increased use of welfare services and a loss of community vitality as people move away to find work.
2. The industry feels that putting an end to the timber industry in some areas could lead to a lack of effective fire management and an increased threat from bushfires.

Conservationists

1. Conservationists want the biodiversity of the forests protected.
2. They want the forests to be managed within a catchment framework.

Aboriginal interests

1. Aboriginal groups want recognition that native title exists on some areas of State forest.
2. The traditional owners' access to forests should be maintained so that they can continue to exercise their native title rights, including their cultural rights and responsibilities.

3. Cultural heritage considerations should be part of the sustainable management of forests into the future and traditional owners should be responsible for the management of cultural heritage as part of ecologically sustainable forest management.

Local governments

1. Local governments are concerned about potential job losses and that a reduced timber supply would put pressure on non-renewable resources.
2. Although protecting environmental values is important for the eco-tourism potential, some councils are concerned that job losses would reduce the revenue base for council-provided services and infrastructure.
3. Weed and pest control plans might be difficult to implement if large areas of forests are made into reserves.

Flora collectors

1. Flora collectors are concerned about continued access to State forests for their resource security and business certainty. These operators often maintain roads in State forests that are available to other users. These roads will not be maintained by their industry if they have no access to flora.
2. Environmental sustainability is intrinsically linked to commercial sustainability.
3. The flora collection industry is a major and growing employer of staff trained in environmental sustainability guidelines and practices for flora collection. This business sector might be able to take up some slack in employment from any changes in the timber industry.

Apiarists

1. Apiarists are concerned that areas allocated to forestry will be heavily logged and therefore become useless to apiarists.
2. Putting State forests into reserves may reduce available apiary sites. Some apiarists use State forests for approximately 80 per cent of the year. Many have to travel great distances to get to useable State forests to make their business viable.

Graziers

1. Some graziers use State forests for cattle grazing and continued access is important.
2. For graziers dependent on State forests, a change in forest use and management might adversely affect the viability of their livelihood as graziers.

Farm foresters

1. Farm forestry can contribute positively to the environment, but it is important to recognise that the primary purpose of farm forestry is for timber harvesting.
2. Investing in farm forestry requires a view to long term returns because of the time it takes for trees to grow. Assured right of harvest and economic incentives are required to make farm forestry a viable industry.

Tourism and recreational forest users

1. Projected increases in tourism in the region indicate a need for an increase in the supply of national park-type areas for tourists to visit.
2. A wider range of recreational activities is presently allowable in State forests than in national parks, including horse riding, mountain-bike riding and four-wheel driving. Access to State forests is important for these activities.

Mining industry

1. Maintaining access for mineral exploration and mining, particularly in areas of moderate to high prospectivity, is essential.
2. The industry is concerned about maintaining economically viable mines while respecting conservation and cultural values of any given area.

Forest-dependent communities

1. Communities dependent on forests are concerned about job losses, job security and work conditions because of the instability within forest industries.
2. They are concerned about a decline in community vitality as a result of job losses in forest industries as well as local asset depreciation.

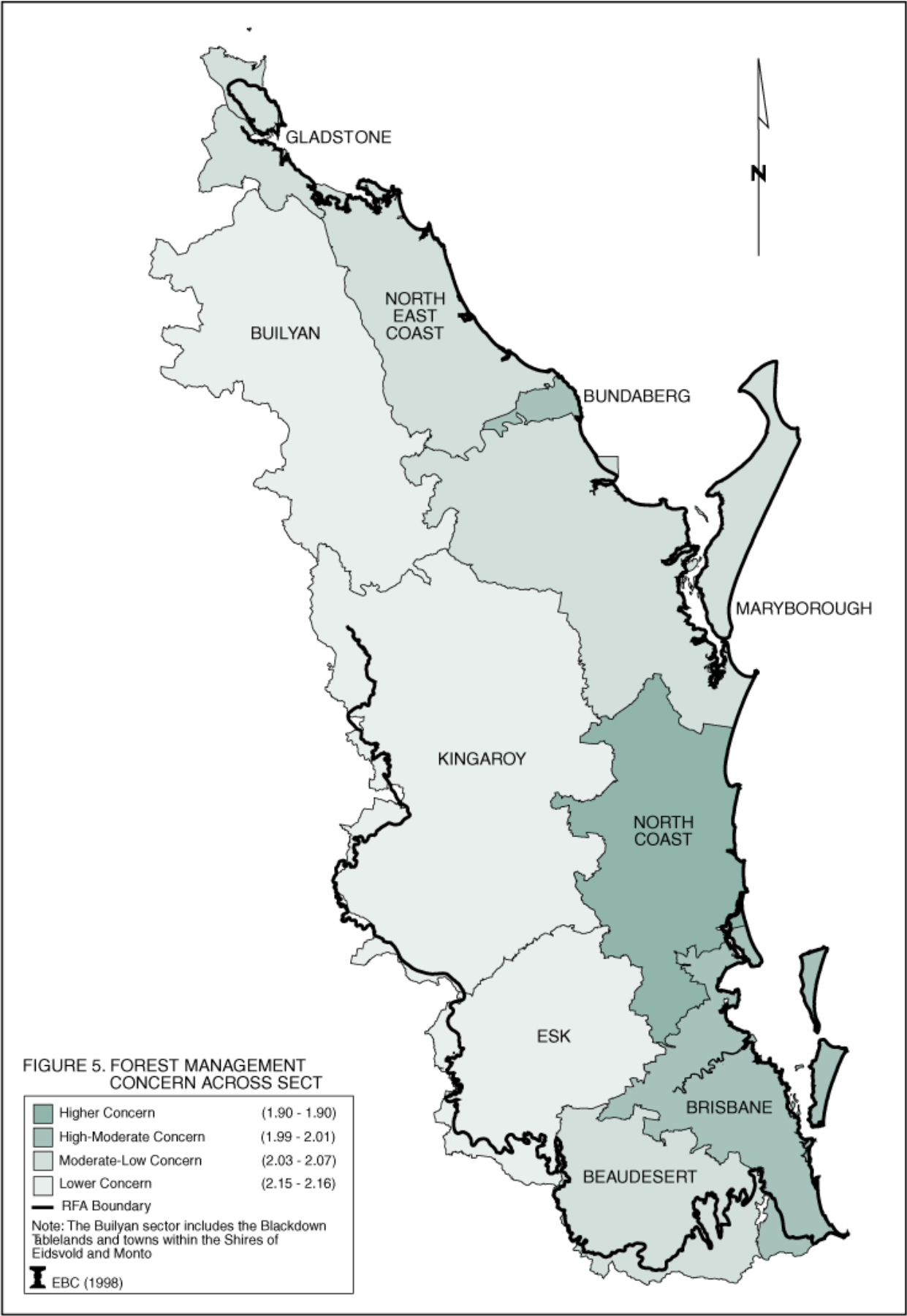


Figure 5. Forest management concern across sectors

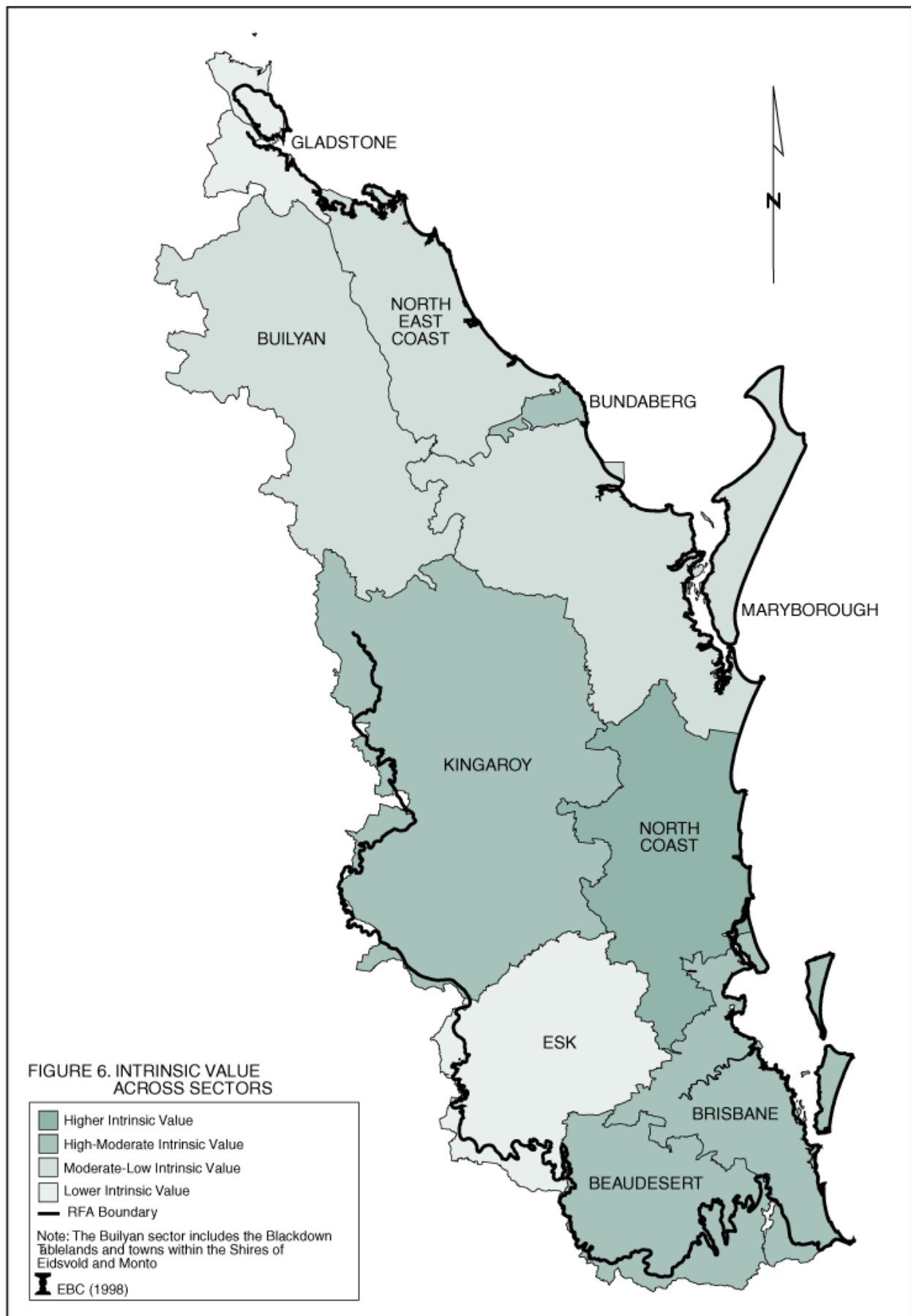


Figure 6. Intrinsic value across sectors

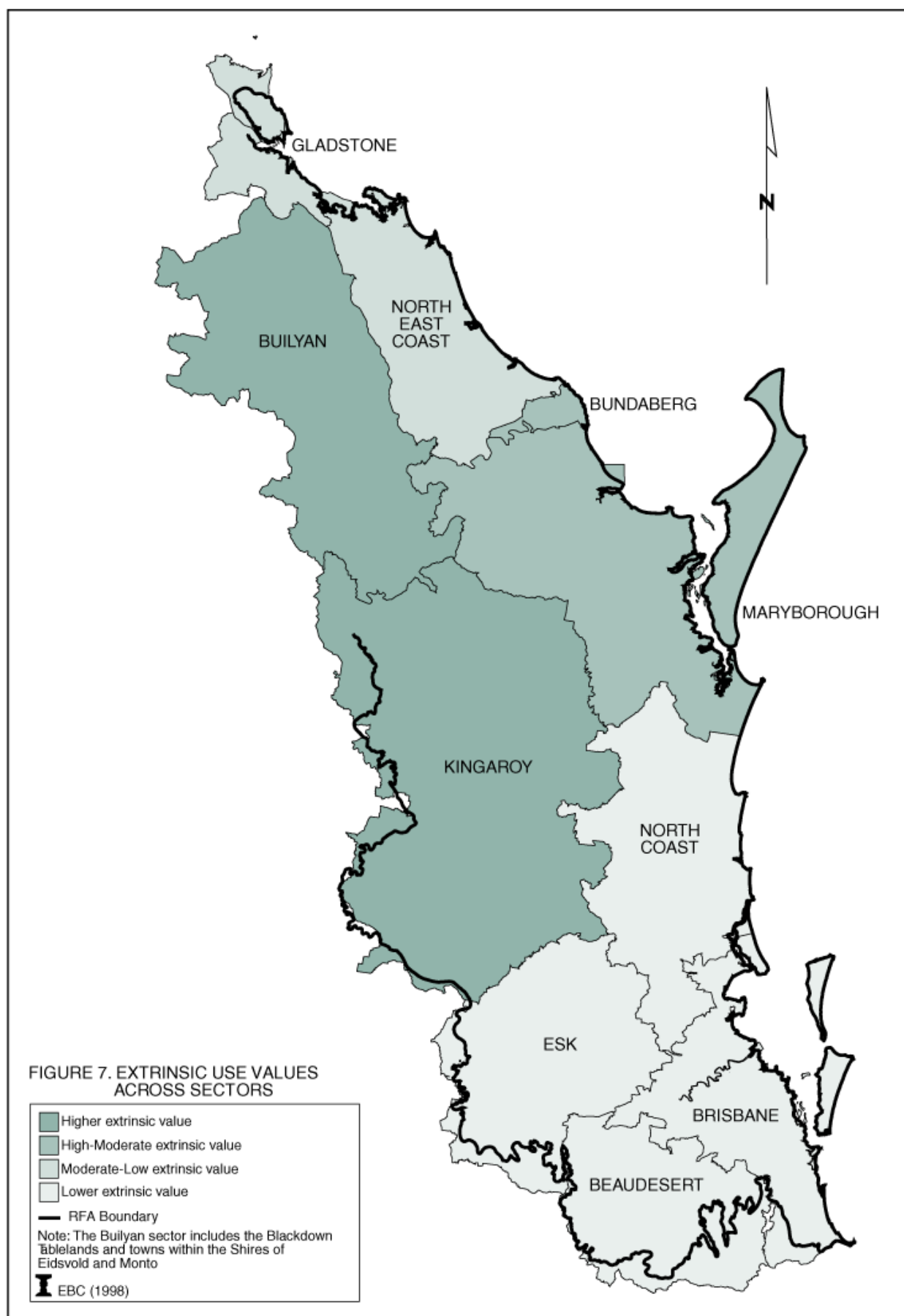


Figure 7. Extrinsic use values across sectors

SOCIAL CASE STUDY AREAS

SE 5.3

Project objectives

The objective of the Social Case Study Areas project was to research a range of selected case study towns to:

- construct a comprehensive baseline socio-demographic profile
- provide a profile of the service delivery capacity
- examine the potential responses of local communities to changes in forest use and management.

Methods

The project included both desktop data analysis and primary qualitative data collection through consultation with communities and stakeholder groups. The project used community workshops and focus groups for the collection of primary qualitative data. A comprehensive selection process was used to identify case study areas that were representative of a range of communities sensitive to changes in forest use and management in the region. The selection of the case study towns was a three-stage process that resulted in the selection of 15 towns. A review of DPI Forestry resource data and consultation with local government refined these 15 case study towns to 12. Seven of these towns (marked * below) were then selected for primary qualitative data collection via community workshops and focus groups. The 12 social case study areas for this report were:

Gympie*	Cooroy*	Dingo	Maryborough*
Conondale	Builyan Many Peaks*	Beaudesert	Brooweena
Linville*	Wondai*	Woodford*	Eudlo

For the socio-demographic profile of the case-study towns, local government areas and the Australian Bureau of Statistics (ABS) census collection districts were the major units of analysis. The data for this study were derived from secondary sources, such as local government planning documents and service directories, and principally from ABS databases, especially the 1996 and, where 1996 figures were not available, the 1991 census.

The workshops scoped general issues of concern for the local communities about the RFA, as well as inquiring into the significant events in the recent history of the area and the vision of workshop participants for their town's future. The workshops also discussed the community's perceptions of potential social impacts from a range of hypothetical resource-use scenarios. In addition, the workshops provided an avenue for community involvement in the social assessment process.

The approach employed in the social assessment workshops is based on the focus group method. In recognition of the varying perspectives and values within the communities concerned, a representative selection of community interests was invited to the workshops. The selection included people who were either involved in forest activities or had related interests in forest use and management in the area. They came from a wide range of community 'interests', including sawmill owners and employees, logging contractors, local government representatives, conservationists, graziers, apiarists, landcarers, farm foresters, integrated catchment management, tourist operators, retail and trade personnel and the human services sector.

Stakeholder peak body organisations on the RFA Reference Panel, where appropriate, were contacted to nominate participants for the workshops. For other community interests not represented on the RFA Reference Panel, local networks were used to identify possible participants. Focus groups were held with the Wondai RFA Committee, the Gympie Chamber of Commerce and the Cooloola Shire Council.

Key results

History and geography of case study areas

Where information was readily available, a brief outline of the geography and history of towns where primary data were collected was undertaken to provide a historical context. The consistent themes in the histories of the case study towns were:

- their heritage and connection to the timber industry and the use of local State forests
- major changes since settlement in the towns' services and economic base i.e. dairy, cattle, mining, timber and

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agriculture; most smaller towns experienced an early expansion and then a reduction in population and services

- the development of the larger towns such as Gympie and Maryborough to be regional service providers with a diversified economy.

Socio-demographic profile

The general characteristics of the socio-demographic profile were:

1. There is a sharp separation between youthful and ageing populations; towns tend to be one or the other.
2. The towns show relatively little ethnic diversity in their populations.
3. Post-secondary school attendance is very low.
4. Incomes are generally low, with high proportions in low income categories.
5. Figures for rental housing are much lower than for the region as a whole and figures for full home ownership are much higher.
6. Proportions of people dwelling in caravans and improvised dwellings are generally quite high, especially in the smallest of the towns.

Town character and community visions

The town visions were:

1. Each of the 12 towns made some mention of the forecast population increase for the region.
2. For some towns, this forecast population was seen as advantageous, for others a cause for concern.
3. The towns of Maryborough, Gympie, Beaudesert and Wondai saw increased populations as an opportunity to develop new and existing industries and businesses.
4. The towns of Cooroy, Eudlo and Linville showed clear evidence that the character of their towns was at risk from population increase and related development.
5. Eudlo, Cooroy and Wondai have incorporated restrictions on building materials, building height, colours and design features to maintain the country streetscape of the towns.
6. The towns of Woodford, Conondale and Gympie specifically indicated that a historical connection to forests and the forestry industry was integral to the community vision.
7. Today the towns of Woodford, Conondale and Gympie are characterised by a commitment to sustainable farm forestry, revegetation of logged areas and softwood plantations.
8. The protection of forests for scenic and environmental reasons was further detected in the documents of Wondai, Beaudesert, and Linville.
9. Wondai, Beaudesert and Gympie identified an interest in encouraging forest-based tourism and recreation.

Service capacity

The service capacities are:

1. Doctors per 1000 people ranged from 0.38 in the shire of Duaringa to 1.76 in the Noosa Shire in 1995. The average doctor ratio for the South-East Queensland region was 1.09 doctors per 1000 people in 1995.
2. Many towns indicated a need to continually monitor the demand for medical services as part of their overall commitment to updating infrastructure.
3. Councils were reluctant to acknowledge spare capacity in all services.
4. Each town's local government area has widely ranging public housing capacity, from a total stock of zero in Woocoo Shire to 1045 in Maroochy.
5. Maryborough, Wondai and Cooroy have public housing within the town.
6. All towns except Conondale have primary education facilities.
7. Six towns have facilities for secondary education; these were Cooroy, Maryborough, Gympie, Woodford, Wondai and Beaudesert
8. Of the 12 towns, Gympie, Maryborough and Cooroy have tertiary education facilities.

Community workshops and focus groups

General issues raised in workshops and focus groups included: a high concern about job losses in the timber industry; the viability of the timber industry and timber-dependent communities in the future; the need for effective management of State forests; socio economic hardship in rural areas and youth having little incentive to stay in their home towns. In general, there was recognition by all participants of the importance of the timber industry to the overall vitality of their local community.

The visions held by workshop participants for the future of these communities included a sustainable timber industry utilising farm forestry and plantations, balanced with the protection of the environment and biodiversity. Other visions for the towns included a small potential for tourism benefits and improvement in service provision to their areas. However, most participants felt that tourism was not going to replace the timber industry in their area as a new local industry base.

Workshop participants were generally concerned about the possible impacts of a reduction in the availability of State forest resources in terms of the job losses in the forest user sectors and the flow-on impacts on the town's economy. Most participants recognised that there was a need to manage forests in an ecologically sustainable manner to ensure the long term viability of the timber industry and timber-dependent communities.

RESOURCE, FOREST INDUSTRY AND EMPLOYEE CATCHMENT ANALYSIS FOR SOUTH-EAST QUEENSLAND

SE 5.4

Project objectives

The objective of this project was to:

- identify towns and communities which were reliant on forest industry activity in the RFA region
- identify significant relationships between specific areas of forest resource and communities dependent on that resource.

Methods

The methods used in the collection of data for this project included:

- drop-and-pick-up and mail surveys of timber processing industries, timber industry contractors, timber industry employees, apiarists, graziers with state grazing permits and other forest users with special and term leases
- secondary data from the Australian Bureau of Resource Economics (ABARE 1998)
- information on timber processing industries and their allocations from the DPI–Forestry.

Two questionnaires were used in order to obtain information on forest industries. One questionnaire, referred to as the *Forest Contractor and Forest User Businesses Questionnaire*, sought information specifically from the forest industry or business. A second questionnaire referred to as the *Forest and Timber Industries Employees Questionnaire* sought information from the employees of forest industries and businesses. Forest industry questionnaires were distributed to timber processing industries, forest industry contractors, apiarists and holders of special grazing permits, special and term leases. Forest and timber industry employee questionnaires were distributed to employees of timber processing industries, forest industry contractors, apiarists and holders of special grazing permits. Two hundred and sixty-two completed forest industry questionnaires and 603 completed forest and timber industry employee questionnaires were returned.

Key results

The information was based on forest industries which, for the purpose of this research, referred to all timber processing, timber contracting, grazing and apiarist industries and businesses. The term timber processing industry refers to all industries that have a Crown hardwood allocation and those timber salvage businesses that obtained their hardwood resource from timber mills with a Crown hardwood allocation. The identification of resource dependent communities and the flow-on effects to other communities were identified through (a) the location of timber processing industries with a Crown hardwood allocation, (b) the location of forest contractors, (c) the location of other forest related industries including apiarists and graziers, (d) the residential location of employees, (e) the location of schools used by employee families, (f) the location of employee household expenditure and (g) the location of forest industry expenditure. In identifying forest dependent communities and the flow-on effects to other communities, primary data was collected through the use of industry and employee surveys and through the use of existing mailing lists and databases held by DPI–Forestry and the Department of Natural Resources. The industry surveys provided a description of the specific forest industry (i.e. number of employees, years in operation, use of forest areas) and information on the town location of the industry, industry clients and from which towns specific

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goods and services were purchased. The employee surveys obtained information which allowed the development of a social profile of forest industry employees (i.e. age, sex, education, housing tenure, family size, marital status) and information on the residential location of employees and detailed information on the towns from which they purchased household goods and services.

It was found that the 41 timber processing industries that have a Crown hardwood allocation are based in 35 towns throughout the South-East Queensland RFA region. It was also found that there were an estimated 821 timber processing industry employees and that approximately 370 (45.1 per cent) of these employees were directly dependent upon the processing of Crown hardwood within these industries (this percentage excludes salvage industries). From survey research it was also estimated that the 41 timber processing and salvage industries used 130 independent contractors within the last year and that 41 of these contractors (31.5 per cent) were involved in the harvesting and transportation of timber products. Across all contracting industries, survey research indicated the median number of employees within a contracting business to be 4.0. Using this estimate, the 130 contracting businesses contracted to timber processing and salvage industries had an estimated 520 employees and the 41 harvesting and transport industries had an estimated 164 employees.

In identifying the relationship between areas from which Crown hardwood resource was obtained and forest dependent communities, 17 Town Resource Clusters (TRCs) were defined (See Map 7). The TRCs represented clusters or groupings of towns which:

- consisted of timber processing industries which obtained their Crown hardwood resource from similar geographic areas or sawmill allocation zones
- included the majority of towns in which employees of timber processing industries located within the TRC were resident
- included towns in addition to resident employee towns, which were used by employees when obtaining household goods and services.

The identification of the 17 TRCs was particularly significant in so far as it established a direct relationship between the sawmill allocation zone from which the resource was drawn and towns and communities that were dependent upon that resource and which may be affected if there was a change in the use of, or access to the hardwood resource within the sawmill allocation zone. In addition, it is suggested that the TRCs not only allow the identification of towns and communities likely to be affected by a change in resource, but they can also be used concurrently with environmental and ecological criteria in establishing appropriate forest reserves and management controls.

Survey research also indicated that timber industry contractors, including harvesting and transport contractors were often located within the same or adjacent TRCs in which their industry clients were also located. In addition, the 17 TRCs were also used as a basis for establishing the location of apiarists and holders of state grazing permits and special and term leases. The TRCs, with their direct and quantifiable relationship to specific areas of resource, represent the primary geographic area for the management of social change and the management of social and community impacts within resource dependent towns and communities which may occur with any change in the status of the resource.

For illustrative purposes the following description provides summary information in relation to the Maryborough TRC (See Figures 8 & 9) which had the highest number of timber processing industries and employees when compared to all other TRCs. Although the Maryborough TRC is described here in detail, the same information is also available for all other TRCs. The Maryborough TRC, in which the town of Maryborough is located, had five timber processing industries including a timber salvage industry. All timber processing industries within this TRC obtained their resource from the Maryborough sawmill allocation zone. This TRC also had the highest number of timber processing industry (timber mill) employees, with 203 timber processing industry employees and 609 family dependents. Within this TRC, the town of Maryborough had 53 per cent of all resident employees and Tiaro 32 per cent of all resident employees. The 203 employees within this TRC had an estimated annual income of \$4.8 million and an estimated annual household expenditure of \$3.7 million. Eighty-one percent of employee household expenditure (\$3 million annually) occurred within the town of Maryborough, with the town of Hervey Bay also attracting a further 10 per cent of annual household expenditure (\$360 000 annually). Ten percent of all apiarists and 22 per cent of all holders of state grazing permits were estimated to be located within the Maryborough TRC. Eighty-eight per cent of all expenditure by forest industries within this TRC was constrained to towns with this TRC, with the town of Maryborough attracting 66 per cent of all forest industry expenditure.

In undertaking an analysis of the income of timber processing industry employees and their household expenditure, it was found that within the RFA region, timber processing industries (sawmills) generated \$20 million in employee annual income and \$15 million in annual household expenditure which was distributed through local communities and towns within the RFA region. Including timber harvesting, transport and processing industry employees, these

industries generated an estimated \$24 million in annual employee income and \$18 million in annual household expenditure. When the high levels of local expenditure by forest industries within the region are considered along with the high levels of local household expenditure by forest industry employees, forest industries provided an important and significant contribution to local and regional economies within the RFA region.

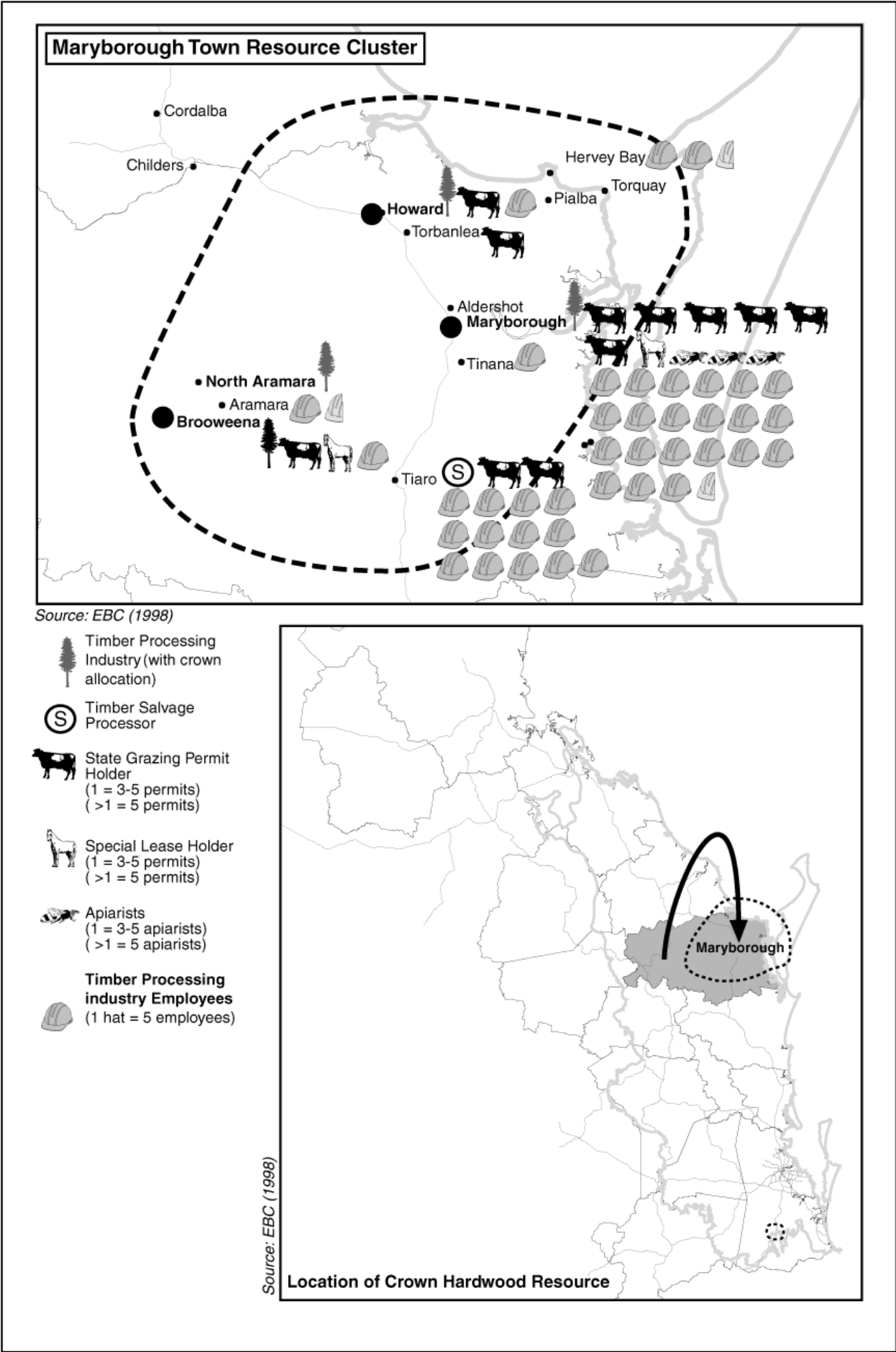


Figure 8. Maryborough Town Resource Cluster: Location of forest industries and Crown hardwood resource

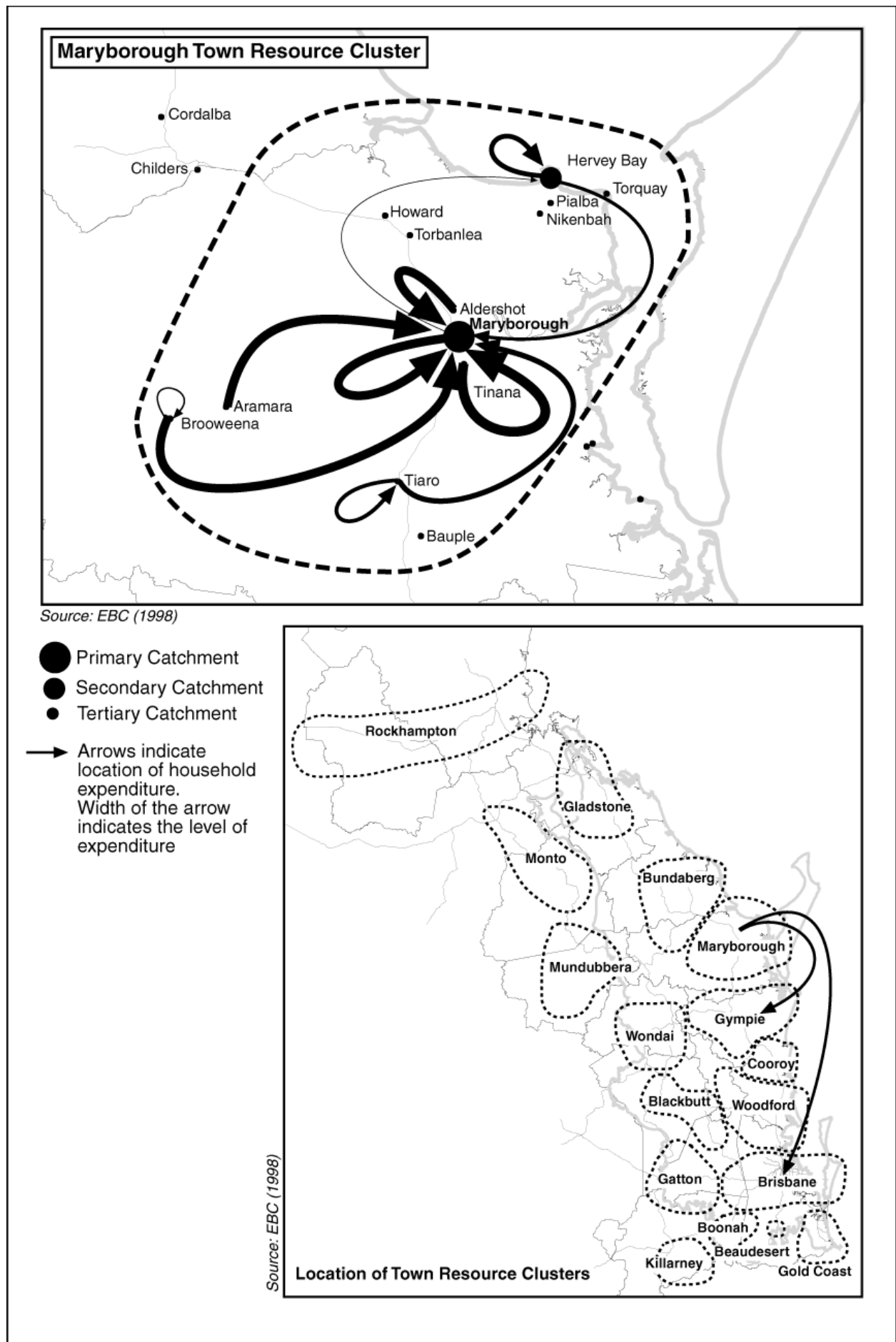


Figure 9. Maryborough Town Resource Cluster: Employee household expenditure network

LITERATURE REVIEW OF THE IMPACT OF CHANGES IN FOREST USE ON INDIGENOUS COMMUNITIES

SE 5.1.2

Project objectives

The objectives of this project are to:

- review and examine:
 - social impact assessments and post impact studies and literature relating to changes in resource use and management with a particular focus on Indigenous communities and forest use
 - how the social impacts were managed and addressed.
- identify and analyse in a South-East Queensland context:
 - the key variables associated with the nature and level of potential social impacts for Indigenous communities with a view to identifying the potential range of social impacts associated with the RFA.

The analysis in this report, combined with the work of Project SE 5.2.2, will form Stage 1 of the Indigenous issues research work. It could then be used in the South-East Queensland RFA impact assessment phase Stage 2 to undertake a social impact assessment, (in accordance with Attachment 1h of the South-East Queensland RFA Scoping Agreement), of forest use options including:

- the examination of the potential social impacts for Indigenous communities arising from changes in the use and management of South-East Queensland forested areas
- the development of impact management strategies.

Scope

The project will review and analyse up to six case study examples of impacts arising as a result of changes in natural resource use and management, with emphasis on forest use in Australia and overseas to:

- identify the key variables associated with the nature and level of potential social impacts for Indigenous communities
- analyse the key variables associated with social impacts for Indigenous communities within an RFA context
- analyse the expected social impacts on Indigenous communities in each of the case studies
- compare the expected impacts against any post impact studies of Indigenous communities that may have been done
- use the results of the case study reviews to explore the range of possible RFA impacts on Indigenous communities in forested areas of the region.

The primary source of data would be government agency social impact assessments and reviews of imposed changes in the use of native forests. FAIRA, Gurang Land Council, and Goolburri Aboriginal Corporation Land Council will assist the project consultants with any research material they may hold.

This project parallels SE 5.1 Post-Impact Studies Analysis and its examination of non-Indigenous post impact studies. The results of the project will assist in the design of monitoring and mitigation programs for Indigenous communities that may be affected by the RFA process.

Methods

The project would be conducted in three parts.

1. A review and analysis of the Indigenous components of social impact assessments of some or all of the following case studies: Wet Tropics World Heritage, Fraser Island, Kakadu, Jervis Bay and Silver Plains.

A north American study is to be determined.

2. A review of any post impact assessments and other relevant literature to assess the actual effects on Indigenous communities that may have been done in the case study areas. These may be post impact studies done either by government agencies or by Indigenous organisations.

3. A review of case study material, social impact assessments and natural resource management literature to identify the key variables associated with the level and nature of potential social impacts from changes in resource use and management.
4. Based on the above data, analyse the potential range of impacts that the RFA process may have on forest dependent South-East Queensland Indigenous communities.

INDIGENOUS COMMUNITY ISSUES AND SOCIAL PROFILE CASE STUDIES

SE 5.2.2

Project objectives

The objectives of the this project are to:

- develop a broad community socio-demographic profile
- integrate the key variables associated with the nature and level of potential social impacts for Indigenous communities arising from changes in the use and management of South-East Queensland forests
- identify issues of concern and interest of up to six Indigenous communities that have association with forests in the RFA region.

The analysis of these reports, combined with the work of project SE 5.1.2 will form Stage 1 of the Indigenous issues research work. It could then be used in the South-East Queensland RFA impact assessment phase Stage 2 to undertake a social impact assessment, (in accordance with Attachment 1h of the South-East Queensland RFA Scoping Agreement), of forest use options including:

- the examination of the potential social impacts for Indigenous communities arising from changes in the use and management of South-East Queensland forested areas
- the development of impact management strategies.

Scope

The project will provide baseline assessment data with a view to identifying potential social impacts for South-East Queensland Indigenous communities with particular emphasis on up to six Indigenous communities to:

- examine the current community sociodemographic profile and social resilience to change of each community and any historical aspects relevant to the current situation
- in conjunction with other RFA projects explore the range of potential positive and negative RFA impacts on Indigenous communities
- liaise and consult with communities and appropriate Indigenous organisations with a view to developing mechanisms to maximise the positive impacts and minimize the negative impacts from changes in the use and management of forests.

The main sources of data would be:

- social and demographic data sources from ABS and ATSIIC that will also be used for the Indigenous Chapter in the Social Assessment Overview Report
- primary data collected through field work in each of the communities
- data provided by the appropriate Native Title Representative Body (NRTB)
- data and analysis from projects SE 5.1.2 and EH 6.1.2.

Methods

The project would focus on up to six Indigenous communities in the RFA region. These communities would be chosen by FAIRA, Goolburri Land Council and Gurang Land Council (two communities each) with a project officer working within each of the NTRBs to co-ordinate the logistics of community fieldwork, consultation and meetings and the collation of any available data. A senior consultant will be contracted to the NTRBs collectively, and would co-ordinate and conduct all parts of the project, with the assistance of the three project officers.

South-East Queensland Comprehensive Regional Assessment

The project would involve:

- analysis and presentation of various ABS data including the National Aboriginal and Torres Strait Islander Survey 1994
- analysis and incorporation of data from projects SE 5.1.2 and EH 6.1.2
- collection of primary qualitative data through such forums as community meetings and through other appropriate fieldwork/consultation.

In the regional contexts being sampled, the senior consultant would also be required to undertake preliminary exploration and identification of the sorts of possible localised initiatives which could serve to further government objectives /responsibilities and Aboriginal interests mutually.

The project will be managed by a project steering committee consisting of representatives of FAIRA, Gurang Land Council, and Goolburri Land Council with the assistance of the contact officers from the Department of Agriculture, Fisheries and Forestry and the Queensland Department of Natural Resources. The project steering committee will report to the South-East Queensland RFA Indigenous Issues Working Group.

TIMBER

INTRODUCTION

The timber resource for South-East Queensland is comprised of native and plantation hardwoods and plantation softwoods in both public and private ownership. Publicly sourced native timber comes from State forests, timber reserves and other Crown land with Crown rights.

There are 490 000 hectares of merchantable publicly owned forests¹ in South-East Queensland, consisting of 340 000 hectares of native and 150 000 hectares of plantation forest. Merchantable private forests² cover 244 500 hectares of South-East Queensland, including 230 000 hectares of native and 14 500 hectares of plantation forest. In total, these merchantable forests comprise 734 500 hectares in the region.

Given the variability of sawlog production in South-East Queensland, especially from private lands, the average harvests for the period 1994/95 to 1996/97 are presented here. Over this period, the total sawlog harvest for South-East Queensland averaged 1.39 million m³, of which 1.05 million m³ (76 per cent) was plantation sourced. From the average total native forest harvest of 338 000 m³, 62 per cent (210 000 m³) was sourced from private land. Public plantation sawlog removals, averaging 972 000 m³ have provided 80 per cent of sawlog timber harvested from all public forests over the period 1994/95 to 1996/97. In contrast private plantations contributed only 27 per cent (78 000 m³) of all privately sourced timber, with the remainder cut from native forests.

¹ The area of public forest considered suitable for sawlog production.

² The area of private forest with standing sawlog volumes in excess of 2 m³ per hectare.

PUBLIC FOREST RESOURCE DESCRIPTION AND INVENTORY

SE 1.2

PART A

Project objectives

The objective of the Public Forest Resource Description and Inventory project (Part A) was to describe in detail the public native forest and plantation resource in South-East Queensland, with particular emphasis on those factors that are relevant to commercial wood production.

Ecologically sustainable forest management

As the framework for the RFA process, ecologically sustainable forest management (ESFM) is expected to impact on the area, range of species and volume available to that part of the timber industry dependent on the Crown native forests of South-East Queensland. The plantation estate, although having a lower level of complexity in terms of multiple-use values, is also affected by ESFM considerations.

Through analysing the various ESFM components within the RFA process, it was envisaged that the Crown timber resource availability might be estimated. Conceptually, the volume available at the conclusion of the RFA process could be estimated to be:

- the volume currently obtainable under the environmental prescriptions set out in the Harvesting, Marketing and Resource Management manuals, currently known as the CRA Baseline scenario*
- adjusted for any volume changes from the establishment of a CAR reserve system, the implementation of the code of practice (COP) and the further differentiation of the remaining multiple-use estate through the implementation of the Department of Natural Resources' multiple-use management planning system (MUMPS).

*The project report results, for the CRA Baseline scenario review, indicate that the yield simulations for the majority of the allocation zones require further revision prior to their use in the RFA integration and option development process.

To date, alternative management scenarios incorporating these ESFM components have not been developed. Therefore, the project report focuses on timber resource and yield estimations under pre-RFA harvesting, marketing and resource management guidelines, Area Information System (AIS) area figures, and silvicultural practices (i.e. the CRA Baseline scenario), for both public native and plantation forests.

The principles and standards of the Code of Practice for Native Forest Timber Production, currently undergoing review, are likely to impact on the timber supply from Crown forests. This has not been accounted for in the CRA Baseline scenario. This is also the case for the plantation code of forest practice.

Species Management Profiles (SMPs), being prepared by DNR since 1996, aim to provide information concerning the biology and management of endangered, vulnerable and rare flora and fauna listed in the regulations of the Queensland *Nature Conservation Act (1992)*. SMPs are dynamic, and will continue to evolve as the results of research and monitoring developments are made available to enhance what is currently a limited understanding of the biological and ecological processes taking place in the forests of South-East Queensland. As information is compiled for the SMPs, it is possible that management practices in some native forests will be modified to account for these species. However, the potential impacts of this have not been considered in this report.

Several important elements of ESFM in Queensland are still under development, including MUMPS, which is currently being tested by DNR.

Although the slow progress of certain elements of ESFM has limited the detailed analysis to CRA Baseline scenario, the broad implications of ESFM have been discussed in the more detailed project report and the following issues have been addressed:

- general ESFM principles
- current and future ESFM initiatives in Queensland
- the possible impacts of ESFM initiatives on both the native forest and the plantation estates, the CRA Baseline scenarios, and possible impacts on future management objectives.

South-East Queensland Comprehensive Regional Assessment

A preliminary desk top version of a multiple-use management plan for Nerang State Forest was used as a case study to illustrate the potential resource impacts of EFSM initiatives on the CRA Baseline scenario in native forests. The aim of the case study was to examine and assess the likely impacts of initiatives on yield. It does not assess the effectiveness of these initiatives in meeting their stated objectives.

Methods (CRA Baseline scenario)

Native forest

Resource description

Twelve broad categories derived from vegetation community mapping were used to describe the forest types of South-East Queensland. These categories were intersected with tenure and management units (MUIDs) to describe the current standing timber resource.

DPI-Forestry's native forest databases and yield regulation system were utilised to determine standing sawlog volume. These included:

- the AIS, which provides net available area information
- the Native Forest Inventory (NFI), which provides information on stand structure based on temporary sample plots
- the Native Forest Permanent Plot System (NFPPS), which provides input for growth models of various species based on permanent plots
- the SKED computer model developed by DPI-Forestry which employs the AIS, the NFI and the NFPPS databases to predict sustainable timber yields.

Resource yield trends

Allocations over the past 20 years for the 14 allocation zones that approximate the RFA region were used to determine recent yield trends.

SKED was run under the CRA Baseline forest management scenario to simulate standing volumes, standing basal area and harvesting event data at the stand and species level for each MUID in South-East Queensland over the proceeding 103 years. South-East Queensland allocation zone summaries were provided by aggregating the data to the zone level, averaged into 10 year intervals.

Individual allocation zones were analysed in terms of resource outcomes and stand and species sustainability indicators. In analysing resource outcomes, predicted species group yields were compared to average actual yields from sales figures over the last four years for these species groups, as well as historic trends in sustained yield figures for that zone. Sustainability was analysed by studying the trend of certain stand level indicators, such as standing merchantable sawlog volume on net available area (i.e. the net area containing resource meeting minimum harvestable volume requirements) over the simulated period. Projected total and merchantable basal area for the zone and for the species groups within the zone were also assessed as well as changes in species group merchantable and total standing basal areas over time. These species indicators provided greater insight into stand behaviour and structure over time.

Productivity

Forest productivities, defined by mean annual increment (MAI) for compulsory sawlogs, were calculated using results from the CRA Baseline SKED run. MAI values were grouped into three classes – high, medium and low, based on the relative productivity of Queensland forests.

Limitations

A qualification of this report's outcomes is that the AIS net area was derived from data at a much larger scale than the spatial vegetation-tenure coverage, leading to difficulties in reconciling the databases. As a result the AIS net area was apportioned across the GIS gross area of the productive vegetation types.

At the time of use, the AIS data had not been updated to include areas logged under the Interim Forest Management Arrangements (IFMA).

The report does not provide a critical analysis of DPI-Forestry inventory extent and sampling methods, nor does it critique the yield prediction and harvesting models used by the SKED system. The CRA report, Turner (1998), provides an appraisal of methods and data used by DPI-Forestry to estimate wood resource yields. The Turner

report highlighted that, historically, SKED overestimated the actual volume of removals by approximately 14 per cent. However this error figure cannot be directly extrapolated to sustained yield estimates.

No sensitivity analysis of the SKED parameters used to define the allowable cut for each allocation zone is provided nor is SKED run in stochastic mode to give a better indication of the dispersion in the range of allowable cut figures over time and hence the precision of the estimates.

Analysis of the predicted yields for each allocation zone is based on a definition of sustainability and sustainability indicators that relate to timber production over a 100 year simulation period. Ecological indicators in Queensland are not currently defined for yield prediction purposes and although the report does discuss some basic stand structure parameters (distribution of species basal area over time as well as stand merchantable and unmerchantable basal area) yield predictions are not discussed from an ecologically sustainable perspective. The report does not attempt to evaluate what are desirable sustainable stand structures within and between allocation zones and what would be an acceptable level of change in current stand structures.

All SKED estimates at the stand and species level are subject to a degree of uncertainty as they rely on underlying models to predict changes in stand structure, growth, harvesting and mortality. SKED models were developed to predict stand dynamics at a broad scale, and not detail individual species responses, therefore the interpretation of the basal area outputs at the species level can be considered as indicative only.

Although required by the project specifications, it was not possible to develop alternative ESFM scenarios and identify their impacts on the current sustainable yield figures, as such there was a heavy reliance upon a simple desk top case study for Nerang State Forest to explore the ramifications for native forest timber production from implementation of ESFM guidelines. The major result and limitations of the study are presented in the *Key results* section.

Plantations

Resource description

Data analysis for the public plantation estate was carried out using data from the DPI-Forestry's plantation resource database (WEEDS), in particular the Plantation Register Module and Plantation Decisions Support System (PDSS). This is summarised by species and age classes for the South-East Queensland region.

Resource yield trends 1998-2010

Softwood yield information was generated from the PDSS and incorporated into a 'user friendly' version of the PDSS known as the Plantation Resource Outlook Database (PROD) from which yield information was extracted and summarised. Yield scheduling estimates are based on a simulation which optimises net present value subject to current market expectations and management practices.

It was not possible to generate hardwood yield information for the report. The small size of the estate and its relatively slow development has meant that inventory data currently collected are not yet sufficient to develop operational models for use within a hardwood PDSS, although this is a future aim of DPI-Forestry.

Productivity

Site productivity for the plantation estate is determined by the site index, derived from permanent growth plot inventory data, for various native and exotic softwood species within the different plantation areas of South-East Queensland.

No PDSS for hardwood plantations currently exists, so it was not possible to obtain site productivity data for hardwoods species.

Limitations

Area and yield figures are based on current management, silvicultural practices and ESFM considerations. Changes in area and sustainable yield based on new ESFM initiatives or future gains in productivity through improved silvicultural techniques were unable to be estimated.

A hardwood PDSS has not yet been developed by DPI-Forestry so it was not possible to provide resource trends or productivity estimates for the hardwood estate.

Due to commercial in confidence constraints and the amount of time and resources required to interpret and analyse the native hardwood data, little explanation of the methodology or reliability of softwood yield predictions is given, nor is evidence of the quality of the models provided. There is also only limited information in the report on plantation productivity and future management objectives in regard to planning and thinning regimes.

Key results (CRA Baseline scenario)

Native forests

Resource description

Table 11 displays the extent of forest types by tenure in South-East Queensland. This table shows that out of a total land area of 6.1 million hectares, 4.3 million hectares are privately owned, and 1.8 million hectares are State owned. There is a total of 1.2 million hectares of native forest on freehold tenure, details of which are contained in the project SE 1.4 An Inventory of Private Forests of South-East Queensland.

Table 11. Gross area of each forest type by tenure in South-East Queensland (ha)

Broad forest type	Tenure class						Grand total
	Freehold	National parks & reserves ⁵	Other Crown land; no timber rights	Other Crown land; with timber rights	State forest	Timber reserves	
Dry forest	341 536	192 474	25 905	74 682	98 423	1 324	734 344
Dry SPG¹	360 899	11 823	38 034	73 457	172 054	7 179	663 447
Moist forest	249 674	33 704	9 345	36 369	218 194	10 538	557 824
Moist SPG²	38 463	4 186	38	698	4 317	161	47 862
Mixed forest	62 014	3 978	966	4 523	31 959	0	103 439
Rainforest	68 906	58 375	1 229	2 797	117 517	3 215	252 039
RF with eucs	1 296	32	0	0	244	35	1 607
Wet/moist BBT³	20 473	21 475	0	193	23 578	0	65 720
Wet sclerophyll	22 173	11 409	163	634	19 783	892	55 054
Plantations⁴	15 775	497	0	2 517	159 442	131	178 361
Non-euc forest	25 866	20 051	253	5 040	2 829	351	54 390
Non-forest	3 070 273	127 594	58 032	75 922	40 427	162	3 372 408
Total forested	1 207 074	358 004	75 932	200 910	848 339	23 825	2 714 087
Total native forest	1 191 299	357 507	75 932	198 393	688 897	23 694	2 535 726
Grand total	4 277 347	485 598	133 964	276 832	888 766	23 987	6 086 495

The vegetation community mapping from which these broad vegetation types were derived did not assess highly disturbed or regrowth forest areas.

1. Dry forest dominated by spotted gum
2. Moist forest dominated by spotted gum
3. Wet to moist blackbutt forest
4. Plantation area figures are based on the vegetation communities data set, not the plantations data set, and as such the figures show a slightly larger area incorporated into plantation. This is primarily due to the vegetation data set including smaller areas of private plantation, some overestimation of the amount of hoop pine in the public estate and the inclusion of remnant vegetation within and surrounding plantations. Tables 14 and 16 provide area statements for the softwood and hardwood plantation estate sourced from the DPI Plantation Register 1998. These figures are less than those shown above. The Plantation Register is considered the more accurate area statement.
5. The national park and reserves figure includes all other tenure classes not defined in the table above ie. national parks, proposed national parks and other State reserves.

The total gross area of native forest on land covered by the tenures of State forest, timber reserve and other Crown land where the government has timber rights is 911 000 hectares. Of this, a significant area is protected from harvesting for various purposes, including scientific, recreational, scenic amenity and conservation, which includes protected forest types such as rainforest.

Table 12, the net area of Crown forest considered available for wood production, shows that there is a total net productive area of 338 095 hectares of public forests in South-East Queensland. The majority of this (91 per cent) occurs in State forests. The most extensive forest type across the productive Crown estate is 'Moist forest' (39 per cent), followed by 'Dry forest dominated by spotted gum' (32 per cent) and 'Dry forest' (14 per cent).

Table 12. Net area of each forest type by tenure in South-East Queensland (ha)

Broad forest type	Tenure									
	Other Crown land; with timber rights		Forest entitlement areas		State forest		Timber reserves		Grand total	
	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%
Dry forest	3 968	1.0	0	0.0	42 922	13.0	123	0.0	47 013	13.9
Dry SPG¹	16 901	5.0	988	0.0	88 209	26.0	1 105	0.0	107 203	31.7
Moist forest	6 985	2.0	114	0.0	125 081	37.0	961	0.0	133 141	39.4
Moist SPG²	0	0.0	0	0.0	1 739	1.0	75	0.0	1 814	0.5
Mixed forest	112	0.0	0	0.0	21 182	6.0	0	0.0	21 294	6.3
Wet/moist BBT³	172	0.0	0	0.0	16 461	5.0	0	0.0	16 633	4.9
Wet sclerophyll	54	0.0	0	0.0	10 757	3.0	186	0.0	10 997	3.3
Grand total	28 192	8.0	1 102	0.0	306 351	91.0	2 450	1.0	338 095	100

1. Dry forest dominated by spotted gum

2. Moist forest dominated by spotted gum

3. Wet to moist blackbutt forest

(% is the proportion of the total net area)

The total standing volume of compulsory sawlog timber in the public native forest estate in South-East Queensland, Table 13, is estimated to be 3 934 900 m³. The majority of this (95 per cent) is located on State forest land. The wet to moist blackbutt and wet sclerophyll forests, together accounting for 8 per cent of the area, contribute 21 per cent of the compulsory sawlog volume. The two moist forest types together comprise 40 per cent of the productive area and are comparatively less productive, contributing approximately 40 per cent of the compulsory sawlog volume. Although containing 46 per cent of the Crown productive forest area, the two dry forest categories contribute only 33 per cent of the compulsory sawlog volume. Refer to Map 8, 'Compulsory sawlog volume classes across the productive native forest estate'.

Table 13. Standing compulsory sawlog volume in each forest type by tenure for the CRA baseline scenario (m³)

Broad forest type	Tenure									
	Other Crown land; with timber rights		Forest entitlement areas		State forest		Timber reserves		Grand total	
	m ³	%	m ³	%	m ³	%	m ³	%	m ³	%
Dry forest	21 652	0.6	0	0.0	437 377	11.1	482	0.0	459 511	11.7
Dry SPG¹	127 008	3.2	5 271	0.1	740 421	18.8	8 470	0.2	881 170	22.4
Moist forest	41 174	1.0	533	0.0	1 514 043	38.5	5 166	0.1	1 560 916	39.7
Moist SPG²	0	0.0	0	0.0	20 418	0.5	650	0.0	21 068	0.5
Mixed forest	322	0.0	0	0.0	201 690	5.1	0	0.0	202 012	5.1
Wet/moist BBT³	688	0.0	0	0.0	535 511	13.6	0	0.0	536 199	13.6
Wet sclerophyll	370	0.0	0	0.0	272 241	6.9	1 403	0.0	274 014	7.0
Grand total	191 218	4.9	5 804	0.1	3 721 700	94.6	16 171	0.4	3 934 893	100

1. Dry forest dominated by spotted gum

2. Moist forest dominated by spotted gum

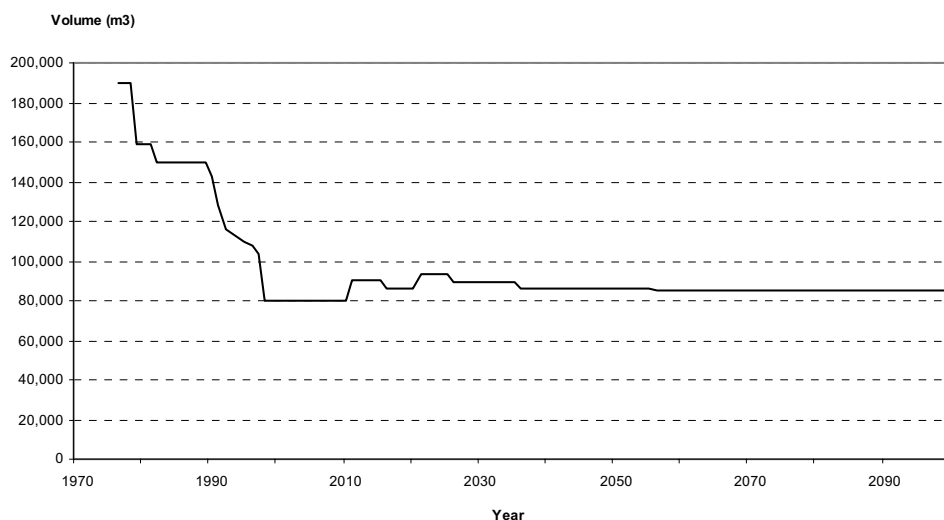
3. Wet to moist blackbutt forest

(% is the proportion of the total standing sawlog volume)

In addition to the compulsory sawlog resource, the Crown production forests of South-East Queensland are estimated to hold 16.3 million linear metres of poles. About 97 per cent of these are in State forests, and around half of the pole resource resides within the moist forest, moist spotted gum forest and wet to moist blackbutt forest types.

Resource yield trends

Figure 10: Compulsory sawlog yield for 14 allocation zones that approximate South-East Queensland. Historical allocations and target yield.



Note: The target yields shown in Figure 10 are for the CRA Baseline scenario for all allocation zones making up South-East Queensland. The zonal predictions as already stated, do not take account of the expected decrease in target yields for zones as a result of ESFM considerations and the development of a CAR reserve system. Therefore the target yield line through to the year 2100, does not represent RFA target volumes.

The availability of State resource has decreased by over 50 per cent in the past 20 years (Figure 10). This is in part a result of the shift over time from harvesting mature forests to harvesting regrowth forests with their lower yields and in part due to the conversion of significant areas from production to conservation. Other contributing factors include the refinement of yield estimation methods, the application of silvicultural systems that did not optimise sawlog growth and application of more stringent environmental requirements.

The combined hardwood, compulsory sawlog allocation for 1997 from the 14 allocation zones within the South-East Queensland region, was approximately 109 000 m³. The CRA Baseline scenario yield projections used for this analysis indicate a resource reduction of 23 per cent, to approximately 84 000 m³. This reduction is coupled with a projected decline in the availability of blackbutt by 39 per cent, from the average cut over the last four years and, in most zones, a significant increase in the stand basal area of non-merchantable stems. In conjunction with the compulsory sawlog yield, a further 13 per cent of this volume is available as optional sawlog, along with an approximate volume of 70 000 m³ of fibre. Of this fibre volume, less than 40 per cent is currently represented by other wood products such as posts, sleepers and landscaping material.

The project report presents a detailed evaluation of the outcome of the simulations, looking at both stand and species level indicators, in graphical form, for each of allocation zones in South-East Queensland.

On the basis of this sustainability analysis for each allocation zone provided in the project report, the projection for Builyan/Gladstone and Gayndah/Mundubbera appear to be sustainable, although the increase in the non-merchantable component of stand basal area for these zones merits further investigation. The resource projections for Bundaberg, Brisbane, Boonah/Warwick, Duaringa/Dingo, Gympie, Gatton/Toogoolawah, Kilcoy/Woodford and Murgon/Wondai require further analysis to address specific issues, such as changes in projected species mix which is not currently analysed as a sustainability indicator. The projections for Maryborough and Yarraman/Toowoomba require reworking to address changes in basic production measures in the second half of the projections. The resource projections for the Eidsvold/Monto zone and north coast zone are not sustainable and require complete reworking.

The South-East Queensland allocation review, completed by DPI-Forestry in December 1998, used updated data to provide a new set of yield figures for the region. The review will address some of the broad stand structure issues raised in the SE 1.2 project report. However, these figures will require adjustment to account for ESFM considerations.

Productivity

Productivity of native forests in Queensland is low in comparison with other states. Analysis of the productivity of the forests of South-East Queensland indicates that only 5900 hectares of the Crown production forest (1.7 per cent) fall into the highly productive category where MAI for compulsory sawlog exceeds 0.8 m³/ha/year. The wet to moist blackbutt forest accounts for approximately 60 per cent of this area, while the remainder is largely in the wet sclerophyll and other moist forest types. Forests of medium productivity (MAIs > 0.1 ≤ 0.8 m³/ha/year) comprise the majority of the production native forest estate at around 215 000 hectares in area (approximately 64 per cent). Other moist forests account for 41 per cent of this medium-productivity forest area and the dry forest categories together represent the same proportion. Low-productivity forests (MAIs ≤ 0.1 m³/ha/year) are also common, representing 117 000 hectares (approximately 35 per cent) of the estate. The dry forest types account for the majority of these low-productivity forests. Refer to Map 9, 'MAI classes across the productive native forest estate'.

Ecologically sustainable forest management (Nerang case study)

The current CRA Baseline resource figures do not account for changes in resource availability as a result of ESFM considerations. A preliminary desktop case study of the Nerang State Forest in the Brisbane allocation zone indicated that current ESFM considerations could result in a drop in current available standing volume of 18 per cent. The lack of information relating standing volume to sustainable yield from the native forests of South-East Queensland, makes interpolation from one to the other indeterminate. If it is assumed that the annual yield is reduced in proportion with the available standing volume, then a fall in yield for the zone from 2500 m³ to 2050 m³ per year would be expected. However, the increase in the number of competing forest resource values and changing social values will, overall, dictate the resource impacts specific to an individual forest area.

The application of quantitative estimates of resource decline from this study to South-East Queensland is invalid and misleading because of a number of limitations, including:

- the unique location of Nerang State Forest within the urban sprawl of Brisbane and the Gold Coast, i.e. the greater number and type of forest uses and the larger population involved in these uses is not typical of all State forest in South-East Queensland
- the failure of the study to account for all current harvesting constraints in the CRA Baseline scenario, i.e. including restrictions identified under current DNR management plans
- the inability of the study to consider possible impacts of long term management in relation to changes in stand structure and forestry operations under post-RFA ESFM guidelines
- the focus on predicting the change in current standing volume, which does not readily lend itself to assessing the sustainability of harvesting.

The case study is presented in detail within the project report.

Softwood plantations

Resource description

Table 14 shows that the total area currently under softwood plantation in South-East Queensland is 150 352 hectares. The two main genera planted in the region are *Araucaria* and *Pinus*. These two genera have very different, complementary site requirements. The native *Araucaria* is focused on the more fertile and slightly higher elevation sites inland from the coastal zone and the exotic *Pinus* is planted on the low-fertility sites along the coastline. Refer to Map 10, 'Public and private forest estate plantations'.

The major native species grown are *Araucaria cunninghamii* (hoop pine), which currently occupies 42 931 hectares (approx. 29 per cent of the plantation resource) and approximately 400 ha of *Araucaria bidwillii* (bunya pine) planted over 20 years ago. There has been ongoing re-establishment of hoop pine with 1864 ha planted in the last five years.

The major exotic *Pinus* species are *Pinus caribaea* var. *hondurensis* (Caribbean pine) (33 372 ha), *Pinus elliottii* var. *elliottii* (slash pine) (47 477 ha), a cross-breed of these two former species known as the F1 hybrid, (19 868 ha) and a number of other *Pinus* species occupying a total area of 3648 ha. In total, the three main *Pinus* species account for approximately 67 per cent of the softwood estate, covering a total of 100 717 ha. The F1 hybrid is now favoured over its parent species, primarily due to form and growth rate, with over 10 000 ha being established in the last five years.

DPI-Forestry has adopted the policy of no further expansion of the plantation estate by broadscale clearing of native forest and plantation establishment. Essentially, all current plantation establishment comprises second rotation plantings on previously planted first rotation sites that have been harvested.

Table 14 Gross area of softwood plantations in the South-East Queensland RFA region by age class

Botanical Name	Gross Area (ha) by Age Class											Grand Total
	1-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50+	
<i>Araucaria cunninghamii</i>	1 864	2 496	2 665	3 402	4 570	6 545	5 764	3 805	3 255	4 039	4 526	42 931
<i>Araucaria bidwillii</i>					88	173	20	43	48	3	32	407
<i>Pinus caribaea</i> var. <i>hondurensis</i>	149	4 815	14 713	10 493	2 719	405	61	16	1			33 372
<i>Pinus elliottii</i> var. <i>elliottii</i> X <i>P. caribaea</i> var. <i>hond.</i> (F1 Hybrid)	10 028	6 595	2 909	332	4							19 868
<i>Pinus elliottii</i> var. <i>elliottii</i>	173	21	1 249	9 042	17 432	15 604	3 524	191	70	121	50	47 477
<i>Pinus patula</i>				40	5	83	137	168	166	99	159	857
<i>Pinus radiata</i>	142	119	24	23	217	159	124	77	39		14	938
<i>Pinus taeda</i>		16	46	57	86	262	71	2			7	547
Other <i>Pinus</i> spp.	3	15	13	402	240	564	68				1	1306
Other species						1	4	7	1		33	46
Experiments												2 603
TOTAL	12 359	14 077	21 619	23 791	25 361	23 796	9 773	4 309	3 580	4 262	4 822	150 352

Source: Plantation Register DPI—Forestry 1998

Note: gross area does not include areas in fallow, tracks or failed.

Resource yield trends

Table 15, describing five year predicted average yields, indicates that clearfall sawlog output is increasing rapidly for both native pine and exotic pine until around 2001 to 2010, after which both fall slightly. Underlying this trend are increasing sawlog volumes for hoop pine, Caribbean pine and the F1 hybrid, while slash, loblolly and radiata pine climb initially before falling substantially (refer to the project report for detailed species figures details). The decrease in the latter species volumes and the general volume increase overall reflect the development of the dominance of the F1 hybrid and *Pinus Caribaea* var. *hondurensis* as the large area plantings in the last 15 years (see Table 14) of these species come on line. For the period 2016 to 2020, the average annual forecasted yield of sawlog for all species is approximately 1.3 million m³, which shows an overall increase of 302 000 m³ in yield from an average of 990 000 m³ for the period 1996–2000, reflecting the increased plantation estate.

Table 15. Estimated softwood plantation five-year average yields by products in the RFA region

Species	Product	Yield cubic metres				
		1996-2000 av	2001-2005 av	2006-2010 av	2011-2015 av	2016-2020 av
Total exotic species	Pulpwood	533 548	511 174	310 615	255 189	271 525
	Roundwood	98 564	63 754	66 21	82 326	54 075
	Sawlog	488 093	525 094	795 999	784 49	768 889
	Total volume	1 120 205	525 09	1 172 833	1 122 010	1 094 489
Total native species	Total volume (sawlog)	501 702	558 797	530 441	519 275	523 113
Total all species	Total volume	1 621 907	1 658 819	1 703 274	1 641 285	1 617 602

Source: Plantation Resource Outlook (DPI 1996a)

The major plantation species are reported by scientific names provided in Table 15.

Looking at the total Queensland plantation estate, yield predictions suggest that the growth in total available timber from existing plantations will continue to increase, reaching a peak of approximately 2.2 million cubic metres in 2002 before settling to a long term sustainable yield of 1.8 million cubic metres in approximately 2010 (DPI 1998). This overall increase is attributed to the increase in area of the plantation estate in the last 25 years, and improved genetic and silvicultural management practices. However, the impact of ESFM considerations on yield estimates, under the new plantations code of forest practice and an increased awareness of multiple-use values, such as recreation, have not yet been fully assessed.

Productivity

Site index, the predominant height at age 25 years for all exotic conifers and age 25.5 years for hoop and bunya pines, is the standard forest mensuration measurement of site productivity or growth potential of a forest stand. It allows stand heights and therefore volumes to be predicted at a certain age. Improvements in productivity have been made through genetic breeding, weed control methods and soil nutrition. Productivity may also be influenced through the timing and employment of thinning and pruning practices.

Site index values vary from 20 to 29 for hoop pine and 23.5 to 30 for exotic pines. The range for hoop pine is the same as that for the whole of Queensland, however, the Queensland range for exotic species is from 23.5 to 35, indicating that the more productive exotic plantations, namely Caribbean pine are contained outside the region. Atherton region contains the most productive exotic pine plantations. A site index table for plantation yield zones is presented in the project report.

Hardwood plantations

Resource description

Table 16, the Gross area of hardwood plantations in South-East Queensland, indicates that the estate is quite small, with a total of 1246 hectares established, which represents less than one per cent of the total plantation estate in South-East Queensland. The four main species planted include *Eucalyptus cloeziana* (Gympie messmate), *Eucalyptus siderophloia* (grey ironbark), *Eucalyptus grandis* (rose gum) and *Eucalyptus pilularis* (blackbutt), covering areas of 211 hectares, 215 hectares, 403 hectares and 139 hectares respectively. The area of rose gum planted accounts for approximately 32 per cent of the estate and is aged between 30 and 50 years.

The spread of age classes in the table indicates no establishment in resource for age classes between five and 30 years of age. More recent plantings have focused on Gympie messmate, *Eucalyptus maculata* (spotted gum) and *Eucalyptus henryi* (large-leaved spotted gum), covering areas of 109 hectares, 34 hectares and 40 hectares respectively. The change in species plantings is primarily a function of new plantation initiatives, which focus on encouraging the development of the private plantation estate. For example, the planting of Gympie messmate, a species with a disjunct distribution from Gympie district, west to north of Tambo and west of the coastal zone between Townsville and Cooktown, lies in its potential to respond to tree breeding to further increase its level of site tolerance to both very wet and dry sites. In this way, the public hardwood estate enables the facilitation of the development of private plantations through research initiatives.

Table 16. Gross area of hardwood plantations in the RFA region by species (where planted area > 20 ha) and age class

Botanical Name	Gross Area* (ha) by Age Class											Grand Total
	1-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50+	
<i>Eucalyptus cloeziana</i>	109			1				85	1	15		211
<i>Eucalyptus siderophloia</i>							1	8		1	205	215
<i>Eucalyptus grandis</i>							29	141	52	97	84	403
<i>Eucalyptus henryi</i>	40											40
<i>Corymbia citriodora</i>	34										1	35
<i>Eucalyptus microcorys</i>	1						10	9	< 1		24	44
<i>Eucalyptus pilularis</i>	8			< 1			28	90	< 1	3	10	139
<i>Eucalyptus robusta</i>								16	1			17
<i>Eucalyptus saligna</i>							6	17		2	10	35
<i>Flindersia brayleyana</i>						< 1	2	4	3	4	5	18
<i>Grevillea robusta</i>											11	11
Other species**	1							1	8	3	4	17
Experimental												61
TOTAL	193	0	0	1	0	0	76	371	65	125	354	1246

Source: Plantation Register DPI 1998

Gross area does not include areas in fallow, tracks or failed. Net area is the gross area excluding areas affected by code of practice guidelines such as slope, soil condition and stream buffers.

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There are also approximately 60 hectares of experimental hardwood plantation hardwood trials and 60 hectares of other native non-eucalypt hardwood species.

Standing volume

Table 17, the current standing volume of hardwood plantations in South-East Queensland, indicates a total standing merchantable volume of 91 061 m³ for the estate, of which 43 per cent (38 999 m³) is sawlog to 30 cm SED large s/l and 65 per cent (59 607 m³) is total sawlog both large s/l and small s/l. A species breakdown of the data is provided in the project report.

Table 17. Total standing volume of hardwood plantations in the RFA region by district and product

Forest district	Volume (m ³)					Total
	Poles	Large S/L ¹	Small S/L ²	Roundwood	Residual	
Beerburum	187	1515	1 392	510	741	
Imbil	196	3317	4 687	1 589	1 800	
Maryborough & Gympie	3 287	34 167	14 529	2 752	20 392	
TOTAL	3 670	38 999	20 608	4 851	22 933	91 061

Source: Plantation Register DPI 1998

1. Large sawlog to 30 cm SED (small end diameter)
2. Small sawlog 20 —30 cm SED

No volume forecast data or site productivity data for the hardwood estate are currently available. Nor was it possible to discuss the impacts of ongoing EFSM developments on current resource levels.

Further work

A number of key issues still remains to be addressed in order to determine a set of sustained yield figures for the RFA integration process. These include: the development of an agreed process for the review, modification, and authorisation of the SKED runs to better reflect existing/newly proposed sustainability indicators; the incorporation of ESFM considerations into these SKED runs and associated multipliers; further investigation into the level of error associated with the different components comprising the SKED system and the development of a better understanding of the relationship between compulsory sawlog sustained yield and other wood product yields. Chapter 6 of the project report discusses areas for further work and outlines strategies to address these key issues.

DPI-Forestry is currently compiling an inventory of their hardwood plantation resource and collecting growth data in order to develop a PDSS for hardwoods. The development of this system is needed to allow resource yields and productivity estimates to be determined for the hardwood estate.

DPI-Forestry is also looking to establish closer linkages between the textual databases that feed the SKED system and the corresponding spatial GIS data sets that represent the spatial entities being stored in the textual data sets. The development of a spatial MUID coverage is complete, and the eventual development of a SUID coverage and corresponding vegetation coverage would greatly enhance the flexibility and accuracy of the system for spatial analysis. Complimentary to these data sets is the development of base data sets such as contours and streams, at an appropriate scale, to enable the development of terrain models and variable width streamside buffers etc. These data sets for example, could then be used to further refine the calculation of SUID net areas for timber volume estimation.

PUBLIC FOREST RESOURCE DESCRIPTION AND INVENTORY

SE 1.2

Part B: Other Wood Products

Project objectives

The objectives of the Public Forest Resource Description and Inventory project (Part B) were to describe the features of the wood product industries other than sawlogs, and to provide sufficient quantitative product volumes and

financial data to allow the economic significance of the industry to be described and the opportunity cost of land use changes to be estimated.

Methods

Resource data

Sawlog production is the major product for which Crown native forests are managed. However, DPI-Forestry also manages the sale of a large number of other wood products from native forests. Many of these resources are sold irregularly and in low volumes, and only those products with high total sales value were considered. This meant that only those products that are likely to influence reserve design were assessed, including two products for which there is expected growth of market demand. The following is a list of the products examined.

Table 18. Other wood products examined

Product type
Poles (lm) (POLE)
Girders (lm) (GIRD)
Landscape material (tonnes) (HHWD)
Round landscaping timbers (m ³) (RLAN)
Sawn timber (non-railway) (m ³) (LAND)
Hardwood piles (lm) (PILES)
Hardwood posts (pcs) (POST)
Hardwood round timbers (lm) (ROUN)
Railway sleepers (pcs) (SLEE)
Hardwood piles and house poles (lm) (STUM)

There were several difficulties in gathering comprehensive data on other wood products. DPI-Forestry does not estimate sustainable yields for the products examined. Standing estimates are collected for poles and girders, but these are the only other wood products assessed individually. Additionally, there is some substitution between the high quality end of sawlogs and poles, girders and piles. The remaining other wood products are harvested on an opportunistic basis from material not generally suitable for sawlogs.

To differentiate the volumes reported from sustainable yield estimates, the terminology adopted was 'estimated harvestable quantity'. Three methods were developed to estimate the harvestable quantity, and the method used for each product depended on available information. The products were grouped according to the methods applied to their estimation, as shown in Table 18.

General features of the estimation methods

1. All other wood products were assumed to be harvested at the same time as predicted sawlog operations.
2. The harvestable quantity for poles and girders was proportional to the harvestable area of each MUID. For all remaining other wood products, harvestable quantities were proportional to the sawlog yield.
3. Harvestable quantities were estimated for all allocation zones that are wholly or partly contained in the region.
4. Harvestable quantities of low-grade other wood products, converted to cubic metres, were summed and the total compared with residual fibre estimates. This provided a check to ensure that the available resource base was not exceeded.

Harvestable quantities of poles and girders were derived from DPI-Forestry Native Forest Inventory (NFI) plot data. Landscape timbers were estimated by DPI-Forestry to represent 30 per cent of the projected wood fibre yield forecast under the status-quo scenario. House piles and poles, piles, posts, round timber and sleeper sales data for the last four complete financial years (1993/94–1996/97) were used to calculate average sales quantities by allocation zone. A ratio was established between each product type and sawlog volume for each allocation zone. Harvestable quantities for each product type were then estimated by applying this ratio to the predicted sawlog volumes for all productive MUIDs in the region.

Limitations

A requirement of the project was to estimate land use capacity to the greatest extent possible based on the principles of ecologically sustainable forest management (ESFM). However, a lack of resolution on ESFM principles and practices for South-East Queensland precluded the development and evaluation of other wood product volumes under ESFM guidelines. This is explained further in Part A of this summary report.

There are large areas of forest that contain volumes of other wood products, but are deficient in sawlogs or other high-value end-use products. Since no sawlogs are scheduled for harvest from these areas, no resources for other

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wood products are spatially allocated as coming from these areas. This will lead to all the value of other wood products being apportioned to the productive MUIDs. While this could value the productive MUIDs at a slightly higher level, native forests not producing sawlogs, but producing other wood products will clearly be undervalued. However, the total product figures in this report represent the harvestable quantity of other wood products for both sawlog productive and non-sawlog productive forests.

Economic data

Costs and returns were collected from processors of other wood products. An attempt was made to collect costs and returns from processors who produced only one product type, because of the difficulty of separating costs for each product when multiple product types are processed. As a result, only a few processors were surveyed, and for all but one product only one processor was surveyed. The limited number of surveys per product type meant that, to maintain processor confidentiality, costs and returns by product have not been presented in this report.

Limitations

The small number of processors surveyed limited the statistical accuracy of cost and return information. Although a larger number of surveys would have been preferred, limiting surveys to processors who processed only one product (to reduce the inaccuracies of proportioning costs between products) was considered to provide an improved outcome.

Key results

Estimated harvestable quantities for other wood products examined in this report are displayed in Table 19 by allocation zone. Maryborough, Kilcoy/Woodford and Gympie allocation zones had the greatest potential supply of other wood products.

Table 19. Estimated average annual harvestable quantity by allocation zone (1998-2020)

	GIRD (lm)	HHWD, LAND & RLAN (m ³)	PILE (lm)	POLE (lm)	POST (pcs)	ROUN (lm)	SLEE (pcs)	STUM (lm)
Builyan- Gladstone		1 493	3	1208	877	415	187	3
Bundaberg		1454		11 171	727	1 162	81	2 395
Brisbane & S.E.		550		1031	4 635	1 344		242
Boonah- Warwick		225		220	2 207	1 857		
Duaringa- Dingo		969			468	4 175		
Eidsvold- Monto		1 952		8 553	14 800	439	3 400	55
Gayndah- Munduberra		1 730		8309	2 461	523		54
Gatton- Toogoolawah	29	677	76	4057	13 592	7 416		32
Gympie		1932	100	7922	16 993	11 117	398	274
Kilcoy- Woodford		1786	447	6495	8 693	145	70	
Maryborough	165	3813	266	35298	48 841	6 923	38	4 009
Murgon- Wondai		1953		11 388	9 357	2 364		192
North Coast Zone		2072	237	12835	8 106	4 040		330
Yarraman- Toowoomba	75	792	5	2650	4 747	2 302	488	
TOTAL	269	21 398	1 134	111 137	136 504	44 222	4 662	7 586

*Products that are sawn - hence input volumes are higher than end product volumes reported here (assume a 50 per cent recovery rate).

Refer to Table 18 for product abbreviation explanations

The average annual turnover estimated for the 10 products examined was \$13.8 million with the annual average operating profit being \$1.8 million in 1996/97 dollars.

AN INVENTORY OF PRIVATE FORESTS

SE 1.4

Project objectives

The objectives of the Private Forests Inventory project were to:

- assess and describe the privately-owned native forest and plantation resource of South-East Queensland
- assess standing volume, estimate productivity and aim to understand availability of the private native forest resource of South-East Queensland.

Methods

The project was divided into five components:

1. An assessment of the standing volume of merchantable native timber on private land.
2. A modelling exercise to estimate the productivity of these areas on private land.
3. A review of the impact of land clearing on sawlog volumes on private land.
4. A review of landholder attitudes and intentions regarding areas of native forest on their properties.
5. A description of the private commercial plantation resource.

For the assessment of standing volume, the private native forest resource was defined and stratified according to the following features:

- land tenure (including freehold land and leasehold land where the State does not possess rights to the timber)
- property size (only properties greater than 10 hectares considered)
- slope (included only forests on slopes less than 25 degrees)
- forest patch size (included only patches of native forest greater than 10 hectares as defined by Murray Darling Basin land cover mapping based on 1989–91 LANDSAT images)
- forest type (based on a range of sources).

For sampling purposes, modelled vegetation types (as a precursor to field mapped regional ecosystems) were used as a surrogate for forest type as they were the most comprehensive coverage of the South-East Queensland RFA region at the time. Twenty modelled vegetation types were identified across the region and these were sampled at varying intensities, with those considered important to the timber industry sampled at a higher intensity.

The necessary numbers of sample locations in each forest type were randomly located within 100 m of public roads. A total of 600 primary sampling points and another 600 secondary sampling points (to be assessed if the primary site could not be accessed) were identified across the region using GIS coverages of the relevant stratification features.

A consultant, employing experienced timber assessors familiar with the forest types being examined, carried out the field sampling. Sample points were located using a Global Positioning System, topographic and satellite image maps. The plot was deemed to be the private forest nearest the sample point that could be viewed from the roadside. Where there was no forest present once the sampling point had been located, the assessors would either mark it as a null plot or they would assess a patch of forest of similar type if it was close by, noting the location. A total of 754 plots were visited and assessed.

The assessments were made from the roadside looking at the broad ‘picture’ of the forest present. The forest was assessed for forest type, standing volume and stand structure. Due to the accuracy limitations of the visual assessment method, stands were placed into one of six volume classes. These were <2, 2-4.9, 5-11.9, 12-19.9, 20-40 and >40 m³/ha. The lowest class (<2 m³/ha) was established to define those stands considered unviable for logging. The actual stand volume was estimated where the stand was in the >40 m³/ha volume class. Several other observations were made regarding such factors as disturbance.

At least one plot in each vegetation type was revisited and physically measured after gaining the approval of the landholder. The focus of the measured plots was on sites where visual estimates indicated greater than 2 m³/ha. These plots were completed by staff of the Department of Natural Resources (DNR) with the assistance of the consultants.

For analysis purposes, forested area was derived from the Murray Darling Basin land cover mapping. Field mapped pre-European regional ecosystems were used to define forest type. These were grouped into five forest types:

rainforest, wet forest, moist dry forest, woodland and unproductive. Plots were placed into one of the four productive forest types based on forest type observed in the field. Map 11 shows the distribution of each broad forest type on private land.

Limitations

Limitations of the methods are described in detail in the project report. The main limitations were the reliance on visual estimates of volume, which had a poor relationship to the measured plots, and that sampling was restricted to roadsides.

For modelling of forest productivity, multiple linear regression was used to model the relationship between mean annual increment (MAI) and environmental variables such as rainfall for the public native forest estate. MAI was estimated for management units (MUIDs) using DPI–Forestry’s SKED yield scheduling system. The average environment for each MUID was described by 19 climatic or topographic variables and four substrate attributes defined from geological type or stratigraphic units. Climate attributes were defined by indicative BIOCLIM parameters using a 100 m digital elevation model (DEM), and the same DEM was used to define a set of topographic attributes. As MUIDs vary in their spatial extent and degree of environmental heterogeneity, covariates for these factors were tested for their importance in explaining MAI.

The predictive model of MAI was subsequently extrapolated to the private native forest estate. Levels of MAI that reflected low, medium or high productivity forest type were defined as ≤ 0.1 , > 0.1 and ≤ 0.8 , > 0.8 m³/ha/yr respectively. The distribution of predicted MAI for private forests was summarised by the modelled forest ecosystems grouped as wet, moist, dry and woodland forest types. Rainforest was excluded from the analysis because of a lack of growth data relating to this forest type.

Limitations of the modelling are described in detail in the project report. Apart from reliability of the MAI data and ultimate productivity model, the major limitation was that the management of private native forests could not be included in the model. Different management practices may differ significantly from those on State forests, which could influence the productivity of private forests in either direction.

Data on land clearing was collated from readily available sources, these being:

- The Statewide Landcover and Trees Study (SLATS 1997) analysis of clearing between 1991 and 1995
- Queensland Herbarium (unpubl.) analysis of change in remnant vegetation between 1995 and 1997 (using SLATS classification of LANDSAT images from these times). These were grouped into the five forest types to assess the possible impact on standing volume and potential productivity.

The review of landholder attitudes towards using their native forests for wood production used a number of relevant questions as part of a farm forestry survey with 96 responses (as part of project SE 5.2), as well as existing surveys and reports. Field extension officers from DPI–Forestry and DNR were also consulted to obtain their opinion of landowner attitudes. This section of the inventory also sought to gauge landholder attitudes towards the management of private forest for sustained timber production. As part of a survey of sawmill managers and owners in South-East Queensland (project SE 2.2), questions were asked on log supply, log quality, access issues etc. from private forests. A total of 32 sawmills responded to the survey.

Details of the private plantation resource were extracted from existing databases, particularly the 1995 National Plantation Inventory. Information detailing the location, extent and species composition of plantations has been provided in this report. A minimum size of approximately 500 hectares was used for reporting purposes. Map 11 shows the locations of these private plantations.

Key results

The total area of private native forest in South-East Queensland was estimated to be 1.36 million hectares (Table 21). This includes only forest in patches greater than 10 hectares, on lots larger than 10 hectares and on slopes less than 25 degrees. This project estimated that 1 075 000 ha (80 per cent) of the study area is carrying less than 2 m³/ha of standing sawlog volume. Of the 284 000 hectares (20 per cent) of the area which is carrying larger volumes the majority are moist dry forest types which are mostly carrying between 2 and 4.9 m³/ha. The wet forest type was generally carrying larger volumes of timber with some sites carrying extremely large volumes. Volume on rainforest sites was highly variable, and although estimated, was not considered reliable. As such, volume estimates in Table 20 are reported both with and without rainforest. The total standing volume on private land was estimated to be 4.4 million m³. Of this, only 1.8 million m³ is estimated to be potentially available in stands currently containing merchantable volumes and excluding rainforest. Clearly there is considerable variation around these estimates.

Table 20. Estimated standing volume by forest type on total area and standing volume contained in stands carrying merchantable volumes (>2m³/ha)

Forest type	Standing volume on total area				Standing volume on area containing merchantable volumes			
	area (ha)	mean (m ³)	min* (m ³)	max* (m ³)	area (ha)	mean (m ³)	min* (m ³)	max* (m ³)
Rainforest	104 694	1 711 739	0	3 862 143	12 080	1 630 803	0	4 385 409
Wet forest	38 229	499 268	274 101	724 436	22 410	483 384	278 332	688 435
Moist dry forests	833 732	1 842 547	1 592 427	2 092 666	180 389	1 215 823	1 022 807	1 408 840
Woodland	327 696	389 959	304 758	475 160	15 066	89 646	20 490	158 801
Non productive	55 153	na	na	na	na	na	na	na
Total	1 359 503	4 443 513	2 171 286	7 154 405	284 106	3 419 655	1 321 629	6 641 485
<i>Tot without RF</i>	<i>1 254 809</i>	<i>2 731 774</i>	<i>2 171 286</i>	<i>3 292 262</i>	<i>217 866</i>	<i>1 788 853</i>	<i>1 321 629</i>	<i>2 256 076</i>

* minimums and maximums represent 95 per cent confidence intervals around the mean.

Table 21 summarises the estimated productivity on private land derived from the modelled relationship between MAI on State forests and environmental variables. The model explained 69 per cent of the variance for the relationship between MAI and the environment of the MUIDs.

Table 21. Area and potential annual volume (modelled) for each forest type in each productivity class

Forest type	high		medium		low		unknown**		Total	
	area	volume	area	volume	area	volume	area	volume	area	volume
Rainforest*	na	na	na	na	na	na	na	na	104 694	na
Wet forest	232	289	28 388	13 577	3099	133	6 509	2 873	38 229	16 872
Moist dry forest	2982	3753	246 149	111 822	551 564	27 578	33 037	5 907	833 732	149 060
Woodland	2112	2685	69 097	31 428	230 572	11 529	25 915	3 919	327 696	49 561
Unproductive	na	na	na	na	na	na	na	na	55 153	na
Total	5 326	6 728	343 634	156 827	785 235	39 240	65 462	12 699	1 359 503	215 493

Productivity of rainforest was not estimated as part of this project due to a lack of reliable data and small contribution of this forest type to current harvest.

** MAI for area of 'Unknown' productivity taken as the average MAI (weighted by area) for that forest type.

The productivity of rainforest on private land could not be estimated due to a lack of data. A map showing the areas of each forest type in each of the productivity classes is included in the project report.

The potential annual yield of timber from the total area of private native forests in South-East Queensland was estimated to be 215,000 m³/ann. If half of this potential were realised, approximately 108 000 m³ would be available annually. However, if only those areas currently containing merchantable volumes were to continue to contribute volume in the future, this would amount to only 45,000 m³/ann. This compares with the 210 000 m³ cut from private forests in 1995/96.

Recognising the limitations of the modelling, the current levels of harvest from private native forests clearly appear to be unsustainable in the long term. Given the current importance of the private native forest resource to the timber industry and its potentially greater importance in the future, there is an obvious need for considerable effort to ensure it is managed in a productive and sustainable manner. As a result of greater landowner input and fewer environmental restrictions, the private resource offers opportunities for more intensive management than State forests. This may provide opportunities for increasing yields beyond those predicted. However, an immediate reduction in the level of harvest of private forests appears essential to avoid the imminent exhaustion of the private native forest resource.

Land clearing has been reported from two sources to be occurring at a rate of approximately 0.3 per cent per annum and 0.8 per cent per annum across the South-East Queensland RFA region. The largest area of clearing is occurring in the moist dry and woodland forest types representing approximately 60 per cent and 25 per cent of the private forest resource respectively. However, the greatest rates of clearing are occurring on the woodland and unproductive forest types. A clearing rate of 0.8 per cent is estimated to reduce standing merchantable volume by approximately 12 000 m³ each year and potential annual yield by 1800 m³/ann each year. Whilst neither of the available clearing rates include regrowth of cleared land back to a forested state, they clearly have implications for the long term supply of wood from private native forests.

Private forest owners in South-East Queensland were found to possess a wide range of views regarding the potential economic uses of native forests that they have on their properties. The method provided little quantitative data on availability apart from the sawmiller survey that indicated that half of sawmillers believed that the current level of private resource would be available for the next 10 years or more. Having spoken to various extension officers and landholders, and surveyed farm foresters in the region, several issues were identified that are preventing more landholders from actively managing their forests for sustained timber production. These include a lack of information regarding silviculture, economics and marketing as well as an uncertainty about future government decisions regarding harvesting rights.

There were three major areas of privately owned plantations identified that would make a significant contribution to wood flow for the timber industry. These are all slash pine plantations and cover a combined area of about 12 450 hectares. These plantations are being grown to provide sawlogs, veneer and export chips. The predicted annual yield from these plantations is approximately 150 000 m³.

COMMERCIAL PLANTATION LAND CAPABILITY ANALYSIS OF SOUTH-EAST QUEENSLAND

SE 1.5

Project objectives:

The objectives of this project were to investigate the capability of land in South-East Queensland for development of native and exotic plantations to supply a range of wood products.

This project addressed the following issues:

- identification of native hardwood and softwood and exotic softwood species suitable for commercial plantations
- identification of cleared public and private land
- prediction of the productive potential for plantations on cleared land.

Methods

Species selection

A range of target native and exotic species and species groups were identified making particular use of existing work being undertaken in Queensland as part of a private plantations initiative. Hardwood species selected were those noted in Queensland Forest Research Institute (1998) *Hardwood Plantation Research and Development*, as 'showing most promise and that justify more intensive research as plantation species'. A variety of factors were taken into account in identifying these species, including growth characteristics, wood quality, growth potential, environmental requirements, biological constraints, potential products/uses and market potential – all factors which influence commercial viability.

Soils

Soil characteristics are recognised as being critical to identifying plantation potential. As comprehensive soil mapping was not available for the whole of the RFA region, an expert panel was used to attribute four soil characteristics to base maps. 1:500,000 scale Land Resource Area maps were used as the basis for the northern half of the region whilst the Moreton geology sheet was used as the basis for the southern half of the region. The four soil variables were: fertility (nutrient supply potential), permeability (drainage), depth of soil and texture (soil water holding capacity). As a result of the scale of the underlying land units, they were found to frequently contain a wide range of soil types. In these circumstances, land units were given both a predominant value and a range of values.

Plant ecology and plantation silviculture experts then assigned a value for plantation soil suitability for each of the land units under adequate natural rainfall. Plantation soil suitability values for various units also have ranges associated with them. In all cases the experts provided a value which represents the most likely plantation soil suitability to be found in that unit. Plantation soil suitability was rated as high, medium, low or unsuitable based on the expected potential productivity¹ of the areas (Table 22).

Table 22 Description of plantation capability classes by mean annual increment (MAI)

Plantation soil suitability	Expected potential productivity
High	> 20 m ³ /ha/yr MAI
Medium	15-20 m ³ /ha/yr MAI
Low	10-15 m ³ /ha/yr MAI
Unsuitable	< 10 m ³ /ha/yr MAI

Plantation capability

In defining plantation capability, rainfall was considered to be the critically limiting environmental factor in combination with soil suitability. Annual rainfall limits for each of the soil suitability classes for each species were defined by plantation specialists resulting in decision matrices that defined plantation capability. These were then analysed spatially and maps produced of the outputs.

Validation of models

The plantation experts involved in the initial attribution perused maps of the projected suitabilities to check for anomalies. The results of the assessment were further validated by intersecting the projected capability (by class) with known site information. For the pines, this was done using a plantation coverage that detailed existing native and exotic plantations. Readily available site information from DPI–Forestry temporary plots was used to validate the hardwood projections. The intersections of plantation and site data with predictions were evaluated by perusing the mapped output and interpreting a tabular analysis. Due to its natural distribution being outside of the region, no data was available for Queensland western white gum (*E. argophloia*) to enable verification.

Available land

In identifying land available for plantation establishment, a number of operational constraints were considered. The key features considered were:

Cleared land – derived from the Murray Darling Basin Project M305 (Ritman 1995) which used LANDSAT scenes from 1989–1991 to classify the study area according to a range of features including vegetation density and landcover types. Twenty percent crown cover was used to define cleared land.

Slope – a limit of 25 degrees was used as the limit of capable land as defined by the Draft Code of Practice for Plantations (DNR 1998) as being suitable for plantation establishment without special management prescriptions and suitable harvesting techniques;

Lot size and cleared area – a nominal limit of 10 hectares was used to screen property sizes and cleared areas, based on the minimum size used by DPI–Forestry in their plantation joint ventures (DPI–Forestry undated).

Current land use – urban areas were excluded from the analysis, while cropping and improved pasture (indicating high value land) were reported separately from other cleared land.

Limitations of methods

The analysis method used in this study was based predominantly on expert knowledge. Ongoing work within DNR is using more detailed spatial regression analysis to establish site requirements of many of the species selected for this study.

The scale of the underlying land units used for soil attribution was clearly a key limitation of the study. Heterogeneous land units were attributed with a range of values for some soil variables in addition to the predominant value. The ranges were carried through into plantation soil suitability, resulting in variability within capability classes.

Other limitations include:

- only five species/species groups were modelled, when there are potentially numerous species suitable for plantation establishment
- 1989-91 LANDSAT scenes were used as a basis for determining currently cleared areas and current land use. Work was underway on more contemporary LANDSAT scenes but these were not available at the time of analysis
- during the course of the project it became obvious that the project requirement to consider implications of predicted climate change was beyond the capacity of the project to deliver a viable outcome.

The areas identified and capability classes are indicative only and may be under or overestimated due to the range of soil attributes (and hence productivity potential) within each land unit. Since most of the land units have a range of

capability classes, only a proportion of the areas classified as being high, medium, low or unsuitable would have that actual capability value.

Key results

Species selection

Five plantation types were identified for analysis. These being:

- native softwood
- hoop pine (*Araucaria cunninghamii*)
- exotic softwood
- F1 hybrid *P. elliotti* x *P. caribaea*
- native hardwoods (divided into three categories)
- Queensland western white gum (*E. argophloia*)
- spotted gum (*C. citrodora*)
- a group containing blackbutt (*E. pilularis*), Gympie messmate (*E. cloeziana*) and rose gum (*E. grandis*).

These species/species groups were selected due to their potential commercial viability and their expected capacity to grow well in a plantation situation. They also have quite different site requirements from each other, ensuring that the maximum range of potential sites would be analysed. A series of priority 2 species are also noted in the project report, and many of these have similar requirements to the species/species groups analysed in this project.

Soils

Tables of soil attributes and associated plantation soil suitability for each land unit are presented in the project report.

Plantation capability

Matrices of plantation soil suitability and rainfall, used to define plantation capability, are presented in the project report.

Validation of models

Validation for the exotic pine indicated a relatively sound model with 90 per cent of existing plantations falling over the 35 per cent of the region predicted to be of moderate capability or higher.

The prediction for hoop pine appears to be less reliable than those for the other species. Even allowing for the maximum soil suitability of each land unit where these were heterogeneous, the model was predicting, at maximum, only low capability for 39 per cent of the existing plantation estate. Given this, it is recommended that further work be undertaken to improve the reliability of hoop pine predictions.

The prediction for Queensland western white gum could not be validated using any site data as this species does not occur naturally within the study area and existing plantation data are too limited to enable comprehensive validation. A relatively high proportion of land classified as 'capable' for this species, would suggest that the projection for this species be used with caution.

The validation for spotted gum indicated that 85 per cent of the plot data fell within the 73 per cent of the region predicted to be of high or medium capability land. A total of almost 2 million hectares of land was predicted to be of moderate to high capability. Although the species has a broad distribution, this would appear to be an optimistic prediction of the medium or better capability land.

Validation of the group of three eucalypts, blackbutt, Gympie messmate and rose gum, indicates that the natural distribution of these species falls predominantly within the 57 per cent of the region predicted to be capable for these species.

Spatial analysis

The total area of cleared land in South-East Queensland was found to be approximately 3.42 million hectares. A total of 2.72 million hectares of cleared land met the slope and size constraints and of this, approximately 2.48 million hectares were considered to be of lower value, while 0.24 million hectares were considered to be high value (i.e. cropping or improved pasture).

Maps showing the areas of predicted capability for each plantation type are presented in the project report. Table 23 summarises the total areas of capability for each plantation type.

Table 23. Areas of capability for each plantation type in South-East Queensland

Plantation type	Area in each capability class (ha)			
	high	medium	low	unsuitable
Exotic softwoods	14 729	650 084	1 028 556	1 029 521
Native softwoods	48 743	581 990	776 910	1 315 247
Qld Western White Gum	464 734	909 595	707 901	640 660
Spotted gum	321 061	1 641 849	681 902	78 078
Group of three hardwoods	582 789	78 824	801 539	1 259 738
All hardwoods*	957 115	1 341 349	365 379	59 047

* All hardwoods — includes the highest capability for any area for any of the hardwood species.

Discussion

Capable land was identified for each of the plantation types within the 2.72 million hectares of potentially available land. In interpreting the results of this study it is important to recognise the limitations of the study method and the results of the validation procedure. In particular, the areas identified as being ‘capable’ of supporting plantation in fact indicate the general area in which land of that capability class is most likely to be found.

When combined, almost the whole region is predicted to be capable of supporting hardwood plantations, with 84 per cent predicted to be in the high or medium capability classes (see Table 23 – all hardwoods). Clearly this is an overestimate of the potentially capable land. The extent of the spotted gum and western white gum predictions are the main factors influencing this result.

There are a number of other factors that will influence feasibility beyond those considered in this study which would need to be considered in developing a broader plantation strategy. These include:

- tenure – ownership of capable land will influence availability for plantation establishment
- location of markets – the location of markets and potential markets would need to be identified and taken into consideration when identifying areas for plantation establishment. The cost involved in transporting timber from plantation areas to processing sites and markets will heavily influence the viability of plantations
- size of individual and aggregate units – economic viability of plantations requires a minimum area as a management unit (at both individual property lot level – which has been considered) and as a marketing unit (at an aggregate level)
- land price – the cost of land will influence the economic viability of establishing a plantation and hence whether or not it is available for conversion to plantation. Whilst this has been addressed to some extent in the study, viability is highly dependent on actual land price and potential plantation productivity
- Consideration of any local government zoning for forestry activities.

The study highlighted the problem of the inadequacy of soils information in relation to potential plantation productivity. The major limiting factor in this project was the lack of accurate soils information for the bioregion. Detailed soil mapping has been completed for areas of agricultural importance but no such information exists at a broader level or for land which would be most likely to be available for plantation establishment.

However, regardless of the scale of the data and the inherent problems with investigating at this scale, for most species (groups) the results of this project provide an indication of the areas with potential for plantation establishment in South-East Queensland and that warrant further investigation. This project provides broad information that will be used as a starting point for other projects to examine areas of capability in more detail. Other work being undertaken in relation to plantation capability modelling will over time provide more precise indications of plantation capability. These will permit far more detailed evaluation of the potential productivity and hence permit more detailed feasibility analysis.

Further work

Further work in the area of plantation capability should focus on the precision of any estimates. Spatial regression modelling to relate natural presence/absence data for plantation species with bioclimatic variables is being used within DNR to model plantation capability. Preliminary results of this work will be available for use during RFA option development, with ongoing work to refine and expand on this.

Further work is required to collate available site data and to improve soil mapping. Site data from a range of sources are being collated for the preliminary regression modelling. A project is currently being established within DNR to establish a more robust and repeatable method for quickly attributing geology maps at 1:100 000 scale.

Considerable work is still required to enable detailed planning for a major plantation establishment program. In particular, field verification of any prediction is required and plantings should be based on the most accurate

modelling available and should also consider viability. Consideration of economic feasibility and social impacts of major plantation development are also required prior to large scale plantation establishment.

Clearly all this work requires coordination with current plantation developments such as the Hardwood Plantation R&D Strategy (Keenan et al. 1998) and existing government initiatives such as the Plantations for Australia: The 2020 Vision (MCFFA et al. 1997) that has been adopted by both the State and Commonwealth governments.

¹ Potential productivity was taken to be total maximum volume production within the environmental parameters of the analysis and exclusion of factors such as merchantability criteria, other biological limitations (such as loss of growth due to insect herbivory and weed competition) or the effects of silvicultural manipulation to increase stand value (such as thinning).

APPRAISAL AND ACCREDITATION OF WOOD-YIELD METHODS AND DATA

SE 1.1

Project objectives

The objectives of the Appraisal and Accreditation of Wood-Yield Methods and Data project were to:

- review methods used by DPI–Forestry to estimate wood resource yields from public native forests and the capacity of the methods to integrate ecologically sustainable forest management (ESFM)
- provide the basis for accreditation of methods and yield.

Methods

The appraisal was conducted by consultancy. The consultant was selected through a competitive process. The appraisal covers the following four themes in relation to the methods and data used by DPI–Forestry to calculate wood yields for public native forest:

1. growth model
2. data used for yield projection
3. wood-yield calculation
4. the capacity of the model to accommodate different management systems.

Specifically the consultant was asked to:

- describe the current Queensland public native forest yield regulation system
- review the methods used by DPI–Forestry to estimate wood resource yields from public native forests for the three themes: growth model, data, and sustainable yield calculation. The criteria include flexibility (can the model accommodate other resources/values/modified management), validation steps (e.g. projected vs actual yields), confidence levels, data quality (e.g. how recent, what sources—random plots, permanent plots—spatial or block/compartiment based), and management assumptions.
- seek the input of an ESFM expert panel regarding the review of ESFM needs and capability
- identify priorities for future research and development to improve yield calculation methods including the incorporation of ESFM.

Key results

The major purpose of the calculation of native forest wood yields by DPI–Forestry is to help set every five years the annual allocations of sawlogs to Crown sawmills within timber allocation zones, of which there are 13 (excluding Blackdown Tableland) in the South-East Queensland region. The method by which this is done is to project wood production on the forests in each allocation zone, with reductions for harvesting, about 100 years into the future and examine the trends in a number of indicators as to their sustainability. Sustainability of such indicators as total standing volume, size of removed sawlogs, etc. is indicated by the attainment of a steady state condition. This then is the definition of sustainable yield used by DPI–Forestry.

The four components of the yield estimation system are:

1. Data sets

Among the data sets that have been evaluated are the following:

- forest area estimation and means of stratification, including API procedures for the native forests
- current growing stock statistics – as derived from forest inventories or other means
- estimates of past growth of forests as derived from permanent plot measurements and perhaps other methods
- measurements of actual removals from forests and comparisons with standing volume estimation.

2. Models

Mathematical models evaluated for their applicability and accuracy include:

- models for estimating volumes of standing trees
- models for predicting growth and mortality of forests under various conditions
- models for estimating wood product mix from predicted gross volumes.

3. Systems

Computer and other systems critically reviewed include:

- computer systems used to project forest statistics into the future and to take into account constraints on the predictions
- systems set up to verify and validate predictions from growth models
- systems used to keep area and growing stock statistics current.

4. Methodology

The methodology used in various parts of the sustainable or continuing yield calculation process has been evaluated. This includes:

- sampling methods used to gather data for input to the systems, including growing stock information, growth information and removals information
- actual methods used to calculate sustainable yields, including an evaluation of the underlying assumptions
- methods used to estimate the reliability of the predictions.

The system devised by DPI-Forestry comprises three databases – the Area Information System (AIS), the Native Forest Inventory and the Native Forests Permanent Plot System – and various derived models. The simulation model SKED, incorporating these and related predictive functions, provides a means of simulating future growth and removals under various levels of harvest to see whether they are sustainable.

Area information is handled through the AIS. State forests within an allocation zone are subdivided for management purposes into management units (MUs) and these into sub units (SUs). MUs are logical sale units while SUs represent homogeneous areas within an MU. Previous reviews (1992 and 1996) expressed concern about the relatively poor accuracy of SU area estimates. Despite some improvement, there are still serious problems in estimating net harvestable areas. The difficulties in the estimation of net areas are in part a result of the selection management systems used, which means that harvest unit boundaries are diffuse in space and time. In addition, it is conceivable that the reductions in harvestable area over time are real, reflecting an increasing attention to environmental and ecological protection. Of concern is that there continues to be no direct link between this database and a GIS to provide a check on area estimates.

The current status of the forest (Native Forest Inventory) is determined by sampling the forest within SUs. The aim is to have at least two plots located within each SU; where this is not possible, plots are ‘shared’ from similar nearby SUs, a practice considered an interim measure. Despite the improvement from 76 per cent of shared plots in 1992 to 56 per cent in 1997, more than half of the SUs are represented in the database by plots that are only subjectively attributed to them. An active inventory program allows old plots to be retired as new ones are measured and the current database consists mostly of plots measured in the last few years. Ninety per cent of the current database of about 8300 plots are less than 10 years old.

Previous reviews have found that the realised volumes from logging sales have been less than the assessed volumes from plot measurements. To compare actual harvested volumes with estimates from inventory measurements, the outcomes of 58 MUs logged over 1992-97 were reviewed. On average, using the most recently determined net areas, pre-logging inventory estimates and new volume models, the estimates were greater than the actual volumes by about 14 per cent.

South-East Queensland Comprehensive Regional Assessment

A new database of about 5000 trees has now been accumulated for checking models used for estimating volumes of standing trees through a 10 per cent sample of trees marked for removal. Until all these data are analysed in depth it can only be hypothesised that most of the differences between realised and predicted volumes are due to a combination of factors, including estimating the merchantability of the standing trees and the increasing tendency to retain trees for various purposes.

Past growth is estimated by remeasurement of permanent plots. There has been a progressive rationalisation of plots to remove redundant plots and add new ones in a more representative sample of the forest sites. There are now about 410 permanent plots in the database as opposed to 290 in 1992, but the consequence of this rationalisation is that many of them have only the initial measurement. Most permanent plots are remeasured every five to six years. It represents a unique set of data in its representativeness.

The basic premise of growth, mortality and recruitment prediction is that cohorts of trees can be characterised by logistic models to predict the proportion of trees changing diameter classes or merchantability classes, from living to dead, etc., and the probability of recruitment occurring. There has been some validation of these models in recent years but not in a systematic manner.

The SKED prediction system grows the forest annually and imposes a harvest when defined criteria (such as minimum operable area and log size) are met. MUs may either be cut on a regular time cycle (the cutting cycle) or when required to meet an imposed annual harvest. It is assumed that if a number of key indicators examined have reached a steady state within 100 years or so, the input constant allowable cut is sustainable.

Sensitivity analysis can be used to test the responsiveness of the models to changes in minimum log size, minimum loggable areas, etc. Simulations conducted previously suggest that the harvest levels at which steady state conditions are reached are not very sensitive to minor variations in mortality and recruitment despite some concerns about these functions.

Yields of products other than sawlogs such as poles and pulpwood will be able to be simulated using methodologies under development. Models for total wood-fibre potential have been developed under project SE 1.2.

The simulator SKED can be run in stochastic mode, meaning that the growth, survival, recruitment and merchantability-change models are subjected to chance perturbations. From a large number of iterations, the likely distribution of the final outcomes can be assessed. Stochastic simulation using central Queensland data showed a dispersion in allowable cut of a few per cent in the near future increasing to a range of about 30 per cent at 100 years.

The likely impact of ESFM considerations on the yield prediction system has been addressed in terms of stream buffers, wildlife corridors and other informal reserves, steepness, rock outcrops, etc., and silvicultural regime modifications.

Several items have been identified where further analysis or investigation would be expected to lead to improved accuracy and value of sustainable yield estimation. These are:

- alternative methods for estimating net areas—investigate alternative approaches (e.g. API and GIS)
- alternative methods for estimating merchantable volumes—consideration of a stratified sample of plots based on API structural classes and causes of errors in estimations of stem merchantability, and log length
- modifications to the yield simulator—by addition of financial measures, optimise on volume or value.

There are many assumptions built into this kind of a yield projection system. The most significant is probably that the future can be adequately modelled by the past. Although the form of the models developed for the region is such that minor extrapolation is probably safe, the growth models may not accurately simulate major alterations to the past harvesting patterns.

The system developed over many years to estimate sustainable yields in South-East Queensland by DPI-Forestry is unique, well conceptualised, and includes models that are of world class and are based on a very large database for a natural forest. The simulator is quite flexible and is able to reflect better than most the many constraints operating in the real world. Residual problems with data quality, which are being addressed, should not be allowed to overshadow the overall high utility of the yeiudl prediction system for strategic planning.

WOOD AND WOOD PRODUCTS INDUSTRY BACKGROUND AND SITUATION ANALYSIS

SE 2.5

Project objectives

The objective of the Wood and Wood Products Industry Background and Situation Analysis project was to describe the background and current situation in the Queensland timber industry, especially South-East Queensland.

Methods

The project proposal method was followed where possible. As a descriptive report, the methods were largely restricted to a review of recent literature on the Queensland timber industry. The most significant source documents included DPI (1998) and the Consultancy Bureau Pty Ltd (1997). A literature search for information on the history of the timber industry in South-East Queensland and gathering timber harvest data for the last 20 years from DPI–Forestry yearbooks for the region’s forests were the only significant research activities undertaken.

Limitations

Information was not available for South-East Queensland specifically. Consequently, the region was approximated by DPI–Forestry district boundaries for timber harvest statistics (refer to Map 12) and Australian Bureau of Statistics statistical local areas for employment and industry gross product details (derived from the *Manufacturing Industry Survey 1996/97 and 1996 Census of Population and Housing*). The overestimates resulting from inclusion of areas outside South-East Queensland are believed to be small relative to the totals for the region. A breakdown of the statistical local area data into native versus plantation and private versus publicly owned forest contributions would be informative, however, was unavailable for all but employment in the primary processing sector.

Key results

Queensland timber industry regulation

The regulation of the Queensland timber industry is achieved through legislation and associated controls exercised by all three levels of government. The Commonwealth Government has responsibility for the issue of export licenses (applicable to the export of raw product, for example, woodchips) and national compliance with obligations imposed by international agreements, treaties and conventions to which Australia is a party. The Queensland Government has control of forest products on publicly owned land and regulates sawmills and the marketing of timber products under various legislative Acts. The *Integrated Planning Act 1998* allows for commercial forestry operations to proceed without the need for further approvals once the initial development has been legitimately established.

Responsibility for the management, regulation and harvesting of the publicly owned forest resources is carried out by DPI–Forestry, the Department of Natural Resources (DNR) and the Department of Environment and Heritage (DEH).

DPI–Forestry is accountable for the commercial management of Queensland’s publicly owned forest resources and the marketing of the forest products harvested from publicly owned forests. DPI Forest Industries Development is accountable for the development of forest industries and the licensing of sawmills. Although publicly owned plantation timber is sold competitively, access to publicly owned hardwood is largely managed under a non-competitive allocation system administered by DPI–Forestry. This impedes access by primary processors without an allocation, unless they purchase an established allocation or enter into a diversion agreement.

DNR has responsibility for custodial, regulatory and non-commercial aspects of the management of publicly owned forests. Its role includes the preparation of codes of practice for adoption by DPI–Forestry that are consistent with the State’s commitment to the National Forest Policy Statement’s ecologically sustainable development principles.

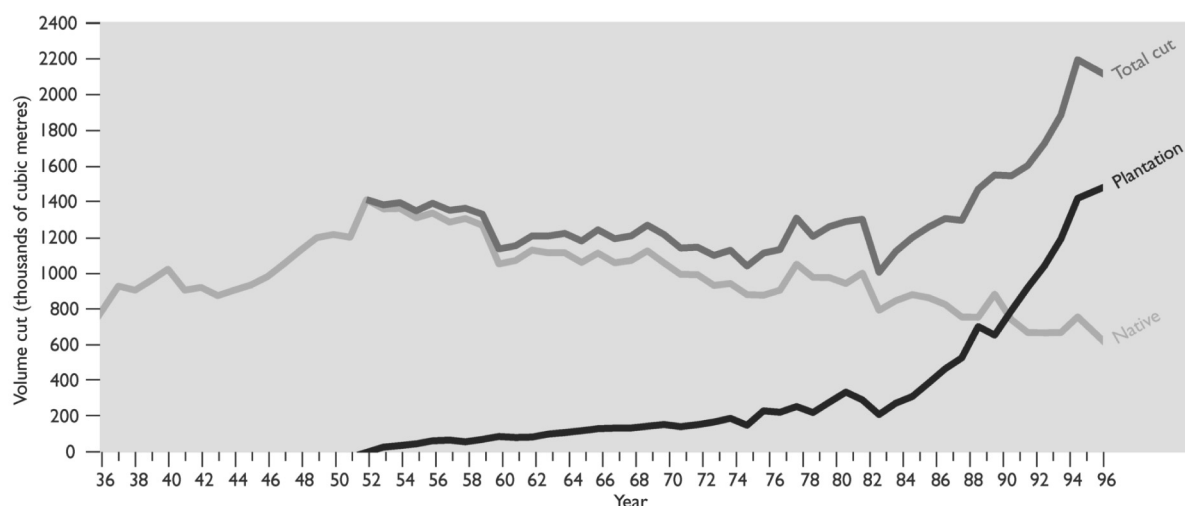
DEH has responsibility for the *Nature Conservation Act* and the *Environmental Protection Act*. The former provides for the conservation of nature on all tenures, both public and private. The latter provides for the licensing of certain uses with environmental impacts, e.g. licensing sawmills that generate smoke in the incineration of residue.

Resource description

According to DPI (1998), the State retains control over 58 per cent (28.7 million hectares) of Queensland's 49 million hectares of forest. However, only 6.1 million hectares of this is on State forests, timber reserves and other Crown land where the State has the timber rights (hereafter referred to as 'publicly owned production forests') and can potentially be managed for timber production. Approximately 1.6 million hectares of this area is reserved for various purposes where harvesting is incompatible with the primary management intent, including scientific and recreational areas, or are unproductive forest types.

Figure 11 presents the total timber harvest from Queensland's publicly and privately owned forests during the years 1936 to 1996. Currently, Queensland's forests supply approximately 70 percent of the State's annual sawn timber consumption requirements.

Figure 11. Total Queensland timber removals from publicly and privately owned land by broad forest type (1936-1996)



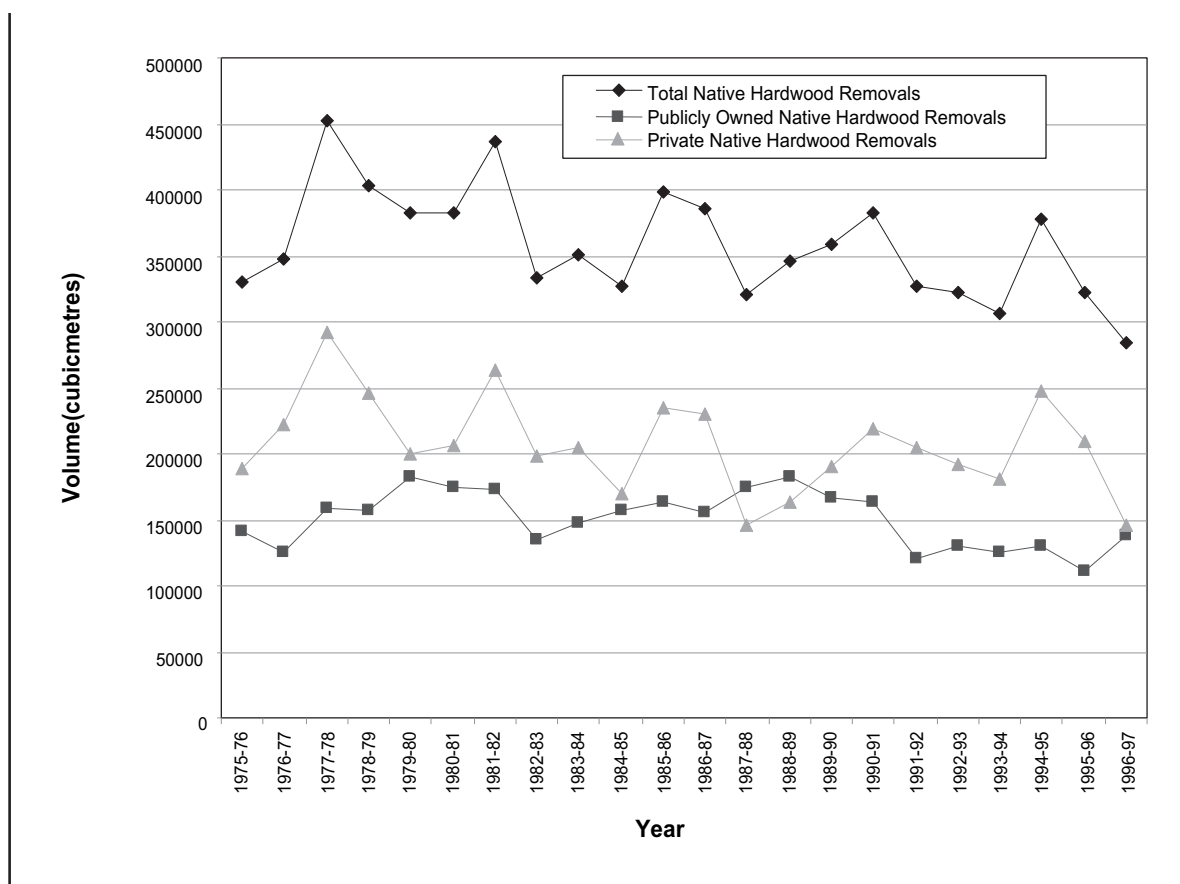
South-East Queensland is around 6.1 million hectares in area, of which 2.7 million are forested. Private forests account for nearly 1.3 million hectares, while publicly owned production forests cover around one million hectares. The remaining 0.4 million hectares of forest in South-East Queensland are comprised of various forested reserves, including national parks. Map 12 displays the region's native and plantation forests by tenure type.

Native forests

Eucalyptus species dominate native timber production in Queensland, and especially South-East Queensland. Florence (1996) reports that forest management in these publicly owned forests has resisted the trend observable in other states towards clearfelling on the basis that public forests are 'natural' and should be managed conservatively. Computer-based forest growth models calculate the sustainable harvest level for each native forest allocation zone and is reviewed every five years. Detailed harvesting plans that give consideration to the protection of watercourses, soil, wildlife, cultural and scenic values, precede each major timber sale and must be approved by DNR prior to commencement of operations. The logging operation itself must abide by DPI-Forestry's series of prescriptions and operating manuals for native forests. Failure to do so may incur a range of penalties. In addition to supervision from DPI-Forestry staff, some harvesting operations in the future will be subject to an independent field audit by DNR.

Throughout Queensland, increasingly stringent environmental constraints, a decreasing area of production forest, the change in silviculture as operations have shifted from forests receiving their first cut to regrowth forests, and historical overestimates of sustainable yield, have resulted in declining annual hardwood supply from publicly owned native forests. Since 1980, the publicly owned native sawlog harvest in Queensland has declined from 500 000 to approximately 200 000 cubic metres. Figure 12 suggests that South-East Queensland has sustained about 70 000 cubic metres of this reduction. Nevertheless, this region currently supplies about 66 percent of the publicly owned hardwood harvest (137 000 cubic metres in 1996/97). Figure 12 also highlights the significance of the private hardwood resource in South-East Queensland, which supplied almost twice as much timber as the region's publicly owned forests in 1994/95 and 1995/96.

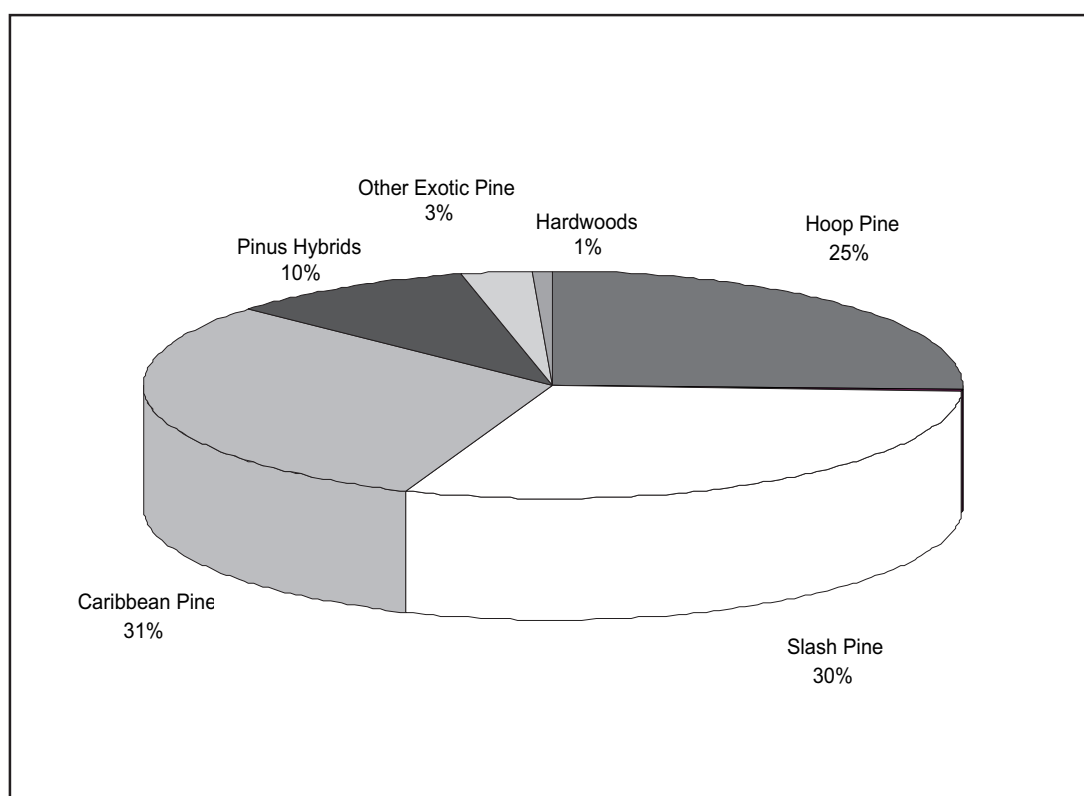
Figure 12. Native hardwood sawlog removals from the native forests of South-East Queensland (1975/76 to 1996/97)



Plantation forests

Today Queensland has 180 000 hectares of publicly owned and about 16 000 hectares of privately owned timber plantations. Figure 13 describes the species composition of the publicly owned plantation estate.

Figure 13 Queensland plantation forest estate composition 1995/96



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In 1996/97, approximately one million cubic metres of sawlog (from a total plantation harvest of 1.4 million cubic metres) were harvested from the publicly owned plantation resource. South-East Queensland contains 90 per cent of Queensland's total plantation estate, including nearly all of the private plantation area. The dominance of the region is epitomised by the fact that approximately 95 per cent of the total plantation harvest is sourced from within South-East Queensland.

Private plantations in South-East Queensland have consistently yielded about 100 000 cubic metres per annum over recent years, however, this is expected to decline as the land on which the plantations have been grown is converted to other uses and new private forest establishment has been slow. In contrast, the publicly owned plantation harvest is expected to increase into the next century, reaching a peak of around 2.2 million cubic metres, before settling to a long term sustainable yield of about 1.8 million cubic metres in 2010 (DPI 1998). South-East Queensland will remain the dominant supplier of this volume in the coming years.

DPI-Forestry is keen to expand Queensland's plantation resource in line with the objective to treble Australia's plantation base as outlined by the *Plantations for Australia 2020 Vision* (Ministerial Council on Forestry, Fisheries and Aquaculture et al. 1997). A strategy with regards to this vision is currently being developed by DPI-Forestry. While joint ventures with private landholders will be an essential component of this strategy, it is envisioned that the private sector will be the main driving force.

The socio-economic importance of the timber industry

The timber industry can be segregated into four sectors:

- forest management
- harvesting and transport
- primary processing
- secondary processing.

Table 24 presents the contribution of each timber industry sector to employment and industry gross product¹ (IGP) within Queensland and South-East Queensland. The notes accompanying the table indicate which ABS Australian and New Zealand Standard Industrial Classification (ANZSIC) codes have been used to generate these estimates. The forest management and harvesting and transport sectors have been combined because of the difficulty in splitting them from the existing ABS Australian and New Zealand Standard Industrial Classification (ANZSIC) codes.

The forest management sector of the industry covers the growing and management of timber production forests. The harvesting and transport sector is involved with delivering the log timber from the standing forest to the primary processing plants. Operators under contract with primary processors undertake most forest harvesting. The methods and technology employed by this sector varies considerably between the native and plantation resources, with plantation harvesting being much more capital intensive and efficient (DPI 1998).

Table 24. Employment and industry gross product for the Queensland timber industry by sector

Industry sector	Queensland employment (persons)	SEQ employment (persons)	% of sector employed in SEQ	Industry gross product (\$m)
Forest management and harvesting and transport ¹	2 059**	1 449**	70.37%	not available
Primary processing milling ²	2 993*	2 235**	74.67%	135.7
Secondary processing ³	5 695*	4 736**	83.16%	233.6
Total	10 747	8 420	78.35%	369.3 #

¹ Consists of ABS ANZSIC Codes 0301 *forestry*; 0302 *logging*; 0303 *services to forestry*; and 0300 *forestry and logging undef.*

² Consists of ABS ANZSIC Codes 2311 *Log Sawmilling*, 2312 *Wood Chipping*, 2313 *Timber Resawing and Dressing*, and 2310 *Log Sawmilling and Timber Dressing undef.*

³ Consists of ABS ANZSIC Codes 2321 *Plywood and Veneer Manufacturing*, 2322 *Fabricated Wood Manufacturing*, 2323 *Wooden Structural Component Manufacturing*, and 2329 *Wood Product Manufacturing, n.e.c.*

* Sourced from ABS 1996-97 Manufacturing Industry Queensland

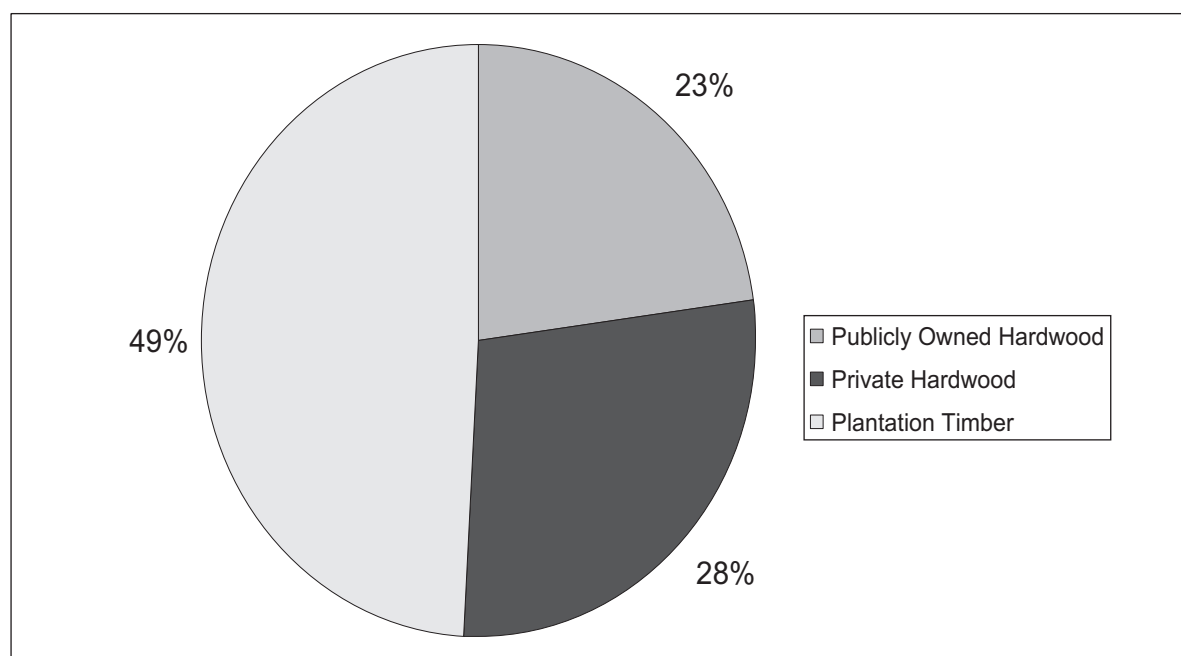
**Sourced from ABS 1996 Census of Population and Housing

#This total excludes the contributions of forest management and harvesting and transport since no estimates for these sectors were available.

There are approximately 400 licensed primary processing plants in Queensland including around 120 in South-East Queensland. Many of these may operate infrequently. An approximate breakdown of employment in the South-East Queensland primary processing sector by resource type for the period 1996 to 1998 is provided in Figure 14. It was not possible to segregate plantation timber sawmill employees according to whether they processed private or publicly owned plantation timber. A large proportion (70 per cent) of the South-East Queensland employment in this sector is generated outside of Brisbane, Pine Rivers Shire, Logan, Ipswich and the Gold Coast (hereafter termed 'major centres'). While not homogenous, primary processors are essentially involved in transforming the raw log into a saleable final or intermediate product. Key activities of primary processors include sawing, veneering, or chipping and pulping of the wood fibre.

Secondary processing is often the final stage in the production value-adding chain for forest products and involves transforming the output from primary processors into final products, such as prefabricated roof trusses and furniture. This sector dominates the timber industry's contribution to the State economy. However 77 per cent of the secondary processing employment is within the major centres of South-East Queensland. It should be noted that this sector could be larger than Table 25 indicates, since ANZSIC code 2921 *Wooden furniture and upholstered seat manufacturing*, employing 5993 people throughout Queensland in 1996/97, was excluded because the dependency of this industry segment on the South-East Queensland resource is uncertain.

Figure 14. Approximate proportion of primary processing employment by resource type in South-East Queensland



Conclusion

The forests of South-East Queensland are the focus of the timber industry in Queensland, contributing 75 per cent of the total publicly and privately owned native and plantation sawlog volume processed in Queensland during 1996/97. This includes virtually all the plantation cut and 66 per cent of the total hardwood cut from publicly owned and private land. In addition, the industry was responsible for 8420 jobs within South-East Queensland in 1996/97 and throughout the State contributed \$370 million in industry gross product. While it is likely that the hardwood sector of the industry will decline further in the next millennium, this loss to industry may be ameliorated if Queensland can generate the public and private support necessary to contribute to the objectives set forth by the *Plantations for Australia 2020 Vision* report.

¹ Industry gross product is very similar to the national accounting measure gross product at factor cost, which is the official statistical measure of production. IGP for an industry is a measure of the value which is added by the industry's production process to the raw materials and services which are input to those processes.

ECONOMIC SURVEY OF LOG PROCESSING FACILITIES IN SOUTH-EAST QUEENSLAND

SE 2.2

Project objectives

The objective of this project was to provide economic data on the log-processing industry in South-East Queensland to serve as inputs into subsequent modelling projects, in particular project SE 2.4 (FORUM model). The type of data collected for this report includes:

- resource flows from stands to mills
- processing costs
- product prices
- employment at mills
- other key economic data.

The collection of this data is the main objective of the project. However, a technical report has also been produced which provides a summary of the key economic data collected as part of this project. In order to honour the conditions of the data-confidentiality agreements established between the Australian Bureau of Agricultural and Resource Economics (ABARE) and the individual log processors, not all survey data collected are presented in this summary report. Confidential data are aggregated to prevent access to individual operator data.

Methods

ABARE conducted an economic survey of log processors that used hardwood and/or softwood logs harvested within the South-East Queensland RFA region in 1995/96.

Respondents were asked to provide financial and technical details of their log processing operations for the 1995-96 financial year. Hardwood and softwood log processing were treated separately, with the following data being collected: public and private log throughput, total log throughput, raw wood materials, recovery by log grade, mill door prices and production, sales by market, freight costs and delivery, and average unit cost on operations. Information relating to mill and labour costs was also provided, in addition to overall financial profiles of each processor.

Forty-six processors (hardwood and softwood) were surveyed from a population of 124 processors holding Queensland DPI sawmill licences in financial year 1995-96.

ABARE field survey officers conducted the survey of wood processing mills in South-East Queensland over a four-week period in August and September 1997. The survey involved face-to-face interviews with mill owners or managers of hardwood sawmills, softwood sawmills and wood panel plants.

Because of the large number of mills using resources from the South-East Queensland RFA region, a representative sample of mills was contacted as part of the survey. The sample mills were stratified on the basis of mill size (based on throughput), type of resources (softwood or hardwood), forest allocation zone and source of logs (public or private). A breakdown of the number and type of mills surveyed is presented in Table 25.

Table 25. Mills surveyed

Type of mill	Sample	Population
Hardwood	31	97
Softwood	15	27
Total	46	124

The population of sawmills includes all those sawmills that source logs from within the South-East Queensland RFA region, even if the mills are geographically located out of the region. Mills that do not process raw logs are not classified as mills for the purpose of this project. Such mills have been classified as *further* processors of wood and were surveyed separately by ABARE. The hardboard plant at Bundamba was the only mill that sourced a significant percentage of its input from raw logs and residues and was also the only mill that produced hardboard. It has been excluded from the summary report for confidentiality reasons.

Mobile sawmills and pole and pile collectors were not included as part of this survey for logistical reasons. DPI–Forestry advised that compared with the fixed sawmills, their total contribution to the industry in South-East Queensland was insignificant.

Information derived from the survey was used to estimate key variables, including the total gross and economic value of the hardwood and softwood log-processing industry, the size and scale of the log-processing facilities, log throughput, mill employment and the types of products produced in the region.

These estimates for the log-processing industry were derived by weighting the survey respondents. The population of processors receiving logs from the South-East Queensland region was stratified into groups based on their throughput (including any throughput from outside of the region).

Weights (for both hardwood and softwood) calculated on both the processor population and estimated throughput of the processors on a stratum basis were applied to the survey results to estimate key variables for the total industry.

Some processor managers supplied only partial responses to the questionnaires. In these cases, estimates calculated from average costs, prices and returns were used.

Key results

Hardwood sector

Mill characteristics

There were 97 hardwood sawmills in 1995-96. While there was a wide distribution of mills around the region, most of the sawmills were located around Maryborough, Gympie, the Sunshine Coast and Brisbane. During 1995-96:

- 339 000* m³ of hardwood logs were processed (62 per cent from private land)
- most mills were operating at below maximum productive capacity
- almost half of the mills only used 5 per cent of the total throughput for all mills
- the major species were spotted gum and ironbark
- 765 people were employed by these hardwood mills.

* 41 600 m³ of this resource was Crown and private sawlogs sourced from outside the region by mills outside the region that are significantly reliant on resource from within the region.

Economic significance

- gross value of production for 1995-96 was \$69 million
- gross operating surplus for 1995-96 was \$12 million.

Products

- more than 90 per cent of the product produced by these first-round processors was unseasoned sawntimber primarily for construction and framing, fencing and boards
- the balance was seasoned sawntimber used mainly for flooring and decking and structural purposes
- very limited markets exist for sawmill residues
- the majority of small and medium-size hardwood sawmills produce unseasoned products, while the larger hardwood sawmills produce higher valued added seasoned product.

Prices

- seasoned products commanded a 30 per cent price premium over unseasoned products
- mill door costs of logs ranged between \$59/m³ and \$72/m³
- processing costs per m³ were \$60 to \$98 depending on the size of the mill.

Recovery rates

- average recovery rate of around 40 per cent and was higher for the smaller mills
- for hardwood sawmills, it was the smaller sawmills that were relatively labour intensive and which had the higher recovery rates.

Softwood sector

Mill characteristics

In 1995/96 there were 27 softwood sawmills located mainly along the coastal strip between Maryborough in the north and Brisbane in the south. During 1995/96:

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- 1 500 000 m³ of softwood logs were processed
- most mills operated at below maximum productive capacity
- 25 per cent of the processors used 75 per cent of the total log throughput for all processors
- the softwood log processing industry was around three times the size of the hardwood log-processing industry in terms of the gross value of product
- 1100 people were employed.

Economic significance

- gross value of production for 1995/96 was \$207 million
- gross operating surplus for 1995/96 was \$67 million.

Products

- in softwood processing, small processors produced high percentages of seasoned product, while the larger processors produced high volumes of unseasoned products
- good markets exist for sawmill residues.

Prices

- mill door costs of logs were around \$66/m³
- processing costs per m³ were \$68 to \$96 depending on the size of the mill.

Recovery rates

- the average recovery rate was around 50 per cent and was higher for the larger processors
- the relationship between recovery rate (into sawntimber) and size of mill was reversed between hardwood and softwood processors; for softwood processors, although the smaller processors were labour intensive, they had the lower recovery rates because these processors primarily produced only one product such as sawntimber.

Wood-based panel

The wood-based panel (WBP) processors constituted the largest share (43 per cent of total volume) of softwood products produced in the region from whole logs. Some WPB processors also use softwood residues.

OTHER FOREST USES

INTRODUCTION

Timber, although often being considered the main resource of value within South-East Queensland forests, needs to be examined in conjunction with a variety of other forest uses. To address this need, five projects were conducted on other forest uses in addition to those on timber production.

Currently there is mining of heavy minerals, coal and to a lesser extent gold and industrial minerals within South-East Queensland forests. In addition, the area is considered to have moderate to high potential for the presence of a number of mineral deposits. The importance of mineral deposits within South-East Queensland forests is examined further in project SE 3.1 Resource Assessment of Mineral Extractives.

Increasing demand for forest-based tourism and recreation is highlighted within SE 4.1a Forest Recreation and Tourism. This report examines the numbers of visitors to State forests and national parks within South-East Queensland for both passive and active uses. This report, in conjunction with SE 4.1b Economic Valuation of Tourism Potential, provides an approximate valuation of the use of forests for tourism and recreation within South-East Queensland.

Forests within South-East Queensland are used in conjunction with freehold and other leased land by the cattle grazing industry. The forest resource is an integral part of many beef cattle management systems, providing a significant element of management flexibility. The project SE 4.2 Forest Grazing, estimates the number of cattle grazed within the region and the approximate value of forest grazing to the industry. Project SE 4.2 also examines the use of forests in the region by the apiculture industry. This section provides data on the potential production available from State-owned forest floral resources within South-East Queensland as well as the potential value this represents to the industry.

Project SE 4.3 Water Resource and Management, used secondary data and a literature review to study the importance and sensitivities of water yield and quality of various forest uses from forest catchments in South-East Queensland.

ASSESSMENT OF MINERAL AND EXTRACTIVE MATERIAL RESOURCES

SE 3.1

Project objectives

The objective of the Assessment of Mineral and Extractive Material project was to evaluate the current and potential mineral and extractive resources and industries within forested parts of South-East Queensland.

This assessment outlined the level of mining and exploration activity and made a comparison of these activities in forested and unforested areas in the South-East Queensland biogeographic region. The major producing mines and deposits that might be mined in the foreseeable future were discussed. A broad scale assessment was made of potential (undiscovered) resources which might be found in the region.

The 'forested areas' of the region were delineated from 1:250 000 scale maps prepared by the Forest Assessment Unit of the Resources Sciences Centre, that showed areas of forest interpreted from Landsat satellite imagery. Plantations of introduced species were excluded from the forested areas.

Methods

Assessments of the known and potential (undiscovered) mineral and extractive resources of the South-East Queensland region were commissioned in 1996 by the Queensland Department of Mines and Energy (DME) and the results were reported in *The Mining Industry and Mineral Potential of the Forested Areas within the Southeast Queensland Biogeographic Region* by Berkman (1996) and the associated *Assessment of Extractive Materials Potential for the Southeast Queensland Biogeographic Region* by Siemon and Holmes (1996). The results of these assessments were combined and consolidated in a report by DME (1998) and the Commonwealth Bureau of Resource Sciences (1998). Assessment results and map data were translated into spatial GIS formats to assist the integration of mineral resource data with data on other land resources in the RFA process.

The mineral potential of the South-East Queensland region was assessed by determining the types of mineral deposits likely to be found within the geological framework known or believed to exist there. This approach identified geological zones (tracts) which could contain particular types of mineral deposits. The general methodology was developed by the United States Geological Survey and has been used successfully for mineral resource assessments of wilderness areas in North America and elsewhere. The qualitative assessment methodology is described in reports by Marsh, Kropschot and Dickinson (1984), Taylor and Steven (1983) and Dewitt et al. (1986). The method has been modified and extended for use in a GIS environment.

A qualitative assessment of the potential resources of an area estimates the likelihood of occurrence of specific types of mineral deposits that might be of sufficient size and grade to constitute a mineral resource. The term 'mineral resource' was restricted to material, the extraction of which was judged to be potentially viable now or some time in the next 25 years.

Geological areas (or 'tracts') in the region which were considered to have a strong possibility of having specific types of undiscovered mineral deposits were classified as having 'high' or 'moderate to high' potential. Areas with some possibility that specified types of mineral deposits might be present were classified as having 'low to moderate' potential. Areas with only a slight possibility of having undiscovered mineral deposits were classified as having 'low' potential. The mineral potential was unknown for areas where there was insufficient evidence to assess their mineral potential. Areas of mineral potential and known resources were classified as 'alienated' where mineral resources development was precluded because of close settlement, environmental constraints and some other land uses. Areas of low and unknown potential were left blank and were not distinguished on the mineral potential map.

In order to provide a broad indication of the relative significance of mineral potential tracts in the region, scores were allocated to different levels of mineral potential and different types of mineral deposits were ranked in relation to one another as follows:

- Standard scores' were allocated according to a subjective ranking of levels of mineral potential: 18 for high potential, 12 (moderate to high), 6 (moderate), 2 (low-moderate) and 1 (low). Unknown potential was not scored. As noted previously, tracts of mineral potential in South-East Queensland fall into categories of 'high', 'moderate to high' and 'low to moderate'.

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- Different types of mineral deposits were ranked according to their relative importance. For example, in similar circumstances a major limestone deposit would be considered as being less significant and have a lower rank (say 3) than a major good-quality coal deposit (say 9).
- A 'weighted mineral potential' score was then derived for individual tracts by multiplying the standard mineral potential score by the rank of the deposit for the tract. For example, a tract with high potential for Walloon coal would have a weighted mineral potential score of 18 (standard score for high potential) x 9 (mineral deposit rank) = 162 (Map 14).

The weighted mineral potential (Map 13) provides a broad guide to the relative significance of the mineral potential tracts for different types of deposits in the region. However, the assessment still remains qualitative and is not a quantitative economic analysis of potential for different types of deposits.

Key results

In the forested parts of the South-East Queensland region there are significant mining operations for heavy minerals and coal, as well as smaller mines for gold and industrial minerals. The region has moderate to high potential for a number of mineral deposit types and is likely to contain undiscovered deposits. For about two-thirds of the region the mineral potential is either low or is unknown due to insufficient data. Parts of the region are currently being geologically remapped which should reduce the areas of unknown mineral potential. Producing mines, major deposits and some mineral occurrences are shown on Map 13, weighted composite mineral potential tracts for different types of mineral deposits are shown on Map 14, and significant quarries are shown on Figure 15.

The forested parts of the region contain active mining operations at 19 centres. The centres produced coal, rutile-zircon-ilmenite, gold, sand, magnetite and other industrial minerals to a total value of \$199.2 million in 1996/97, with total royalties for that year of \$6.02 million (\$190.6 million production in 1994/95) (see Table 26). Most of the production value is generated by the two largest mines, the rutile-zircon-ilmenite mining operations on North Stradbroke Island and the coal mine at Tarong supplying the Tarong power station. They are followed by the silica sand mining on North Stradbroke Island. The Burgowan coal mine closed in early 1997.

In 1996 there were 147 mining leases with a total area of 230 square kilometres within the 35 000 square kilometres of forested land within the region, which represented 0.65 per cent of the forest areas. The committed exploration expenditure in the South-East Queensland region was \$4.1 million in 1995/96, whereas the total mineral expenditure in Queensland in 1996 was \$180 million. Berkman (1996) estimated that in 1994/95 there were 644 people directly employed in mining and exploration activities in forested areas of the region. These figures do not take into account the multiplier effect of employment in primary production.

The cleared parts of the region contain the coal mines of the West Moreton district (Ipswich to Amberley), a gold mine at Gympie, the Kingaroy kaolin workings and the Flinders dolomite operation. Total 1994/95 coal production from the West Moreton district was 4.3 Mt of saleable coal, worth \$187 million. Gold production at Gympie was about 300 kg for 1994/95, valued at \$5 million. The total value of production from mines in cleared areas was about \$192.5 million.

The value of mine production from the forested and unforested areas was about the same. However, the production from the forested areas was obtained from 19 centres, compared with four centres in the cleared land.

Extractive materials are vital for the development of urban areas and infrastructure in the region and are required within an economical transport distance of major markets, in this case Brisbane, the Gold Coast, the Sunshine Coast and major regional centres. Most sources and known potential deposits were in cleared areas, but some important ones were in forested land. Because of their relative low value compared with other commodities, extractives were not generally traded between regions. Hence the opportunity costs of precluding access to resources of extractives in forested areas would depend on the location of other extractive resources in the region. Some relevant statistics for production of extractive resources in the region include:

- | | | |
|---|--------------------|----------------------|
| • quarry rock from all major quarries in region | production 1994/95 | >16.7 million tonnes |
| • clay from mining leases in region | production 1994/95 | >1.45 million tonnes |

The region has Queensland's largest quarry, Hymix at Nerang, with more than one million tonnes produced in 1994/95. This quarry is partly in State forest and total production of quarry rock from State forests in the region in 1994/95 was in excess of 2.6 million tonnes, compared with a total quarry rock production of in Queensland in 1994/95 of about 22 million tonnes.

Table 26. Summary of mines in forested areas in 1996/97

Commodity	Leased area (ha)	Lease rent (\$/y)	Name/location	Mine owner	Commodity produced	Employees
Coal+	4 267	42 670	Meandu, Tarong @	Pacific Coal PL	coal	303
Rut/Zircon	11 867	210 042	Nth Stradbroke Is #	Stradbroke Rutile PL (CRL)	rutile, zircon, ilmenite monazite	166
Magnetite	143	4 477	Mount Biggenden @	Commercial Minerals Ltd	magnetite, Bi Co	25
Limestone	84 4	2 860 98	Moffatdale @ Marule Lime @	South Burnett Lime PL K. D. Scarlett	limestone limestone	4 1
Gold	93	2 500	Shamrock #	D'Aguilar Gold PL (currently only processing site)	Au Ag As Cu Pb	na
	196 2	6 448 20	Manumbar # *Hell Hole Creek @	Three Star Mining NL J. S. Deane	Au Ag Cu Au	12 4
Sand	734 110	17 659 2 077	Cooroonpah#@ Coonarr Creek (4) @	ACI Operations PL Eastern Smelting (Qld)PL Bundaberg Metal Industries PL Toowoomba Foundry PL Smiths Premix PL	glass sand foundry, silica sand	18 na
	88 157	880 5 198	Iveragh@ Bribie/Beachme re (2) @	Qld Cement & Lime Toowoomba Foundry P/L Southern Pacific Sands	silica sand foundry sand	na na
Bentonite	9	306	Yarraman@	P C P Douglass PL	bentonite	3
Perlite	77	770	Numinbah Mine@	Aust. Perlite PL	perlite	3
Gemstones	3	69	*Brigooda @	L. W. Koy	garnet, sapph, zirc	0
Total	17 834	296 074	19			>541

* Non-commercial tourist, recreational only.

Export

+ Burgowan Collieries PL coalmine near Howard closed in 1997

@ Domestic

Known deposits which might be mined in forested parts of the region in the future included the Agnes Waters-Middle Island-Hummock Hill Island heavy mineral deposits, where reserves exceeded 2.4 Mt of ilmenite, rutile and zircon. The Mount Rawdon gold deposit, about 15 km south-east of Mount Perry, has a resource of 22 Mt of ore with average grade 1.2 g/t gold and 4 g/t silver. Development of the Spring Mountain coal resource, south-east of Ipswich, could proceed by underground mining (at a rate up to 2 Mt/year) within 10 years. Other known deposits in forested parts of the region include the Ban Ban zinc deposit, about 30 km south of Biggenden, and the Norton gold deposit.

The Stuart oil shale is a world-class deposit located in an unforested part of the region close to infrastructure at Gladstone. Other oil shale deposits are at Nagoorin south of Gladstone and Lowmead north of Bundaberg.

Berkman (1996) and Siemon and Holmes (1996) reported potential for 27 types of deposits. Mineral deposit types included six types of metalliferous deposits, two types of heavy mineral sand deposits, four types of coal deposits, oil shale deposits, 10 types of industrial mineral deposits and four types of deposits for extractive materials (Table 27).

On Map 14 tracts with weighted score classes range from 2 to 180 and occupy about 30 per cent of the region. About 2.2 per cent of the region is occupied by areas with alienated tracts and about 67 per cent of the region comprise areas of low and unknown potential which have not been differentiated. Tracts with weighted score classes of 108 to 180 cover about 1.4 per cent of the region and include deposits with a deposit ranking in the range of 7 to 10 (Table 27). These tracts include known major deposits of Walloon and Tarong coal, the North Stradbroke Island and Agnes Waters-Middle Island-Hummock Hill heavy mineral sand deposits, oil shale deposits and the Mount Rawdon volcanogenic gold deposit. About 10.9 per cent of the region was covered by tracts with a weighted score of 48 to 96 which indicates potential for mineral deposit types with a rank of 4 to 8. The tracts with a weighted mineral potential score of 2 to 36 occupy about 17.6 per cent of the region and represent deposit types with a rank of 1 to 7.

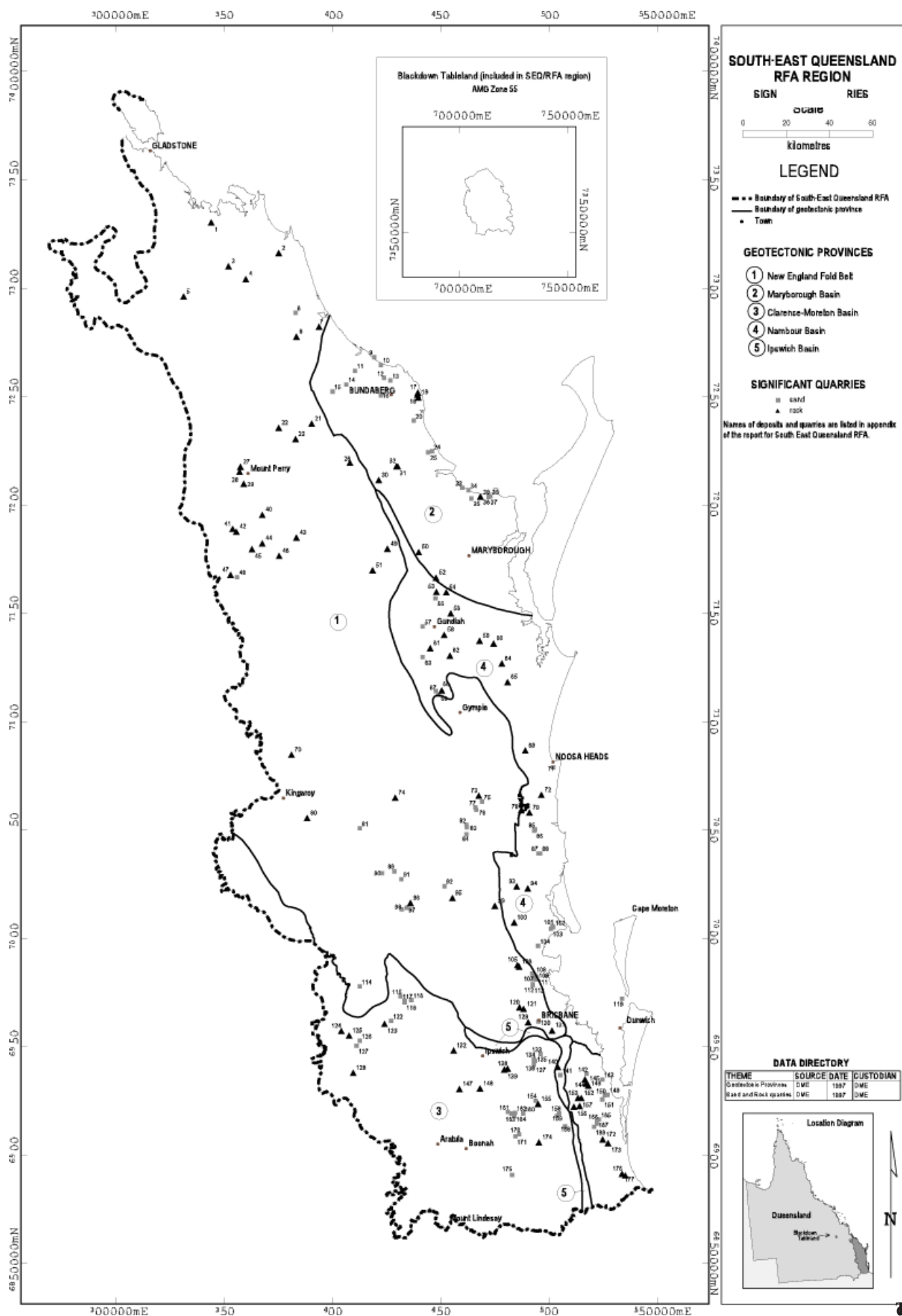


Figure 15 Significant quarries

Table 27. Summary of potential mineral resources as at September 1997

Mineral deposit class	Deposit type	Ranking of deposit type	Mineral potential	Standard score	Weighted score	Area of tract (sq km)	% of region covered by tract
Gold deposits	volcanogenic (epithermal) gold deposits	7	H	18	126	215	0.35%
		7	M-H	12	84	408	0.66%
		7	L-M	2	14	4380	7.12%
			alienated			223	0.36%
	structure/vein-hosted gold deposits	4	H	18	72	1 822	2.96%
		4	M-H	12	48	5 043	8.20%
		4	L-M	2	8	448	0.73%
Other metalliferous deposits	Porphyry copper-molybdenum	7	H	18	126	65	0.11%
		7	M-H	12	84	228	0.37%
		7	L-M	2	14	81	0.13%
	base metal skarn deposits: copper-gold-lead-zinc; copper-gold-magnetite; zinc-lead-gold	2	M-H	12	24	302	0.49%
	volcanogenic hydrothermal deposits: mercury; copper-lead-zinc-gold	2	M-H	12	24	539	0.88%
	base metal vein deposits: copper-gold; copper-lead-zinc; copper-gold-silver; lead-silver	2	M-H	12	24	430	0.70%
		2	L-M	2	4	207	0.34%
Shoreline and alluvial/eluvial placer deposits	coastal heavy mineral sand deposits (ilmenite-rutile-zircon)	10	H	18	180	128	0.21%
		10	M-H	12	120	71	0.11%
			alienated			1 128	1.84%
	Alluvial/eluvial placers: ilmenite-gold	4	M-H	12	48	39	0.06%
Coal deposits	Burrum	1	M-H	12	12	155	0.25%
		1	L-M	2	2	274	0.45%
	Walloon	9	H	18	162	289	0.47%
		9	M-H	12	108	15	0.02%
		9	L-M	2	18	1 740	2.83%
	Tarong	7	H	18	126	50	0.08%
		7	M-H	12	84	90	0.15%
		7	L-M	2	14	355	0.58%
	Ipswich	5	H	18	90	53	0.09%
			alienated			129	0.21%
Oil shale deposits	oil shale deposits	8	H	18	144	21	0.03%
		8	M-H	12	96	196	0.32%
Industrial mineral deposits	limestone	3	M-H	12	36	132	0.21%
	magnetite	3	M-H	12	36	2	0.00%
	glass/silica sand	5	H	18	90	21	0.03%
		5	M-H	12	60	24	0.04%
	foundry sand	3	H	18	54	29	0.05%
		3	M-H	12	36	67	0.11%
	dolomite	2	M-H	12	24	7	0.01%
	diatomite	1	M-H	12	12	6	0.01%
	perlite	1	M-H	12	12	6	0.01%
	kaolin	3	H	18	54	11	0.02%

Table 27. Summary of potential mineral resources as at September 1997 (Continued)

Mineral deposit class	Deposit type	Ranking of deposit type	Mineral potential	Standard score	Weighted score	Area of tract (sq km)	% of region covered by tract
Extractive materials	Bentonite	2	M-H	12	24	10	0.02%
	Graphite	1	M-H	12	12	7	0.01%
	Quarry rock	3	H	18	54	128	0.21%
		3	M-H	12	36	295	0.48%
		3	L-M	2	6	445	0.72%
	Sand and gravel	3	H	18	54	42	0.07%
		3	M-H	12	36	143	0.23%
		3	L-M	2	6	326	0.53%
	Brick clay	3	H	18	54	64	0.10%
		3	M-H	12	36	202	0.33%
	Building stone	4	H	18	72	36	0.06%

RECREATION ASSESSMENT

SE 4.1

PART A

Forest-based outdoor recreation opportunities exist on forested land of all tenures. The majority of the demand for recreation access however, falls on land managed by either the Department of Natural Resources (DNR) (State Forests) or the Department of Environment and Heritage (DEH) (conservation reserves including national parks). Each manages its resources according to different legislation and individual policies resulting in different recreation opportunities offered, activities allowed and facilities provided.

The majority of passive recreation activities including camping, picnicking and bushwalking are treated in a similar manner by the two management agencies. There are however a number of activities that, for legislative or policy reasons or as a function of the resource base, are discouraged or cannot be offered according to land tenure. Activities of a more active nature, or those that involve the introduction of non-native species such as horses, tend to be discouraged from the conservation estate. Potential changes in tenure resulting from establishment of a CAR reserve system will have an impact on the recreation opportunities available for these activities.

Project objectives

The objectives of project 4.1 A were to:

- identify current tenure related legislative and policy constraints placed on recreational use of forested land in South-East Queensland
- identify current provision of 'indicator' recreational opportunities in State forests in South-East Queensland
- identify the impact of potential allocation of forested land to the conservation estate on the diversity of and opportunities available to recreation in South-East Queensland.

Outdoor recreation

Need for access

Very little forest-based recreation demand is currently met by freehold land, placing the majority of recreation demand on public sector lands. In Queensland, most of the large areas of public land available are located far from major centres and, consequently, much of the demand for some types of outdoor recreation experiences or activities

cannot be met close to where people live. Sufficient land is simply not available in the public estate to satisfy current recreational demand (Batt 1997). In addition, not all public land is available to recreation. Availability is affected by tenure and as a result the majority of the recreational pressure is felt by the conservation reserves (DEH) and State Forests (DNR).

Quality through diversity

The aim of the Queensland Government as the major outdoor recreation opportunity provider is not simply to provide quantity but quality of recreation. In the annual report of the Department of Environment (1996) one of the desired outcomes within the conservation strategy was 'better community access, safety and nature-based recreation opportunities'. The statement 'ensuring that high quality, safe and sustainable opportunities are provided' appears in the DNR document *What we do for you...* (1998). Both these statements infer the provision of quality and quality cannot be measured by gross visitation.

If any generalisation can be made about outdoor recreation it is that people have very diverse motives and desires. Individual perceptions of 'quality' outdoor recreation experiences vary significantly not only between different activities but within each activity (not all bushwalkers, horse riders and campers are alike). Managing outdoor recreation and providing opportunities for the 'average' visitor is not satisfactory as the 'average' visitor does not adequately represent the heterogeneous nature of recreationists. Quality of recreation experience is best, therefore, assured through the provision of a diverse range of opportunities (Clark and Stankey 1979).

Diversity of opportunity can be achieved by allowing a broad range of activities to occur and by providing or managing for a range of landscape settings. A landscape setting is a description of the level of naturalness of an area that can be classified by a combination of physical, social and managerial characteristics.

The personal *experience* that an individual recreationist has will be based not only on the opportunity but, among others, the individual's motivations and experience. Within one opportunity each individual can have a different experience. By providing a range of opportunities the recreationist can select the opportunity best suited to the desired experience.

Promoting diversity of recreational experiences is also important for social equity reasons. Failing to provide diversity of opportunities suggests elitism, favouritism and discrimination (Clark and Stankey 1979).

State forests and conservation reserves have a different role to play within the broader landscape and in the provision of recreation opportunities due to differences in legislative constraints, management mandates and subsequent policies. Together they provide a diverse range of opportunities. Diversity of opportunity is important to the community.

Methods

Tenure analysis

A tenure analysis of the two major land management agencies (DEH and DNR) was conducted as a means of determining the impact tenure change would have on the provision of recreation opportunities.

Differences in the way national parks and State forests are managed were identified. These differences are, however, not as clear as may be anticipated. Other than the legislative prohibition of horses and dogs on national parks, differences in management are subtle, blurred and in some cases site specific. This makes the analysis of the implications of potential tenure changes on recreation a consideration of a set of complex issues, including the current political and social climate. The major difference between the two departments is their overall management mandate. DEH has the mandate of conservation of natural and cultural values. DNR manages State forests as multiple use reserves which infers that several goods and values are simultaneously produced and utilised in a sustainable manner, as a means to optimise the net social benefit to the community.

Under these management mandates, the majority of passive recreation activities are treated in a similar manner by the two management agencies. Within the conservation estate, where presenting the values (visitor access) compromises protection of the values of the area, protection takes precedence (Department of Environment 1997). As a result, activities of a more active or competitive nature, or those that involve the introduction of non-native species such as horses, tend to be discouraged from the conservation estate.

Potential changes in tenure resulting from establishment of a CAR reserve system may, as a result, have an impact on the diversity of recreation opportunities provided. Each activity and site would need to be considered on a site-by-site basis by management. However, the activities most likely to be considered a threat to conservation and as a result affected by tenure change include:

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- horse riding
- trail bike riding
- mountain bike riding
- four-wheel driving
- camping with horse or dog.

For the purposes of this study these activities have been termed *indicator activities*.

Recreation inventory

As an outcome of the RFA, a number of State forests may or may not be converted into some form of conservation tenure. As a result, the recreation opportunities currently available on State forests may be impacted by such a change. For this reason, this study concentrated on making an inventory of the indicator activities currently occurring on State forests.

All State forests within Queensland are divided into one or more management units. Each of these units are assigned an identification number and are known as MUIDS. These MUIDS form a convenient means of subdividing each State forest into smaller areas for recreation assessment.

Those MUIDS in which one or more of the identified indicator activities currently take place were assessed for the following data:

- activity
- site condition
- site quality for each activity
- setting
- visitation.

Meetings were arranged within each DNR district within South-East Queensland and those staff members most familiar with each State forest completed inventory forms developed specifically for the process.

Recreation site significance

The abovementioned factors were then used to calculate recreation site significance (RSS). RSS is the level of *importance* an individual site has in the provision of a particular recreational opportunity. The higher the RSS the greater the potential loss of opportunity with tenure change and the greater the potential community discontent.

The equation used to calculate the RSS for each activity incorporates all of the above factors.

$$RSS = (P + 3Q + 2C + 5V) / 11$$

RSS = Recreation site significance

Q = Quality

P = Popularity factor

C = Condition factor

V = Visitation factor

Testing of model

The model used to calculate RSS was tested using a group of recreation management experts. Three recreation managers familiar with the complex nature of recreation assessment and familiar with the State forests of South-East Queensland were each asked to rate in their opinion the RSS of each of nine state forests for horse riding. All experts were unaware of either the scores produced by the model, or those of the other individuals. The only additional information given was that of the values of the variables used in the calculation. The correlations between the experts and the model were statistically analysed by Queensland University of Technology's Statistical Consulting Unit, and it was found that *'highly significant correlations existed between the three expert ratings and that of the model, and that there was no significant difference between the means of the expert ratings and the model rating. We can therefore conclude that the sample data provides no evidence of differences between expert and model ratings.'* (Queensland University of Technology Statistical Consultancy Unit, 1998)

Map interpretation

RSS for each MUID and activity within the State forests of the region was plotted on a series of maps.

A RSS is not recorded for every MUID or every State forest, and a MUID may appear blank on the map. Lack of a RSS indicates either an insignificant level of use for that particular activity, lack of data or may be a result of the predominance of plantation.

As previously mentioned, RSS is the level of importance an individual site has in the provision of a particular recreational opportunity. The higher the site significance the greater the potential loss of opportunity with tenure change and the greater the potential community discontent. In addition, the RSS of individual MUIDs should not be considered in isolation. A majority of the activities included in the study (horse riding, trail bike riding, four-wheel driving, and mountain bike riding) are linear activities (requiring a length of track) and are, as a result, not isolated to one MUID. These activities involve travelling across the landscape and may involve entire State forests or, on occasions, more than one State forest. The contiguous nature of MUIDs and State forests can be important to the recreational experience.

Public consultation

A series of recreation workshops were held to determine if the recreation interest groups did perceive any impact (positive and negative) on their activity, should State forest tenure be changed to that of conservation estate. These workshops involved both indicator and non-indicator recreation groups. The workshops confirmed that the most likely impacted activities were those identified as indicator activities.

In addition, the workshops provided an opportunity for indicator recreation groups to provide input into the RSS map of their activity.

Conclusion

The provision and management of recreation opportunities is a complex business. To meet the needs of Queensland's recreating public, sustainable recreation opportunities of appropriate quantity and quality need to be provided.

Current situation

The conservation estate plays a significant role in the provision of recreation opportunities. This is evidenced by the gross visitor numbers estimated for the reserves (5.1 million people in South-East Queensland) and the proportion of their budget spent on expenses related to recreation and visitor management. National parks and similar protected areas are intended to provide the less developed, passive opportunities, with the more developed and active opportunities generally left for other tenures (DoE 1997).

State forests as multiple use reserves also play a significant role in recreation opportunity provision. Not only do large numbers of people choose to recreate within State forests (3.1 million visitors in the region), but the opportunities offered differ from those offered within the conservation estate. State forests are multiple use reserves, and the very nature of more disturbed settings allow for more active recreation that is either disallowed or discouraged from the conservation estate.

The provision of both the passive and active opportunities ensures diversity of opportunity. Quality of recreation experience is best assured through the provision of a diverse range of opportunities (Clark and Stankey 1979) and, as such, maintaining a balance of tenures that allows access for various activity types is essential.

Effect of tenure change

The potential effects that converting State forest into a national park may have on the recreation opportunities currently available to the Queensland public include:

- *Potential increase in visitation.* It is quite feasible that, due to the higher profile of national parks, there will be an increase in visitation. Such increases have been documented in the cases of iconic locations such as Fraser Island. Debate does, however, still exist as to whether the increase in visitation was a result of the higher profile possessed by national parks or the significant media attention the area received due to both the conflict over timber harvesting and the conversion. The question that needs to be asked is whether an 'average' State forest (average in terms of attractiveness for recreation) would experience any increase in visitation when converted to an 'average national park' or would an increase in visitation be only experienced by those areas representing natural icons? In addition, quantity does not equate with quality.

- *Decrease in diversity.* Any increases in visitation that may occur in converted areas would occur within the range of recreation opportunities currently offered in the conservation estate. Any increase would, therefore, be experienced solely within the more passive less developed activities. Any decrease in the multiple use estate, due to conversion of State forest to national park, would result in a decrease in opportunity and visitation within the more active and developed activities. This would indicate a reduction in diversity of opportunity offered. A loss of diversity has been equated to a loss in quality (Clark and Stankey 1979). By reducing diversity in this manner, the less active activities and opportunities are favoured, raising the issue of equity.
- *Displacement of recreationists and pressure on conservation reserves.* Demand for more active opportunities is expected to continue to grow, and recreationists potentially displaced by any loss of opportunity are going to continue to demand access to the Crown estate. As a result, additional pressure may be placed on the management of conservation reserves to change legislation and policy to ensure that opportunities for active recreation are provided. This would undermine the integrity of the conservation estate and its ability to fulfil its vital role in conserving the natural and cultural values of Queensland.
- *Cost to society.* As agreed under the Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia, 'where different configurations of reserves can be identified as meeting the criteria, the option which imposes the least cost on society should be adopted'. Any loss of opportunity represents such a cost to society and any cost to society is accompanied by a degree of community discontent. The importance recreationist place on their ability to access Crown land in pursuit of their goal needs to be adequately accounted for.

ASSESSMENT OF THE SIGNIFICANCE OF FORESTS TO THE RECREATION AND TOURISM INDUSTRIES OF SOUTH-EAST QUEENSLAND

SE 4.1

PART B

Project objectives

The purpose of this project was to examine the possible impacts of potential forest use changes on recreation and tourism in the South-East Queensland forests.

Methods

There were four major methods used to collect the information used in the project report. These were:

1. Case studies of links between tourism and recreation and forests, utilising both focus groups and business links surveys.
2. Surveys of commercial tour operators in State forests and national parks.
3. Estimation from existing data of visitor numbers to State forests and national parks.
4. Expenditure surveys of visitors to State forests and national parks.

Case studies of links between tourism and recreation and forests

Focus groups

The focus group workshops were held to gain a broad understanding of links between the forests and businesses. In addition, the participants were invited to provide their vision for future links between forests and business, and their ideas on what might be required in terms of forest management and business development to support the vision.

Business links surveys

A brief survey was undertaken of all identifiable businesses in the case study towns (apart from farming businesses). The survey was administered at the end of focus group meetings to all business representatives attending the meetings. Questions were asked about the proportion of income that was provided by visitors and local residents

visiting forests, and where expenditure on business inputs and employment was incurred. The questions were structured to provide information for this study and also to be compatible with information being collected on timber towns under the social assessment process.

Survey of commercial tour operators in State forests and national parks

A telephone survey was designed to reach all operators and collect information that describes their operations but which is not confidential in nature. Questions were asked about the type of operation and length of trips, the State forests and national parks visited, the proportion of their business which involved visits to State forests or forested national parks, the number of vehicles or horses used, the type of vehicles, price of tours and the people employed.

Estimation of visitor numbers to State forests and national parks

Visitor-days for South-East Queensland national parks and State forests were provided by the Department of Environment and Heritage, the Department of Natural Resources and the Department of Primary Industries. The estimates provided in this report are the best estimates available in the context of some data gaps in this area. For example, visitor numbers are not recorded for all State forests or national parks.

Expenditure surveys of visitors to State forests and national parks

Surveys were conducted in order to estimate how much money independent visitors to State forests and national parks spend on a typical visit to forests in the study area.

Key results

The project report provides information on economic values associated with nature-based tourism and recreation in public forests in the South-East Queensland region, as defined for the RFA process. Significant values are indicated, now and in the future.

There are 224 State forests and 143 national parks represented in this study of public forests in the South-East Queensland region. Visitor facilities are provided in many of these State forests and national parks. Other sites in these forests can be visited by those who undertake more extensive activities such as bushwalking or four-wheel driving on roads and tracks.

An estimated 7.6 million visitor-days are spent in these forest areas each year. This total is made up of 1.8 million visitor-days spent in State forests and 5.8 million visitor days spent in national parks which feature forests. The majority of visitor days, 7.2 million, are made by independent visitors who provide their own transport to the forests. It is estimated that the commercial tour operators who have permits to operate in State forests and national parks cater for 347 000 visitor days to forests per year.

The majority of visits made are day trips. The number of visitor nights spent camping in State forests is 30 000 per year. The number of camping nights spent in national parks is 620 000.

It is estimated that one million visitor days are made by tourists to the South-East Queensland region, and the remaining 6.6 million visitor days are made by local South-East Queensland residents.

There are many more visitors to national parks than to State forests. The national park estate in the South-East Queensland region includes a number of very popular sites that feature rainforest and forests in combination with beaches. Noosa National Park is the most visited site, with around 1.2 million visitor days per year. The rainforest locations of Springbrook and Lamington National Park together attract over one million visitor days per year. These rainforest areas are part of the Central Eastern Rainforests Reserves of Australia World Heritage Area. The other significant attraction in the region is the Great Sandy Region with the Fraser Island World Heritage Area and Cooloola, together attracting 1.1 million visitor days per year.

State forest areas with high visitor numbers include those close to Brisbane. The State forests in Brisbane Forest Park attracted about 800 000 visitor days per year. Daisy Hill and Bunyaville were the next most visited State forests.

The forests provide an important resource for the commercial nature-based and ecotourism tour sector. There are around 84 operators running commercial tours into national parks and State forests, with the majority operating in national parks. The takings of this sector were estimated at \$29 million per annum. Total full time and part-time employment in these operations was 768 people, with 229 of these people employed by the 40 operators who conducted 100 per cent of their business in forests.

Total expenditure for all 7.6 million visitor-days to forests was estimated at \$196 million for 1997. Expenditure

South-East Queensland Comprehensive Regional Assessment

associated with visits to forests was calculated based on trip costs plus one night's accommodation cost for tourists. The component of this expenditure made by tourists was estimated conservatively at \$79 million. This was about three per cent of all tourism expenditure in the South-East Queensland region per annum. Expenditure by local residents was estimated at \$117 million, which was about 15 per cent of all expenditure on day trips in the South-East Queensland region per annum.

Net economic benefit, measured as willingness to pay for access to forests for tourism and recreation, was estimated based on results for similar forest locations in the South-East Queensland region and elsewhere. A range of \$75 million to \$118 million per annum was indicated.

Current departmental budgets devoted to management of visitor use of these forests were up to \$6.3 million per annum.

The demand for tourism and recreation in forests is likely to grow considerably. Future projections for tourism and recreation in forests are for an increase at least in line with the predicted increases in domestic tourism and in the population of the South-East Queensland region. The number of visitor-days might increase by 36 per cent to the year 2011 and by 57 per cent to 2021.

Significant values were indicated for net present values projected to 2021, at \$5420 million for expenditure, and \$2074 to \$3263 million for net consumer surplus.

A broad-scale analysis of the potential economic impact, for tourism and recreation, of a change in tenure from State forests to national parks was undertaken. Only two per cent of visitor-days were spent in the 'indicator' recreation activities that might not be permitted in national parks, while 98 per cent of visitor-days were spent in 'passive' activities permitted in national parks. The majority of future demand for tourism and recreation will be for activities consistent with national park tenure. There was insufficient information to predict whether positive impacts of managing more forests as national parks would outweigh the negative impacts of a loss of 'indicator' recreation opportunities.

FOREST GRAZING, APICULTURE AND OTHER PRODUCTS DESCRIPTION AND ASSESSMENT

SE 4.2

FOREST GRAZING COMPONENT

Project objectives

The objectives of the Forest Grazing Component of this project were to:

- describe the features of the forest grazing industry in South-East Queensland
- describe the significance of State forests, timber reserves and State reserves to the industry
- provide sufficient quantitative data (product volumes and financial) to allow the economic significance of the forest grazing industry to be described, and impacts of land use changes estimated.

Methods

Features of forest grazing in South-East Queensland

The examination of the features of forest grazing was conducted via a literature search. With the exception of management guidelines produced by various government bodies and applicable legislation, the search highlighted only a limited amount of historical and current information on forest grazing enterprises in South-East Queensland. In addition to the information found within the literature, further description of forest grazing in South-East Queensland was elicited through consultation with the forest graziers.

Estimation of current stock-carrying capacities and economic values

To meet the project objective of providing sufficient data to summarise the economic significance of the forest grazing industry in South-East Queensland, it was necessary to find a method of estimating the stock numbers on forested Crown land. As well, costs and returns typical for the forest grazing sector had to be assessed.

No comprehensive database was available on stock numbers in native forests of the South-East Queensland RFA region. As part of its management of stock grazing permits, DPI–Forestry determines and records carrying capacity information. However, for all other grazing leases, carrying capacities were only collected until the late 1980s. These were recorded only on the individual lease files, so they were not readily accessible and consequently were not collected for this project.

There is an abundance of information and many systems available for estimation of carrying capacities on pasture and open woodland, but data on forested land are limited. Through using Regional Ecosystems (RE) and the carrying capacities specified on stock grazing permits it was proposed to estimate the stock-carrying capacities on State forests, timber reserves and State reserves. However, REs were a poor predictor of carrying capacity.

A number of meetings with representatives from the Cattlemen’s Union (CU), the United Graziers’ Association (UGA) and the Department of Natural Resources (DNR) led to the construction of the land systems method. Forest canopy density, topography and rainfall were judged to be the three most influential variables in determining carrying capacity. Soil type was also deemed to be important, however the digital coverage of this variable was inadequate and so was not used. The personal experience of the group members was then used to delineate a number of classes within each variable to reflect intra-class variability in carrying capacity. The classification system is as follows:

- topographic position
 - Class 1a: ridges with slopes less than 15 degrees
 - Class 1b: side/mid slopes of greater than 40 degrees
 - Class 1c: side/mid slopes of less than 40 degrees and greater than 15 degrees
 - Class 1d: creek flats with slopes up to 15 degrees (creek flats include drainage zones and lower hills, i.e. any slope of less than 15 per cent that is not on a ridge).
- forest canopy density/land cover
 - Class 2a: projected forest canopy from 80 per cent to complete closure
 - Class 2b: projected forest canopy from 50 per cent to less than 80 per cent
 - Class 2c: projected forest canopy from 20 per cent and less than 50 per cent
 - Class 2d: projected forest canopy below 20 per cent
- rainfall
 - Class 3a: rainfall from 950 mm to less than 1450 mm
 - Class 3b: rainfall of 1450 mm and over.

A workshop was conducted in December 1997, where a total of 14 members of the UGA and the CU from the RFA region attributed carrying capacities to the classes outlined above. The graziers were divided into three groups according to the rainfall zone in which their property was located. The members of each group were then asked to use their expert knowledge and negotiate among themselves an estimated carrying capacity for every forest canopy density and topographic combination within their rainfall zone. A set of underlying assumptions relating to the derived carrying capacities were outlined by participants, such as availability of water and appropriate fencing.

Each of the three digital coverages (topographic position, rainfall and canopy density) were then combined to produce a single coverage with a total of 48 land system classes. Through using the carrying capacity, tenure and current stock grazing permit and term lease information, the estimated number of cattle in each class was attributed.

Several members of the CU and the UGA present at the workshop in December 1997 completed a survey to collect data on costs and returns from forest grazing. The survey required graziers to estimate the costs and returns attributable only to their operations on permitted or leased forest land.

Using the estimated stock numbers and the costs and returns of forest grazing, a current economic value of forest grazing (1996/97) was estimated. The net present value of native forest grazing over the 20-year period of the South-East Queensland RFA (1998/99–2017/18) was calculated using a six per cent real discount rate.

Limitations

The small number of graziers present at the workshop (14) was a limitation on the results and their applicability. Nevertheless, given the time and budget constraints, this method was the most efficient. The method used to collate several DPI officers' and graziers' comments included some subjective decisions. However, these were necessary to allow logical consistency between these new carrying capacities and those developed in the workshops (i.e. having an equal or higher carrying capacity for the less than 20 per cent canopy density class than for the 20–50 per cent canopy density class in the same rainfall and topographic zone).

The surveys sent to graziers were targeted using the convenience sampling method. This is when surveys are sent to specific targets in the population, usually chosen for their interest in the topic and their willingness and/or appropriateness to reply to the survey. The number of surveys distributed to and returned from graziers was not of sufficient size under scientific principles for the results to be extrapolated to the population being studied. The reader is encouraged to interpret the results in light of these limitations.

Key results

Features of forest grazing in South-East Queensland

Forest grazing in the South-East Queensland region has been encouraged from the earliest days of European settlement. Forest grazing has continued into modern times through the management policy and philosophy of DPI–Forestry: that forest reserves be utilised for the maximum benefit to the State. Today, large areas within the forested Crown estate of the region are under some kind of grazing lease or permit. This land may be suitable for a range of undertakings, including breeding, growing and fattening, depending on the structure and quality of the vegetation. The forest is usually grazed in conjunction with pasture on other leasehold land or freehold, although it is generally much less productive than the latter.

The forest resource is an integral part of many beef cattle management systems in this region, providing a significant element of management flexibility. Although the productivity of grazing in forests is not comparable with that of improved pastures, graziers see forest grazing as an essential component of their grazing management. Information about this dependence on the forest is scant, but graziers fear reduced enterprise viability without forest access.

Estimated current stock-carrying capacities and economic values

The highest carrying capacities are in the 950–1450 mm rainfall zone, ranging from a zero carrying capacity in the side-slopes > 40 degrees and > 80 per cent canopy density classes, to a high of 4 hectares per head. The creek flats < 15 degrees are the most productive, followed by the ridge slopes < 15 degrees in all the rainfall zones. All the rainfall zones were allocated a zero carrying capacity for side-slopes > 40 degrees. Map 15 represents spatially the different carrying capacities within the South-East Queensland RFA region. Table 28 shows the number of cattle in each class, excluding the side-slopes > 40 degrees where it was estimated no cattle are grazed.

Table 28 Estimated current cattle numbers in the South-East Queensland RFA region

Rainfall	% Canopy density	Ridge slope < 15	Side slopes 15 - 40	Creek flats slope < 15	Total
> 1450 mm	> 80	-	-	0	0
	50-80	105	102	91	299
	20-50	16	25	22	63
	< 20	6	20	16	41
1450 - 950 mm	> 80	-	-	-	0
	50-80	1740	825	3831	6395
	20-50	8085	1540	19191	28 816
	< 20	389	206	997	1592
< 950 mm	> 80	2	10	8	20
	50-80	311	161	514	987
	20-50	1315	344	2619	4278
	< 20	89	72	352	513
Total		12 057	3305	27 642	43 005

The average annual operating profit from grazing cattle in the South-East Queensland native forests was estimated at \$33 per head. When calculated over the estimated size of the herd currently grazed in the region's Crown native

forests (43 000), this amounts to a current (1996/97) operating profit of \$1.4 million per annum. The net present value (NPV) of future profits indicates by how much investing in the industry is more profitable than the most common investment opportunity: money in the bank. The NPV of grazing at current levels in the region is \$16.5 million when calculated for 20 years at a real discount rate of six per cent.

FOREST GRAZING, APICULTURE AND OTHER PRODUCTS DESCRIPTION AND ASSESSMENT

SE 4.2

APICULTURE COMPONENT

Project objectives

The objectives of this project were to:

- describe the nature of the apiary industry in South-East Queensland
- describe the significance of State forests, timber reserves and State reserves to the industry
- provide sufficient quantitative data (product volumes and financial) to allow the economic significance of the apiary industry to be described, and impacts of land use changes estimated.

Methods

Existing resource use patterns

To date, limited comprehensive information on the apiary industry in Queensland has been collected. The Natural Resource Database Apiary (NRDA) was compiled in 1997 to address this deficiency using data collected from an apiary questionnaire that was mailed to registered beekeepers with greater than 50 hives. The database includes site-specific information on each apiary site held by individual beekeepers, including production figures, targeted flora and site history information. For the beekeepers who responded to the questionnaire, production on State forests and timber reserves was compared with other tenures for the whole of Queensland and for the South-East Queensland region. Historical apiary site usage of State forests and timber reserves was also collected to supplement the NRDA.

In determining current honey production figures a number of data sources were compared. These included:

- agricultural census data for extracted honey and honeycomb for the financial years 1989/90 to 1995/96; the data extracted were for the whole of Queensland and for the South-East Queensland RFA region
- alternative data sources for estimating current honey production were based on honey levies, receivals and an estimated average production by hive numbers.

Limitations

Exact locations of apiary sites were not recorded in the NRDA, hence analysis could only be done at broad tenure levels. There was approximately a 60 per cent response to the questionnaire.

The contribution of various tenures could not be determined from agriculture census data and hence the contribution of State forests and timber reserves was apportioned according to the NRDA.

Resource productive potential

It is the aim of the CRA project to measure not only the current usage of native forests but to estimate their productive potential, irrespective of their current use. A method was developed to assess the productive potential of all areas of South-East Queensland native forest.

Data were collected from two workshops in 1997, involving representatives of the Queensland Beekeepers Association (QBA) and the Department of Natural Resources. The base data set was a series of 1:100 000 vegetation map sheets covering the South-East Queensland RFA region. The vegetation map sheets detailed vegetation types and their percentage occurrence.

South-East Queensland Comprehensive Regional Assessment

Workshop participants were selected by the QBA based on their direct experience of beekeeping in the different vegetation-type areas in the region. The participants estimated potential production for honey and building bees numbers and strength for each vegetation type on individual map sheets irrespective of tenure. Information collected at the workshops included how often the vegetation type produced a honey crop and the average production level.

Other valuable information collected at the workshops included the identification and potential usage levels of vegetation types used for building bees. The build types recorded included honey production, crop pollination, queen breeding and packaged bees. The workshop data was entered into the Apiary Productive Potential Database (APPD) and validated. Further items were calculated in the APPD and it was then joined to the vegetation coverages. A number of calculations were undertaken and two spatial coverages produced.

Limitations

The vegetation spatial coverages used to produce the maps for the workshops were in draft format at the time of map preparation and as such were not fully validated or edge matched. It was not possible to translate this information to the final vegetation coverage. Although the validation process for the vegetation mapping may influence the productivity estimates of some sites, the use of individual map sheets allowed for regional differences in the productivity of the same vegetation types to be taken into account.

Economic valuation

An economic survey was sent to 10 apiarists to acquire data on their average annual honey production levels (kg/hive), number of hives and costs associated with honey production. The survey results were used to calculate the average cost per kilogram of honey.

The honey production data were separated into two quality grades. The grades were allocated depending on the presence or absence of specific dominant species for each vegetation type. The honey prices were separated into two quality grades using the median price for the top three grades and the lower five grades respectively as taken from Capilano Honey Limited Pricing Schedule. Beeswax was converted to honey equivalent to allow its production and value to be estimated.

The time bees are located on build sites is generally considered to be part of the cost of honey production. However build sites have an inherent value to the industry as, without access to these sites, honey production would be limited. Sites useful for honey production and building are frequently different. The beekeepers estimated that, on average, hives are being built up and not producing honey for approximately three months each year. Therefore, 25 per cent of the value of honey production was allocated to the build sites according to their potential use. The operating profit for honey and beeswax for each vegetation type was allocated at 75 per cent to compensate for the value allotted to build sites.

Another use of build areas is to prepare bees for the pollination of agricultural and horticultural crops and to restore their condition after periods of pollinating crops that do not provide adequate nutrition. Without build areas, pollination services would have to be curtailed. Estimation of the value of managed pollination was carried out by surveying information on its contribution to crop yields and quality. For a number of crops the net margin attributable to managed pollination could be derived. On the basis of the weeks hives spend pollinating the crop and in build areas restoring condition, the value of pollination was apportioned to build areas. Pollination benefits are split between crop owners and apiarists, with the latter receiving various levels of payment. However, the lion's share of pollination benefits is rolled into general crop statistics, without acknowledging the essential role of bees.

Build areas used in queen-bee breeding can be valued simply by attributing the operating profits of queen-bee breeders to the area needed for the activity.

As there is no package-bee production in the region, the economics of the activity was not investigated.

The economic data were attributed to the two spatial coverages.

Limitations

The economic surveys were targeted at specific apiarists using the convenience sampling method, a non-probability sampling method. The number of surveys distributed to and returned from apiarists was not of sufficient size under scientific principles for the results to be extrapolated to the population being studied with a high level of confidence. However, the average cost per hive was similar to that found in a recent New South Wales report, with the main difference being higher average Queensland production levels.

Experimental data on crop yields with and without managed pollination are scarce. Not all crops that utilise managed pollination could be assessed, and there is no indication of how representative the sampled crops are of the whole range. Hence only an indicative, rather than an average, value of bee pollination could be determined.

Key results

Existing resource use patterns

From the NRDA, State forests and timber reserves were estimated to account for greater than 40 per cent (1700 tonnes) of honey and 17 per cent (15 700 queens) of queen bee production in the RFA region.

Forests of the Imbil forest district, south-west of Gympie, were found to be of particular importance to the apiary industry, with more than 70 per cent of their available sites booked on an annual basis. This coincides with the area of high potential productivity as assessed in the APPD.

Agriculture census data for the financial years 1993/94 to 1995/96 indicate that the average annual production over the three years for the region was 1700 tonnes of honey and honeycomb. Alternatively adopting an estimated hive production of 70 kg/hives for commercial beekeepers only, the annual honey production of the region could be in the order of 2370 tonnes. Given the limitations of the derivation of figures from the alternative sources, it is unclear as to the confidence that can be applied to each set of figures or as to the actual current production of honey in the region.

Resource productive potential

Table 29 details the potential honey and wax production on State forests, timber reserves and State reserves within the RFA region. These figures are based on the assumption that all resources are theoretically available. They do not take into account constraints such as accessibility, practicality, economics or markets.

Table 29. Potential honey and beeswax production by tenure in the South-East Queensland RFA region

Tenure	Production data	Tonnes
State forests, timber reserves and State reserves	Honey (tonnes/yr)	5333
	Honey and wax (tonnes/yr)	5666

SOURCE: Derived DNR Honey-SEQ coverage combined with tenure coverage 1998.

Map 16, developed from the workshops, indicates that the highest potentially producing area is south-west of Gympie. The high productivity estimation of this area is reflected in high use of apiary sites.

Table 30 details the summary information of potential areas of State forests, timber reserves and State reserves used for building bees for the end use of honey production, queen bee production, crop pollination and package bees. It illustrates that by area, irrespective of tenure, building for honey production is the most important build type, with 63 per cent of State forests, timber reserves and State reserves potentially suitable for building for honey production.

Table 30. Percentage suitable area by build type and tenure in the South-East Queensland RFA region

Build use	State forests	Timber reserve	State reserve	TOTAL
Honey	65	85	39	63
Queen production	53	46	28	51
Crop pollination	41	46	19	39
Package bees	29	38	12	28

SOURCE: Derived DNR bee-bld-SEQ coverage combined with tenure coverage 1998.

Note: Any area of native forests may be utilised for more than one build use.

Information was collected on the potential duration of building. This information is summarised on the Build Weeks per Annum map (Map 17). The highest predicted duration of building is contained mostly in the Imbil forests district.

Economic valuation

Table 31 shows the operating profit from honey and beeswax and the build areas and revenue from honey and beeswax by tenure type. Of Crown forest in the region, State forests account for 95 per cent of the potential operating profit from apiculture

Table 31. Estimated potential annual value of honey and beeswax production and build values in the South-East Queensland RFA region (1996/97)

	State forests	Timber reserves	State reserves ¹	Total	Total
	Operating profit \$'000	Operating profit \$'000	Operating profit \$'000	Operating profit \$'000	Revenue \$'000
Honey and beeswax	1250	12	28	1290	7227
Honey build	401	12	15	428	2405
Queen bee build	420	5	19	444	–
Crop pollination build	383	9	18	410 ²	–
Total	2454	38	80	2571	–

1. State reserves less than 50 hectares are filtered.

2. Note that the estimated profit share of crop owners from managed pollination using South-East Queensland build areas is around \$16 million annually.

The annual operating profit (1996/97) of potential honey and beeswax production and build sites for honey production, queen bee breeding and crop pollination in total is \$2.6 million per year. The net present value (NPV) of future profits indicates by how much investing in the industry is more profitable than the most common investment opportunity: money in the bank.

The NPV of potential honey and beeswax production calculated over the 20-year period of the RFA for State forests, timber reserves and State reserves is \$14.8 million. The combined build sites for honey production, queen bee breeding and crop pollination was calculated to have a potential NPV to the beekeepers of \$14.7 million.

Pollination use of bees requires build areas to be available to restore the strength of the hives throughout the year, in addition to the usual winter requirement for such areas. Over-wintering and building of hives together amount to around a week of build-area use for each week of pollination on a yearly average. The pollination benefits attributable to build areas, at a rate of 200 hectares for 100 hives, are around \$10-700/ha/week in the crops for which data could be obtained.

It was not possible to exactly apportion beekeepers' costs between the closely intertwined honey production and pollination components of the same enterprise. Applying the average ratio of operating profit to gross revenue for the industry, the beekeeper's operating profit from pollination is assumed to be \$2.6/week/hive. Distributed to the build areas as above, this amounts \$1.3/ha/week. An indicative figure of \$50/ha/week was chosen for the net economic benefits of build areas used for pollination.

On the basis of cost and revenue figures for the activity, South-East Queensland build areas used in queen breeding yield an operating profit of some \$40/ha/year, or around \$0.8/ha/week, to the apiarist.

FOREST GRAZING, APICULTURE AND OTHER PRODUCTS DESCRIPTION AND ASSESSMENT

SE 4.2

FLORA COLLECTION COMPONENT

Project objectives

The objectives of the Flora Collection Component of this project were to:

- describe the nature of the flora collection industry in South-East Queensland
- describe the significance of State forests, timber reserves and State reserves to the industry

- provide sufficient quantitative data (product volumes and financial) to allow the economic significance of the flora collection industry to be described, and impacts of land use changes estimated.

Industry profile

Flora collection consists of the harvesting, treatment/packaging and shipment to market of foliage and flowers of native plants. Foliage, used in flower arrangements overseas, is the most important product.

Methods

Existing resource use patterns

Data were collected on the sites in Crown forests licensed for use by flora collectors and the companies involved in the industry. The largest operator, representing some 90 per cent of the industry, was surveyed in detail.

Resource productive potential

The relatively small size of the flora collection industry among other forest industries has limited the amount of assessment resources devoted to it in the CRA process. Consequently, no resource assessment has been undertaken. The large number of species involved would have made formal resource assessment particularly expensive. Instead, the resource was assessed through contributions to financial results of the industry.

Limitations

Due to resource limitations, no resource mapping could be carried out. The regulation of the industry at the State and Commonwealth levels, the former by the Department of Environment and Heritage, Department of Natural Resources and Department of Primary Industries (DPI), should ensure that the resource is harvested at a sustainable rate.

Economic valuation

An economic survey of the main operator has been carried out. The method of assessment was primarily financial. The company provided data on production costs and revenues, from which its operating profits were calculated.

The company operates on defined sites in specific State forests. Since royalty figures payable to DPI are known down to the level of State forests, operating profits were distributed to sites in proportion to the respective royalty figures. Differentiation within the lots was undertaken on the basis of relative contribution of different MUIDs comprising each lot, as defined by the company.

Key results

Existing resource use patterns

The flora collection industry relies on Crown forests. This is where, due to limited disturbance, commercial quantities of the relevant resources can be found. In contrast, extensive and unregulated exploitation of private forests has made those areas unattractive for flora collection. DPI has created 29 so-called lots, that is, specified areas within State forests and timber reserves, for the purposes of flora collection. Of these, 14 consist, partly or fully, of native-forest areas.

Due to the concentration of the industry, few details can be published on it without violating commercial confidentiality.

Resource productive potential

As resource assessment could not be undertaken, productive potential was elicited at the level of financial analysis. Indications are that the forecasted growth in the industry (see below) can be achieved within the constraints of the current licensed areas and the code of practice.

Economic valuation

Total industry turnover in 1997/98 was likely to be in the vicinity of \$3 million, most of it from the largest operator. The number of employees is in excess of 50 on a yearly average, full time basis. Indications are that the industry has the capacity to treble its turnover by 2005/06, more than doubling the number of employees.

WATER RESOURCES AND MANAGEMENT

SE 4.3

Project objectives

One of the 11 broad goals of the National Forest Policy Statement is ‘to ensure the availability of reliable, high-quality water supplies from forested land and to protect catchment values’. Water supply and catchment management is an important component of the assessment of South-East Queensland forests and part of a comprehensive assessment being undertaken as part of the process leading to a bilateral agreement between the Queensland and Commonwealth governments relating to the management and utilisation of the region’s forests.

The major objective of the Water Resources and Management project was to compile data to describe the role, importance and sensitivities to forest uses of water yield and quality from forest catchments in South-East Queensland where there were interactions of catchments with forest areas under consideration in the development of an RFA.

Methods

The project was undertaken by an expert review of existing information, drawing on current information held by both the Department of Natural Resources and Department of Primary Industry–Forestry on water management catchments and research. It was backed up by a wider review on water yield and quality in forest catchments in South-East Queensland through:

- gathering information concerning the location of water catchments, total yield/production of water by catchment and historic and current water quality by catchment. Descriptions of catchment geology, hydrogeology, soil and land use distribution provided a contextual framework for this information on catchment hydrology.
- investigating through literature review or other means the impact of forest use in South-East Queensland and management practices on water quality and quantity
- collating information to describe surface and groundwater resources and the nature of uses of water: domestic usage, agriculture and water usage in recreation.

From the above sources, a desk-based study of the available published literature, unpublished reports, data and pertinent information, together with personal communications from key people associated with water resources, including stakeholders, resulted in a report on South-East Queensland water resource and management.

Overall, the project covered two major subjects: water resources including both quality and quantity aspects, and the impact on water resources of forest use and management practices in South-East Queensland, as well as providing a general description of catchment geology, hydrogeology, climate, soil, and land use distribution in the region.

Key results

The region’s water catchments provide domestic supplies for a number of large urban communities and numerous rural communities and for the Bundaberg and Lower Mary River Irrigation Areas. In addition, water within the region carries ecological and social values. Water yield and quality are sensitive to changes both in land cover and in management practices affecting land use in catchments, making the relationship between water, land cover and land use complex. The overall result of land use change since European settlement has been that water quality and quantity and the natural flow regimes of many streams in South-East Queensland have been significantly altered from their pre-settlement condition. Population growth and urban expansion is continuing, which will result in further land use change and more pressures on water resources.

The forested catchments of South-East Queensland have multiple uses, all of which affect the value of the water resource to a greater or lesser degree. The region’s forests are recognised as producing good quality water compared with other land uses in the catchments. However, the study revealed that there was a dearth of published information about the quality or the quantity of water yielded from these forests; although ‘paired catchment’ studies (studies that monitor and compare the environmental parameters of two adjacent catchments receiving different experimental treatments, such as selection logging and no logging treatments) have been set up to investigate the environmental effects of logging.

To date, the focus of research into forest hydrology in the region has been on improving the operational systems of forest/plantation management to reduce soil erosion and improve local water quality. Consequently, the development of operational management systems has been driven more by observational and experiential evidence than by quantitative scientific monitoring and analysis. Forest hydrology research in south-eastern Australia may hold little relevance for the South-East Queensland situation. Certainly, in catchments with multiple uses and a small percentage of forest cover, the effects of selective logging will probably be minor, and at a catchment scale may be 'buffered out' by the effects of other land uses and management changes.

Current and future development of plantations on cleared agricultural land in South-East Queensland may alter the hydrology of the region. In order to accurately predict what these effects may be, research on how new plantations affect local hydrology would be valuable, but this requires funding and development.

In addition, constraints on the availability of unpublished data have limited the scope of this study. These constraints have been a function of a number of valid concerns by State agency officers, and are discussed in detail in the report. In these circumstances, the assessment has provided the opportunity to identify and report on gaps in the knowledge available about forest hydrology in the region, and to make recommendations for research and development. Within this context, the report attempted to address the potential and actual effects of forest management on catchment hydrology by taking a total catchment perspective.

This approach has made it possible to identify a number of relevant issues. Notably, government policy for the management of forests and plantations in the region requires the sustainable production of wood while protecting water, native forest and conservation values. For DPI-Forestry, protection of water values means principally the prevention and mitigation of erosion. In addition, land use changes of the past, especially clearing vegetation to convert land to agricultural purposes, continue to affect catchment hydrology by altering the water balance and (most likely) reducing water quality from its pre-settlement condition. This assessment indicates that there will be continuing, increasing pressure to develop the water resources of South-East Queensland to meet the competing demands of a wide range of users, including growing city populations, agriculture and industry.

In this region, few water supply catchments are completely forested, but the forested parts are often the hydrologically significant headwaters of major rivers, where rainfall is highest. For example, native forests and hoop pine plantations are found in the upper catchment areas of the Brisbane and Mary Rivers, two of the most important rivers for water supply in South-East Queensland.

Conclusions

From the assessment of hydrology, catchment and water values in South-East Queensland, a number of conclusions can be drawn:

1. South-East Queensland is a rapidly growing and developing part of Australia with a diverse range of land uses.
2. The region's water resources will be under increasing pressure to meet the needs of a wide range of users, and the environment.
3. Forests are recognised as producing good quality water compared with other uses of land in the region's catchments.
4. In terms of water quality, there is currently insufficient research available to gauge the effects of current forestry activities and practices.
5. Government policy documents rarely consider the water requirements of the forestry sector.
6. Few data are available on forest water yields and quality in South-East Queensland, although paired catchment studies are now under way in both exotic pine plantations and native forests. Most of these studies are too recently established to have yielded results on water quality and quantity issues.
7. In terms of water yield and town water supplies, forests and forestry activities are likely to be less important in South-East Queensland than in many other regions of Australia because only a small proportion of the region's town water supplies are derived from completely forested catchments.
8. Research in the publicly-owned estate in the region has been focused on improving the operational systems of forest or plantation management in order to reduce soil erosion and improve local water quality. The development of operational systems for these aspects of management has largely been driven by observational and experiential evidence. This focus has been acknowledged in recent research reports and recommendations have been made to improve soil and water quality management systems. This could be achieved by continuing this adaptive learning framework and supporting current management with overt demonstrations (monitoring systems) of sustainability, including the development of key indicators on which to base the monitoring process.

Recommendations

Several priorities for research and development in the region have been identified:

1. Publish the data from DPI–Forestry’s current hydrological studies.
2. Develop a quantitative basis for DPI–Forestry’s soil and water protection practices, and improve these practices based on results obtained from quantitative research.
3. Develop scientifically based soil and water monitoring systems using indicators that are nationally compatible and accreditable. Refine existing operational management systems to include the identification of key indicators and the development of a program of monitoring and reporting against these indicators. The current process of developing criteria and indicators under the ecologically sustainable forest management process, as a part of the CRAs leading to regional forest agreements, and under the Montreal Process, is relevant to the development of regional indicators, and should be taken into account.
4. Investigate the water yield/water quality effects of current forest and plantation management and consider the effects that the establishment of new plantations on cleared agricultural land may have. Findings of significant change should be assessed for water supply policy implications.

ASSESSMENT OF DEVELOPMENT POSSIBILITIES

INTRODUCTION

Critical to the success of the RFA is a forward-looking view for industry, in particular the timber industry. This view must look at both the resource available and the most effective development opportunities based on that resource. Three projects explore opportunities for increasing the resource base and industry development opportunities on the basis of available resource.

Opportunities for industry development options are outlined in SE 2.6 Wood and Wood Products Industry Development Options. Opportunities for increasing productivity of both the native and the plantation resource are explored in project SE 1.3 Forest Resource Enhancement Opportunities.

Further studies are proposed to identify feasible industry development options which will need to consider both the available resource and feasible resource development options. It is proposed that these studies take place after the options development phase of the RFA.

FOREST RESOURCE ENHANCEMENT OPPORTUNITIES

SE 1.3

Project objectives

The major objective of the Forest Resource Enhancement Opportunities project was to identify feasible options for improving timber yields of native forests and plantations (both hardwood and softwood) in South-East Queensland through silvicultural means, and to identify priorities for future research and development through knowledge gap analysis. For the purposes of the project, ‘forest resource enhancement’ has been defined as the manipulation of a timber resource (whether natural forest or plantation) through the adoption of particular management and silvicultural regimes, in order to achieve gains in timber production in excess of those that might have been achieved in the absence of such measures.

Methods

The project was conducted by:

- collating and reviewing existing information from research reports and available resources in relation to productivity enhancement projects undertaken in South-East Queensland and others directly relevant to forests types in South-East Queensland to document silvicultural techniques developed for forest resource enhancement, focusing on:

- productivity gains
- financial viability
- ecological impacts
- strengths and weaknesses.
- discussion with technical experts in the field to provide a wider input in current knowledge and practices for gap analysis
- determining the potential for productivity enhancement under the context of ecologically sustainable forest management (ESFM) outcomes, yet to be finalised, as defined for South-East Queensland and identifying priorities for future research and development.

Key results

Management for wood production in the public production native forests of the RFA region has relied largely on two silvicultural techniques: selection logging and/or post-logging silvicultural treatment. Although selection logging has historically been the harvesting practice, the rules governing tree selection have evolved as markets for timber and management priorities have changed, and as the behaviour of the forest has become better understood.

Various silvicultural regimes were practised in hardwood forests in the early decades of the century. Tree marking was practised from the 1920s as part of a silvicultural system based on ringbarking non-merchantable species, harvesting all merchantable trees irrespective of size (girth), burning to stimulate regeneration and thinning the subsequent regeneration or supplementing it with planted nursery stock. Restricted utilisation of the merchantable species limited the effective application of this technique, with post-harvesting stands often containing many poor quality stems.

The management system was revised in 1938. Until then, cutters had been paid only for felled trees that yielded sawlogs, which encouraged the felling of trees certain to be useable. With the introduction of 'economic tree marking', cutters were paid an allowance for a marked tree even if it proved unusable. The main objective of this system was the progressive development of a forest of high quality stems. The tree marking rules provided for the protection of seed trees, the complete utilisation of every tree possible, and the retention of trees until maturity. However, many trees that were retained as 'potentially useful' had been suppressed by larger trees for so long that they were unable to respond adequately to this treatment intended to release them into a growth phase.

The rules were revised in 1956, resulting in more comprehensive selection prescriptions for a range of specific products, and providing for the retention of seed trees. In the mid-to-late 1960s, the rules were again revised to ensure better productivity. All non-vigorous and poorly formed stems were to be removed, the remaining stand was to be adequately thinned and larger, fast-growing trees were to be retained until they reached harvesting maturity.

Current tree marking rules are largely based on the 1960s prescriptions. The main changes are a reduction in the upper (maximum) cutting diameter limit for trees in the wet sclerophyll forests, the development of tree marking rules for blackbutt forests and particular rules for brush box. In the dry forests, a technique which correlates growth potential with crown condition ('crown scoring') was developed as a means of predicting the growth potential of trees during the tree marking phase.

The information in the project report was obtained by reviewing more than 130 studies and papers (see Tables 32- 34 relevant to the silviculture of forests in the region.

Table 32. Papers reviewed on native forest silviculture, by subject and year[#]

Main subject	Number of papers reviewed	Year of publication			
		Pre -1970	1970-1980	1980-1990	Post-1990
Harvesting and thinning	17	4 (+1?)	6	6*	0
Post-logging burning	8	2	1	0	5
Enrichment planting	4	0	0	4*	0

*Papers predominantly or solely sourced from conference proceedings of research conference, Gympie, 6-20 August 1982 (Anderson 1983a).

Table 33. Papers reviewed on hardwood plantation silviculture, by subject and by year[#]

Main subject	Number of papers reviewed	Year of publication			
		Pre -1970	1970-1980	1980-1990	Post-1990
Species selection	9	1	0	3	5
Establishment, site preparation, and thinning	4	0	1	2	1
Fertilising	6	0	0	3	3
Genetic improvement	1	0	0	0	1
Pests	1	0	1	0	0

Table 34. Papers reviewed on softwood plantation silviculture, by subject and by year[#]

Main subject	Number of papers reviewed	Year of publication			
		Pre -1970	1970-1980	1980-1990	Post-1990
Species selection	7	0	2	5	0
Seed collection / seed orchards	1	1	0	0	0
Nursery practice	11	0	6	1	4*
Thinning	11	1	3	6	1
Fertilising	8	0	1	0	7*
Establishment, site preparation, and planting	20	1	0	10	9*
Weed control	3	0	0	1	2
Genetic improvement	20	3	2	5	10*
Pests and disease	4	1	0	2	1

* Papers predominantly sourced from various DPI—Forestry internal conference proceedings (Department of Primary Industries — Forestry 1993a&b, 1994 & 1995)

[#] Note: Literature concerned with ecological impacts is not included in Tables 32-34.

The report found that in South-East Queensland a great deal of research had been devoted to softwood plantations, particularly of exotic species. In contrast, there are few published studies concerning silviculture in native forests and hardwood plantations. Whereas most silviculture studies concerned with hardwood plantations were undertaken recently, most of those concerning native forests were undertaken before 1980. Overall, the substantial majority of studies were derived from research conducted on publicly owned (Crown) forests.

In broad terms, the silviculture studies concerning native forests dealt with harvesting, thinning, burning and enrichment planting techniques in both wet and dry sclerophyll forests. The results appear to suggest that, in native forests, harvesting, thinning and burning practices aimed at removing non-productive stems, reducing competition and promoting regeneration had the potential to increase the productive capacity of these forests. Although the conclusions varied between individual studies, this general consensus was true of both the dry sclerophyll spotted gum forests and the wet sclerophyll blackbutt forests.

In hardwood plantations, the species selection studies, although limited, appear to suggest that rose gum, blackbutt and Gympie messmate have the most potential for plantation cultivation in South-East Queensland. However, the studies reviewed did not generate sufficient information on effective silvicultural techniques for these species. To bridge this knowledge and information gap, DPI—Forestry has developed a draft Strategy for Hardwood Plantation Research and Development that identifies silviculture, genetic resources, forest protection and wood products as priority areas for research.

Studies on silviculture in softwood plantations have covered a wide range of aspects, including species selection, nursery practice, thinning, fertilising, establishment and site preparation, weed control, genetic improvement, and pest and disease control. The area of genetic improvement has particularly attracted a great deal of research. As a result, DPI—Forestry now has genetically superior stock of several commercially important species (including Caribbean pine, slash pine, hoop pine and a Caribbean/slash hybrid). The techniques developed for nursery practice, site preparation, weed control, fertilising, thinning and residue management appear to be effective in enhancing softwood plantation productivity.

While the importance of practising ESFM in both productive native forests and plantations has been now widely recognised, there is limited quantitative information on the relationship between the various silvicultural practices and their ecological effects. The limited ecological studies reviewed suggested that harvesting, thinning and

prescribed burning could reduce the number of habitat trees and the range of food sources available to a number of species, change microclimates and cause habitat fragmentation.

The ecological studies reviewed indicated that selective logging and silviculture could have significant adverse effects including the alteration of the forest structure, age distribution, and the proportions of various flora species; and the distribution, species composition and frequency of understorey species. Such changes could alter the diversity and abundance of forest-dwelling fauna species. The effects might be reduced by a number of forest management practices, including the retention of habitat trees and seed trees. It is considered essential by many scientists that hollow-bearing trees be retained during harvesting in order to ensure the conservation of hollow-dependent fauna in logged forests. It is also considered important that seed trees be retained for regeneration of tree species required for foragers. In order to address the issue of habitat tree retention requirements, the Department of Natural Resources has developed a schedule 'Trees to be retained for wildlife conservation' in the Code of Practice for Native Forest Timber Production.

This review suggests that forest management strategies should include a continuing commitment both to long term ecological studies and to maintaining the flexibility to improve the current silviculture practices as more scientific information becomes available. Priorities for research into the ecological effects of silviculture techniques should include well designed, long term, comprehensive and large scale biodiversity studies in the region, covering key elements of both flora (including non-vascular plants) and fauna (including invertebrates). These studies should involve a commitment to the establishment of permanent plots and to long term environmental and biodiversity monitoring and auditing. Such studies should span at least the term of one rotation or cutting cycle. It is also important that experimental studies be conducted in areas that are currently being harvested to quantify and evaluate the effects of different management practices and silvicultural treatments. This approach offers the immediate advantage of linking the management commitment and research focus to the issues most in need of resolution, namely the effects of harvesting on biodiversity.

The review of published research undertaken in native forests shows that few studies examined the cost-effectiveness of the various specific silvicultural practices studied. The conclusions drawn from the financial analyses of early studies must be regarded with caution in view of the changes in costs and log price stumpage schedules that have occurred in the interim. The economic feasibility of silvicultural practices remains an important consideration and requires continual re-evaluation in the light of changing markets for timber products, changing utilisation standards (for example the ability of the timber industry to utilise smaller and lower quality logs) and changes in the revenue received from those products.

Although more studies are needed to develop silvicultural techniques that will enhance the productivity of the native forests and plantations in the region, such techniques must be consistent with the principles of ESFM. This means that future silviculture studies should also examine the ecological effects of the techniques being evaluated.

It is recommended that priority be given to research into the following aspects:

Native forests

- silvicultural systems that optimise the value of timber production. This research should also examine ecological effects, and impacts on conservation values. In particular it should consider further development of:
 - harvesting and thinning regimes combined with an evaluation of their financial viability
 - post-harvesting burning with the aim of identifying a frequency and intensity that maximises the potential for regeneration.

Hardwood plantations

- silvicultural systems for sawlog production (most studies reviewed dealt with silviculture for pulpwood)
- economics of various production regimes including consideration of greenhouse issues
- development of effective weed control techniques (no studies dealing with weed control specific to South-East Queensland were found in the review)
- genetic improvement focusing on potentially commercial species
- spacing and thinning regimes for different end products
- site preparation
- nutrition regimes for different soil conditions
- pest and disease control.

Most recent softwood plantation research carried out by forestry-related agencies is considered commercially sensitive. It is, therefore, difficult to make specific recommendations for research in relation to forest resource enhancement, in that 'gaps' apparent in the published research may nevertheless have been the subject of internal unpublished research. However, from the literature reviewed it appears that in South-East Queensland further studies into the development of fertiliser schedules to suit a wider range of atypical soil and site types may offer opportunities to improve plantation productivity. In addition, given the commercial importance of softwood plantations in South-East Queensland, research into minimising or preventing threats from pests and diseases in broadscale softwood plantation activities may be required.

REVIEW OF VALUE-ADDING/TRANSFORMATION OPPORTUNITIES FOR THE SOUTH-EAST QUEENSLAND WOOD AND WOOD PRODUCTS INDUSTRY

SE 2.6

Project objectives

The core objective of this project was to project the potential development of a technically feasible and world-competitive wood and wood products industry in the region to 2020, or, in other words, outline the optimal development path for the timber industry in South-East Queensland without the RFA.

Methods

The project summarised the evolution of the markets and research and development activities that have led to the current structure and markets of the wood and wood products industry in South-East Queensland. This stage primarily involved a review of existing information and the canvassing of industry development plans. It also included a profile on the harvesting and transportation industry.

The consultants also included an assessment of the availability of wood resources from the RFA region. To expedite this stage, the consultants were given access to details of the expected wood resource availability (including native and plantation, hardwood and softwood, sawlogs, other log forms and residues) over the life of the RFA.

The profile of the harvesting and transportation industry included the number and nature of operators and the types of harvesting techniques, costs of harvesting (\$/cubic metre), costs of haulage (\$/cubic metre/km), number of harvesters per cubic metre of output and the number of haulers per cubic metre of output.

The project assessed the current and future (to 20 years) market trends for forest products in domestic and international markets, particularly the Asia-Pacific region. The assessment included present market prices for products and forecasts of prices to the years 2010 and 2020.

The project also assessed the potential of substituting plantation softwood for native hardwood through the current range of hardwood products produced from the region. This included technical issues, investment implications for mills and any associated price and market implications.

The project identified value-adding, transformation and expansion opportunities across the industries, having due regard to such factors as:

- the quantity and quality of the timber resource available from native forests over the next 20 years (hence minimum resource base required). Specifically exclude any potential RFA effects and investigate the 'without RFA' resource scenario
- emerging or future market opportunities
- local production costs (per cubic metre of production) and the relative competitiveness (compared with costs in key international processing centres) of operating costs (logs, labour, production, transportation) and capital costs
- estimated rates of return and minimum mill input for each investment and other associated technical information
- additional technological developments required
- major constraints to development and other limiting factors
- known industry expansion plans for the 20-year planning horizon of the RFA
- substitution from a hardwood-based to a softwood-based forest industry

- additional infrastructure requirements
- presently underutilised resource such as pulpwood
- potential of substitution of other resource for native hardwood.

It also ranked the development options in terms of likely commercial viability, the amount of hardwood resource (and softwood where appropriate) required to supply the project, and the value-adding potential.

Key results

The resource analysis highlighted the need for significant change in all sectors (native hardwood, native softwood plantation and exotic softwood plantation wood processors). The most significant change is in the native hardwoods where the availability of sawlogs drops from the current harvest of 294 000 m³ (107 000 m³ compulsory from DPI–Forestry managed areas plus 187 000 m³ from private property) to an available volume of 125 000 m³ in 2010 and then increases slightly to 131 500 in 2020. This reduction is as a result of the sustainable cut from private native forests being significantly less than the current harvest. The exact magnitude of the reduction cannot be clearly defined as the area of private native forest available for future harvesting can only be estimated. It is clear, however, that the reduction will be significant.

The native softwood plantations, comprised almost entirely of hoop pine, provide increasing volumes of sawlogs through to 2010 but then reduce to the current level of 490 000 m³ per annum by 2020. The exotic plantation sawlog yields increase steadily over the review period from the current 700 000 m³ per annum to 800 000 m³ by 2010 and 850 000 m³ by 2020. Over this period, the available pulpwood volume drops from the current 850 000 m³ per annum to only 257 000 m³ by 2020. This is primarily as a result of the liquidation of the private plantation resource but also reflects the maturing of the public estate.

For the purposes of the study, it has been assumed that no expansion of the plantation estate will occur. This is in line with the basic assumption throughout the study that the status quo will apply through to 2020 in relation to area available for harvest, log specifications and silvicultural regimes for all resource categories.

The study of the markets showed the increasing importance of the plantation softwood industries, both sawn wood and wood panels. It also showed that the hardwood industry is still based on the production of green structural framing. It is anticipated that there will be a shift from green hardwood framing products to dried and dressed products for a range of applications including flooring, decking, structural, panelling, mouldings and furniture components. These products take advantage of the strength, natural feature, hardness and high-quality surface finish of native hardwoods.

There will continue to be a good market for green hardwood products where the end use takes advantage of the specific characteristics of the timber such as strength, stiffness, durability and hardness (for example in cross-arm and wharf timbers).

The exotic softwoods will continue to take market share from green hardwood framing and imported softwoods. The native-plantation-grown softwoods will, like the native hardwoods, be converted into products that take advantage of the inherent characteristics of the timber.

Market opportunities for all these products exist in Australia, but export markets will need to be developed for the native hardwood and native plantation softwood products. The study shows that these products will be cost-competitive in Asia-Pacific markets, but they do not have a significant advantage over competing countries or the other Australian regions. Product definition and niche marketing will therefore be important if these markets are to be profitably exploited.

Wood panels utilising softwood sawlogs (plywood) and softwood and hardwood pulpwood (MDF and particleboard) will also be cost-competitive in Asia-Pacific markets. For MDF and particleboard there is strong competition, particularly from Indonesia and Malaysia. As a proportion of the plantation must be exported, manufacturers will need to concentrate on producing high quality and value-added products to avoid competing with commodity products from these countries.

Pulp and paper market opportunities exist, but the quantity, quality and variability of the resource prevents any industry development in this area.

As a result of the resource, markets and cost-competitiveness analysis, it was concluded that the following developments would occur.

Hardwood sawmilling. There will be an expansion of the existing industry producing high-value products such as flooring, decking, kiln-dried structural, heavy green structural, mouldings and components. There will be a reduction

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in the production of green framing and fencing. New industries will develop specifically for kiln drying, dressing and moulding.

Softwood sawmilling. The existing industry will expand to take up increasing volumes and to maintain world-scale processing facilities.

Wood-based panels. Expansion of the existing MDF, hardboard and particleboard industries will take place utilising both hardwoods and softwood pulpwood. There are opportunities for new plywood and laminated veneer lumber manufacture based on the exotic and native softwood plantation resources.