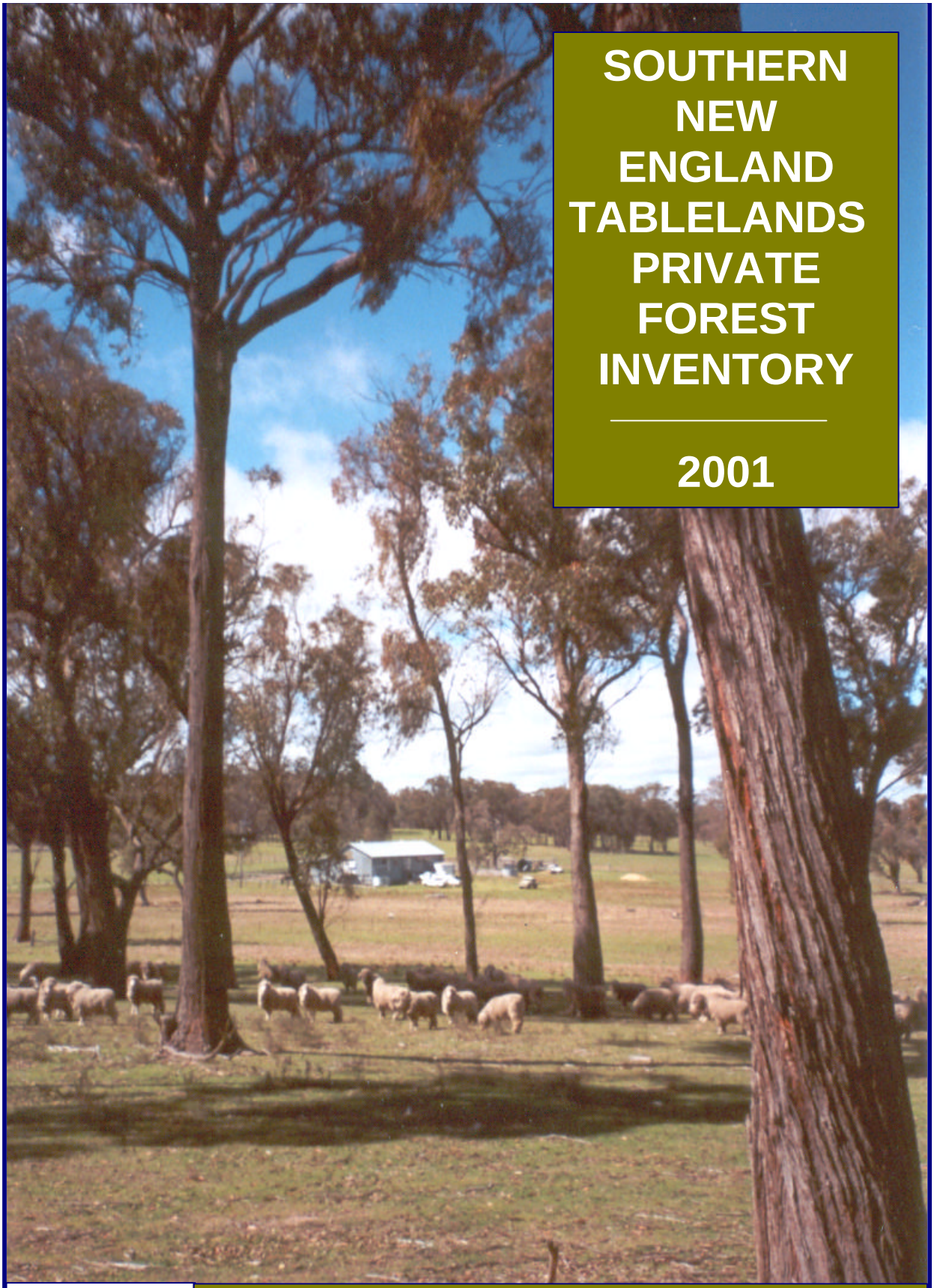

SOUTHERN NEW ENGLAND TABLELANDS PRIVATE FOREST INVENTORY

2001

New England – North West Regional Development Board, Armidale

Compiled by Paul McDonald – Jether Enterprises P/L
John Brandis – Private Native Forest Adviser

October 2001

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A project undertaken by the

New England - North West Regional Development Board Inc.
with funding from the Natural Heritage Trust

Compiled by

Paul McDonald – Jether Enterprises Pty Ltd

and

John Brandis – Native Forest Adviser for the NE-NW RDB

A NOTE ABOUT THE AUTHORS

Paul McDonald: Paul has had over 30 years experience as a professional forester, both with State Forests of NSW, and as a private consultant. He had experience at Walcha in all aspects of Forest Management as well as managing hardwood operations for the local sawmill at Walcha. He also had experience in the New England, as Extension Advisory Officer to landholders on all aspects of 'Trees on Farms'. He had very extensive experience as an Air Photo Interpreter with State Forests, in many parts of NSW. Since 1988 he has worked as a consultant, specialising in Air Photos Interpretation and all form of vegetation mapping from air photos, in many areas of Australia. He was very heavily involved in the CRA process in northern NSW, in both management aspects as well as acting as an interpreter. He has built up a reputation as being a highly skilled and respected interpreter in the field.

John Brandis has almost forty years experience in forest management in northeastern NSW as a professional forester and has served as a District Forester on the New England Tablelands for half of that period. He has had a close association with the timber industry in Walcha and at Armidale and has considerable experience in timber assessment in native forests. During his service with the Forestry Commission he has contributed to improved forest management through forest management plans and the environmental assessment processes and has accumulated a detailed knowledge of the current regulatory environment relating to forests. His expertise is in the active management of native forests and he has provided professional forestry advice to landowners on the tablelands for the Regional Development Board since 1999.

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EXECUTIVE SUMMARY

This report has been commissioned by the New England-North West Regional Development Board and provides detail of the extent and nature of native forests on private land on the southern end of the New England Tablelands. The report has been compiled jointly by a consulting forester – Mr Paul McDonald (Jether Enterprises P/L) and the Board's Private Native Forest Adviser – Mr John Brandis, with funding from the Natural Heritage Trust.

The study provides a detailed perspective of the privately owned forest resources within this region with a reliability that exceeds that available for any other region within the State. It examines the present management of these timbered lands, the incentives and disincentives for better forest management, and the potential for well-planned farm forestry to make a valuable contribution to the regional economy.

The methodology adopted for this study has been designed to take account of a number of limiting factors. They include:

- The very diverse nature of the forest areas that are involved.
- The inherently erratic nature of timber assessments.
- The limited access available to the privately owned forests within this study area.
- The financial resources available for the study.
- A regional perspective is required and is not intended for application at the individual property scale.

A remote sensing approach has been applied, that makes use of recent satellite imagery, aerial photography and a computerised Geographic Information Systems (GIS) program, to provide accurate and consistent information over the study area.

The study area has covered private lands within an approximate 100km-haulage distance of Walcha, and includes five local government areas. It has surveyed almost 1.4 million hectares of land that are intensively used for pastoral purposes.

Forest cover remaining in larger timbered blocks compose some 22% of the overall study area, but only half of this had any real potential to grow wood commercially. The silvicultural condition of the potentially commercial forest areas is predominantly poor and without some incentives to introduce better forest management their condition will continue to decline. While they are mostly forests with a grassy understorey, intensive grazing practices are incompatible with long term timber management, and a sound commercial base for timber production is seen as the most effective incentive to adjust the current management.

Despite this, the study has revealed a potential to dramatically increase the volume of wood grown and diversify the economy of the region with important social, economic and environmental outcomes.

The absence of a market for over two million tonnes of small diameter and low grade wood is identified as a major impediment to both improved native forest management and plantation development – and there does not appear to be a ready solution to this problem.

Landholders in the area have little knowledge or experience in forestry and the current regulatory environment is not supportive for farm forestry. The legislation, some of which remains undeveloped, is complex and discourages all but a few dedicated forest growers.

1 Introduction

1.1 Background to the resource study

Timber from well-managed forests remain one of the few opportunities our society has to produce an essential commodity that is fully renewable, solar based and can be produced from a land management system that has positive social, economic and environmental outcomes. Despite this universal truth, the timber industry has remained at the center of environmental concern, since the early 1970's, and this has not been fully resolved to date.

Fortunately Australia is a democratic nation and Governments have made substantial progress in striking a balance between the competing demands to preserve forests for nature conservation and encouraging a vigorous timber industry. In 1992 the Commonwealth and the States jointly agreed on a National Forest Policy Statement that aimed to provide for the sustainable management of all forests, both public and private, for present and future generations.

Through the subsequent "Wood and Paper Industry Strategy", and "Plantations for Australia – The 2020 Vision", the Commonwealth Government has allocated nearly $49.2 million towards a Farm Forestry Program. The program has been designed to encourage the incorporation of commercial tree growing and management into farming systems for both wood and non-wood production, increasing agricultural productivity and achieving sustainable natural resource management.

The Commonwealth's involvement in forest management through these initiatives, has been a turning point in what has hitherto been regarded as wholly a State Government responsibility.

The Farm Forestry Program has promoted the sustainable management and use of private native forests and woodlands. In 1998 funding was made available to the New England-North West Regional Development Board for a program to promote "*environmentally sustainable, commercially-driven private native forest management*" within the region. Funding for a three-year program was provided from the Natural Heritage Trust (NHT), and commenced in mid 1999 with the appointment of a Private Native Forest Adviser.

One component of the NHT funded project has been "*to accurately determine the extent and commercial quality of the private native timber resource in the region*", resulting in the development of this report.

The New England – North West Regional Development Board is funded through the NSW Department of State and Regional Development and as an incorporated body, is able to source funds from other areas to carry out a range of programs. The Board has a primary role in facilitating economic development in the region. It has hosted the New England Regional Plantation Committee (RPC), a sub committee, with representation from a wide range of government agencies, the timber industry, local government and landowners.

The vision Statement adopted by RPC intended to:

"*co-ordinate and facilitate appropriate research, advisory and industry development programs that will establish a plantation and farm forestry industry, integrated with forest product processing industries that contribute to the wealth and employment in the New England region, and enhance the sustainability of the regional economy and the environment*."

The RPC has recognised that there are a number of impediments to plantation development on the Northern Tablelands and concluded that the existing native forests on private lands, - many of which are in poor condition, were the ideal starting points to build regional timber industry. The southern end of the region, with its existing hardwood timber mill in Walcha, was seen as having the best potential for farm forestry within the region.

The area covered by this study represents a maximum road haulage radius of 100 kilometers from Walcha. It is mostly within the area covered by the NorthEast NSW Regional Forest Agreement, - the exception being the eastern section of Parry Shire, which is west of the Great Dividing Range. The study area broadly corresponds with "Timber Catchment 6" adopted by State Forests of NSW. A diagram of the study area is shown as Map 1.

1.2 The Study Zone

The explorer John Oxley traversed the New England Tablelands on his journey from the Liverpool Plains to Mount Seaview in 1818. From historical accounts it appears that the forests on the tablelands at that time had been open structured woodlands with an under-story of tall grass that was maintained by fire. European settlers drove their flocks over the Moonbi Range onto these grasslands in the 1840's, bringing a sharp change to the regions ecology that continues to present.

The shallow valley bottoms and lower slopes of the tableland are commonly tree-less or thinly covered by the cold adapted species like black and white sally or a number of peppermints, which are adapted to the harsh winter temperature inversions common in winter months.

The stringybark group of species and New England Blackbutt have most potential for timber production, and naturally occur on the upper-slopes and ridge-tops, where the soils are better drained. Tree heights and timber volumes are closely related to rainfall, being tallest on the eastern escarpment, steadily reducing to the west as the rainfall decreases.

The tablelands are highly valued pastoral lands, famous for their capacity to produce fat cattle, prime lamb and superfine wool. The introduction of exotic pasture grasses and superphosphate has intensified pastoral activities, and has lead to the loss of native trees from large parts of the landscape.

On many landholdings, the remaining native forests have been progressively thinned to produce a park-like appearance with widely spaced trees and a ground cover of improved pasture that does not allow the regeneration of native trees and understorey species to develop. The decline of rural trees in this landscape accelerated in the late 1970's and 1980's when "New England Dieback" reached its peak.

The retention of trees on most landholdings has been limited to “shade and shelter” requirements for livestock. Apart from some opportunistic sales of sawlogs and the occasional tree felling for fencing or farm timber, there has been little incentive for landowners to manage their native forests for commercial timber production.

In some situations remnant eucalypt stands have regenerated on the poorer soils or steeper slopes that are not suited for pastoral development. Without the traditional burning patterns that had kept these areas open structured for millennia, they have grown into densely overstocked stands of small diameter trees. These dense stands compete so fiercely for moisture and nutrients that the understorey and ground cover of grasses have become almost non existent. Timber values have declined, biodiversity values lost and there is little vegetation on the soil surface to prevent erosion.

The active management of the remaining native forest areas for timber production would create positive social, economic and environmental outcomes.

1.3 Present Management

Until recent legislation, timber harvesting on private land in NSW has essentially been unregulated, other than on the steeper “Protected Land” where permits are required. Repeated logging operations have progressively taken only the larger diameter and higher quality logs, without consideration of future timber yields, and has progressively degraded the quality of many native forests. These forests now commonly are made up of defective trees or small diameter regrowth, which are only capable of producing low value timber products.

The management of the timbered area after harvesting has often encouraged grass growth to enhance grazing values. There has been little or no silvicultural treatment**.** Intensive grazing has eliminated regrowth and the residual stand stagnates or declines as the individual trees senesce, creating a defacto clearing operation over time. Regrowth and undergrowth are only seen where grazing has been restricted. These tend to be the rougher areas, not so good for grazing, and often of low site quality for timber production. It is only in the higher site quality areas in the south and southeast of the area that good timber stands are evident, and even these do not have much silvicultural treatment other than the occasional logging event.

There is increasing recognition of the need for the sustainable management of the native ecosystems on private land, to overcome land degradation and loss of biodiversity, and also to provide important social, economic and environmental outcomes. Where appropriate this objective is entirely compatible with long term timber management.

1.4 Legislation

State Legislation and regulatory controls for private forest management in NSW have evolved rapidly in recent years.
The three main government agencies implementing these controls are:

- Department of Land And Water Conservation (DLWC)
  Administering the Native Vegetation Conservation Act and the Plantation and Reafforestation Act.
- The National Parks and Wildlife Service (NPWS)
  Administering the Threatened Species Conservation Act.
- Local Councils
  Through their Local Environment Plans.

The legislation and supporting regulations are difficult for most landholders to understand and create an impediment. Many landholders operate in ignorance of the legislation.

The Native Vegetation Conservation Act 1997 has placed stringent controls on the clearing of native vegetation with the objective of ensuring that there is no net loss of native vegetation within the State. Development Consent is now required from the Department of Land and Water Conservation before clearing is undertaken on both “State Protected Land” and “Non-State Protected Land”. The definition of clearing within the Act has unfortunately been cast widely to include logging, silvicultural thinning and burning that are sustainable when undertaken within sensible limits.

Fortunately a number of exemptions, created under State Environmental Planning Policy 46 (SEPP46), have been carried forward as transitional provisions under the NVC Act. Private Native Forestry is one exemption and is defined as:

The clearing of Native Vegetation in a native forest in the course of it being selectively logged on a sustainable basis or managed for forestry purposes (timber production).

There are two different options, one for harvesting and the other for silvicultural treatment. The definitions are explained in the Department’s 1997 publication which emphases sustainability and appropriate forest management planning. The exemptions remain in place until they are reviewed or replaced by a Regional Vegetation Management Plan.

In association with the Department of Land and Water Conservation, the Regional Development Board has made a substantial contribution to the development of an “*Interim Guideline for the Management of Private Native Forests in Northeast NSW* ”. The guideline enables landowners to enjoy an element of self-regulation through a quality assurance approach where owners are able to develop plans of forest management and operational plans, with some guidance from either the Department or a forestry consultant.

An operational harvesting or silvicultural plan that meets the Department’s *Best Operating Standards for Harvesting Private Native Forests* and satisfies the *Ecologically Sustainable Forest Management* criteria should avoid the need for Development Consent under the NVC Act. Until Regional Vegetation Management Plans are complete however, the legal situation will remain unclear.

Under the Threatened Species Conservation Act, the NSW Scientific Committee has made a Preliminary Determination to support a proposal to list *“The loss of Biodiversity as a result of loss and/or degradation of habitat following clearing and fragmentation of native vegetation”* as a key threatening process.

Under the Act it is difficult for landowners to assess what impact a forestry operation may have under the legislation.

Where Development Consents are required, the consent authority (DLWC or Councils) must consider the eight point test of significance for threatened species. The test is unlikely to be significant where there has been adequate forestry planning and appropriate “precautionary” measures are in place. The level of disturbance resulting from sustainable harvesting or silvicultural operations should not place any plant or animal populations, threatened or otherwise, at risk.

Of the five Local Government Areas (LGA’s) within the study, only one – Uralla Shire requires Development Approval for forestry activities within their Rural 1a zones. While timber harvesting on private land appears to have gone on regardless, the Shire has indicated that it is unwilling to vary their Local Environment Plan.

1.5 The Potential of Private Native Forests

Without improved forest management, the growth increment of many private forests is very low – less than 0.25 cubic meters per hectare per year. The biological potential of eucalypts to grow wood in plantations on the tableland is good and there are projections for mean annual increments between 16 to 20 cubic meters per hectare per year or more, over the higher rainfall parts of the study area.

On one hand eucalypt plantations are expensive to establish, at some $2,000 or more per hectare, while native forests require relatively small but technical inputs. Many landowners however have little training or experience in forestry and a well-developed farm forestry culture is absent on the tablelands.

While uneven aged forests are relatively less efficient in growing wood than plantations, there are opportunities to greatly improve growth rates over time. Growth increments between 2 to 5 cubic meters per hectare per year appear attainable on better sites within the study area. As the minimum timber yield per hectare that is needed to warrant a harvesting operation is about 5 cubic meters per hectare, improving growth rates has the potential to greatly reduce cutting cycles, with improved yield at each harvest.

Given the present legislation, farm forestry represents one of the only opportunities that owners have to gain some commercial return from native forests on their land.

David Thompson* and Hugh Harris* have projected the returns from private native forest management on the tableland through a hypothetical supply network that would supply 1000m³ of sawn boards per year to a value adding plant. They found that an unmanaged forest growing at 0.5m³/ha/yr returned only $25/ha/yr over a ten year cutting cycle and would require 50 farms to make up a supply network - each with 100ha of productive forest land.

They project that an improvement in the growth rate to 5m³/ha/yr would bring net returns of between $113 to $163 per ha per year. The higher value return is dependent on a market for low-grade timber residues. The number of farms required in the network would be less than 10, making returns from timber growing a more profitable activity than some traditional agricultural activities in the region.

A commercial market for small diameter thinnings and residues is a key issue for the future of forestry in the area, to minimise the waste of timber resource that is generated during harvesting operations and enable the forests to be commercially thinned, - even if this is revenue neutral. Until such a market eventuates, thinning to waste or firewood remains the only feasible options available.

* *David Thompson is a principal of the Centre for Regional and Agricultural Economics in Armidale and Hugh Harris is a former EO of the New England Regional Plantation Committee also based in Armidale.*

1.6 Forest Agreements and Regional Forest Agreements.

A Forest Agreement for Lower North East Region was signed by four State Ministers in March 1999, and contains several measures that relate to private land. It has established that conservation activity for high conservation value ecosystems will be undertaken on a “purely voluntary basis.”

While some funding has been provided for *Voluntary Conservation Agreements* through the Native Vegetation Conservation Act, the “enhanced level of extension and advice” to be provided to private forest owners to improve their standard of commercial forest

management (Forest Agreement p7 Attachment 2) has not eventuated to date. Neither has there been any call on the capital grant (subject to funding) to assist in the establishment of a biomass energy plant in Walcha.

The North East NSW Regional Forest Agreement, signed by both State and Commonwealth Governments in March 2000 is more specific. The RFA says in part D, page 130:

"The parties recognise that industry development based on private forest resources including plantations will be facilitated by the following measures:

- *The State will improve administrative arrangements and co-operation and co-ordination by State agencies, (refer to Attachment 8) to facilitate the timber industry utilising private forest resources. Education programmes will be developed to deal with ecologically sustainable management issues and clearly relate these to management requirements for conservation and to the codes of forest practice governing activities in both public and private forests.*
- *As a means of encouraging private forestry development, consistent with Clause 46, the State will develop a regulatory framework that enables a more efficient and integrated approval process to allow for effective private forestry development. Codes of practice for private plantations and private native forests will be in place within five years in accordance with Clauses 57 and 58. The State will also provide advice regarding marketing and pricing.*
- *N.S.W. will ensure that under the "Native Vegetation Conservation Act (1997)" and consistent with Clause 56 of this Agreement, regional vegetation management plans covering private lands form a basis for strategic regional planning of private native forestry. With appropriate public involvement, and consistent with the "Native Vegetation Conservation Act (1997)" the regional vegetation management committees will pursue planning policies that provide for appropriate long-term, secure, management provisions for private native forests. The Management Plans should provide for harvesting for commercial wood production to be an "as of right" use where appropriate and subject to relevant codes and Ecologically Sustainable Forest Management consideration.*
- *Parties agree that a private forest inventory of Northern N.S.W. to determine the basis of yield of wood products from private land is required. Parties will use their best endeavours to promote an inventory of private forests, with the agreement of forest owner groups, with the objective of having an Inventory in place within five years".*

Clause 19 of the RFA makes a commitment that *"neither party will seek to use existing or future legislation to undermine or impede this Agreement."*

1.7 Previous Resource Studies

There have been several earlier estimates of timber volumes on private lands that have included parts of the study area but none have specifically covered the area contained in this report. The Northern Rivers Regional Development Board commissioned a study of the private native hardwood and plantation resource within a 100 and 250km radius of Grafton in 1994. This was followed by a similar study for the Mid North Coast Regional Development Board in 1996. Both studies were undertaken by Northern NSW Forestry Services.

An updated report, by the same consultant, of "*unallocated timber*" volumes, divided into timber catchments and inclusive of both State Forest and private resources was compiled

in 2000. It covered parts of the Walcha and Armidale Dumaresq LGA's and has attempted to provide estimates of the annual volumes available.

Mapping of private forests east of the New England Highway was undertaken during the Comprehensive Regional Assessment process for the Lower North East Region in 1998. Details of this mapping are held by the Resource and Assessment Conservation Council in the Department of Urban Affairs and Planning, and could not be accessed.

The native forests cover of some parts of the New England Tablelands were recently mapped by Julian Wall from air photography with NHT funding. The mapping is available on CD from the Department of Land and Water Conservation at Armidale. This mapping unfortunately has little relevance to the current study.

A "management intent" survey for the northern NSW CRA was carried out for the Bureau of Rural Sciences in 1999. The New England Tablelands composed 30% of the study area, and 70% of the timber resource was made up of higher altitude "New England" hardwood species. Half of the owners surveyed said that they intended to conduct forestry operations on their land.

Almost 70% of respondents identified concern or confusion over regulatory and legislative requirements, 43% the need for good financial returns and 50% the need for professional management advice. Almost 40% of survey responses indicated an intention to manage for both timber production and conservation, while 38% were non-committal about current management intent.

2 Assessment Methodology

This study is designed to provide a broad overview of the region, and is not meant to commit any forest owner to commercial management. It is intended to provide a measure of the present and potential native timber volumes that may point to regional business opportunities.

Timber assessment has traditionally been based on a sampling system, where 0.1ha plots are randomly located throughout the forest area and detailed plot measurements are analysed as being representative of the overall forest area. This provides an estimate of the total forest resource, which is difficult to monitor against the timber yields from individual areas. The private forests within the survey area however are highly dispersed, and vary widely in their forest type and structure – suggesting the need for intensive sampling if this approach is taken.

Access to many forest areas may not be available and the cost of adopting such an approach is well beyond the scope and funding available for such a study.

The sample plot based approach to forest inventories has limitations, because the quality of timber within standing trees cannot be reliably determined until the tree is felled. The assessment of merchantability from the outside appearance of trees often results in overestimates of quality, and therefore commercial volumes of timber that are present.

High quality aerial photo interpretation, undertaken by skilled people with a good knowledge of the region and the timber industry was seen as the preferred approach, backed by ground truthing that is based on field data collected by the Board's Private Native Forest Adviser.

To simplify mapping from photography and enable areas to be measured, individual forest areas identified by API would be recorded onto ortho-corrected satellite scenes, and then entered into a Geographic Information System.

A project brief for the study was released in August 2000 and expressions of interest sought from forestry consultants. The successful applicant, a professional forester Paul McDonald (operating through his private company Jether Enterprises P/L) was selected to undertake the study.

2.1 Project Objectives

These were identified in the project brief as:-

1. To identify, to the best available accuracy, the commercial native forest resources on privately owned land within the study area. To include details of location, broad forest type, site quality, stand structure, estimated current merchantable volumes and yield by timber product types.

2. Aggregate the resource data on a sub regional, Local Government Area (LGA) basis with an overall total for the study area.

3. Detail the methodologies and assumptions used and provide a written report with supporting comment.

2.2 Project Parameters

2.2.1 The Study Area

The study area approximates the supply zone for a value added timber industry centred at Walcha. The area is generally within a 100km radius of Walcha and is shown in Map 1. It includes:

- The whole of the Walcha Council local government area.
- The part of the Nundle Shire that is generally east of the Peel River .
- The eastern section of the Parry Shire that is generally east of the New England Highway and north of Bendemeer.
- The bulk of the Uralla Shire that is not beyond Bundarra.
- The bulk of the Armidale Dumaresq Council that is generally west of the Georges River.

2.2.2 Aerial Photographs

The Department of Land and Water Conservation at Armidale have generously made the most recent aerial photography available for use within their office. Paul McDonald undertook Air Photo Interpretation in the Armidale DLWC office. The consultant has extensive experience in photo interpretation and a long association with the study area gained over thirty years in a wide range of roles.

Most photos were at 1:25 000 scale, but two sets, west of the Great Dividing Range were at 1:50 000 scale. Photos and scales are as follows, by 1:100 000 sheet name:

Area	Scale	Photo Date
Part Bundarra	**1:50 000**	Mar-1997
Part Guyra	1:25 000	May-2001
Part Ebor	1:25 000	May-2001
Bendemeer	**1:50 000**	Mar-1997
Armidale	1:25 000	Aug-1994
Part Carrai	1:25 000	Aug-1997
Nundle	1:25 000	Mar-1997
Yarrowitch	1:25 000	Mar-1997
Part Cowarral	1:25 000	Aug-1997
Part Ellerston	1:25 000	Feb-1993
Part Upper Manning	1:25 000	Feb-1993

Photo quality varied greatly. As the photos were stock issue, the photos were generally of poor colour balance, which hampered interpretation. Some photos had hot spot. This is reflection of the sun back into the camera, causing part of the photo to be “washed out” and usually unsuitable for interpretation. Hot spot results from taking photos at times of the day and year that are known to be unsuitable.

Photo date varied as above and could be up to eight years old. The Landsat scenes were recent (June and September 2000). This time lapse did not cause any problems and few areas were found to be cleared, post photo date, as evidenced on the Landsat scene. All data should be used as being at date of photos for each 1:100 000 area.

2.2.3 Landsat Scenes

A Queensland company Geoimage Pty. Ltd supplied these. Two satellite paths are needed to cover the study area and two ortho-rectified cloud free scenes were supplied by the company on four CD’s. Path 89 provided coverage to the east and was acquired on 2/6/2000 while the overlapping path 90 to the west, was acquired on 13/9/2000. The Landsat 7 data has a 16-meter pixel size and contain eight wavelength bands, however only the panchromatic band was used to print images.

Initially a “supervised classification” was considered to digitally segregate non-forested from forested land on the satellite scenes, however this may have been inaccurate. Some parts of the scenes were difficult to visually separate forested from non-forested land because of a shrub layer or other unknown factors. This caused the scene to appear rather uniform in these areas even though they were quite distinctly different on the aerial photos. Past experience in the CRA process has shown that this process was not very reliable as well as being time consuming and costly.

Digital separation is unnecessary, as API has accurately delineated the two and each forested polygon had to be manually transferred to the landsat scene map. Digital separation would not have reduced API time and may have even increased the time lost due to unforeseen problems/errors in the separation process.

2.2.4 Geographic Information Systems

This study could not have been undertaken in the form that has been adopted without the generous support of the Department of Land and water Conservation.

With agreement from the Department in Armidale, satellite data has been loaded into the Department's GIS system, operating with "Arcview", to print images corresponding to each of the fifty seven standard CMA 1:25 000 topographic map sheets within the study area.

Mark Bruyn has contracted to the Development Board to undertake GIS operations in the Armidale DLWC office for this study.

The DLWC have also provided access to other GIS layers of considerable value to the inventory. These enabled all areas of State Forest and National Parks to be excluded, drainage lines and cadastral information to be superimposed onto satellite images. A layer containing main roads within the study area was also available, but was not always accurate.

Maps were arranged in this way to assist with the transfer of the polygons from the photos to the Landsat scene and the next step of digitising the polygon line data into a GIS layer.

The Department's assistance has extended to the digitising of polygons into a GIS layer at the Department's North Coast Regional office in Grafton, at a subsidised cost. Several staff members of the Department with GIS expertise have provided valuable technical support for the project.

2.2.5 Interpretation of Photos

As time and financial constraints limited the project, consideration had to be given to the complexity of the digitising phase and the need to minimise the digitising costs and simplify later analysis. For these reasons it was aimed to keep the number and size of the polygons to a manageable level.

A minimum polygon size of 20ha has been set with this in mind, and is also about the minimum needed for commercial harvesting operation. It has also been necessary to keep the species typing to a broad level to keep polygons to a manageable size, and avoid complex typing which would have otherwise occurred in some areas.

All forested areas above this minimum were delineated, however no API information other than species type was collected for those areas considered uneconomic for various reasons - e.g. stand height.

Areas subdivided into lots less than 25ha, for rural residential purposes were also excluded on the assumption that these areas are unlikely to be available for logging. Forest stands of less than 10m height were mapped but were considered to be non-economic and no data was collected on these polygons.

Interpretation of the photos was undertaken at the Armidale DLWC Office by normal API stereoscopic techniques. The photograph sets correspond to each 1:100 000 map sheet. As each area was examined on the photos the polygons were delineated according to the API specifications on the photos and the data from the interpretation of each polygon was entered onto an office pro forma designed for the purpose.

In general semi cleared pastoral lands that have retained paddock trees, and small remnant stands, even though of possible commercial species, were not included in the assessment. Generally the stand had to be of 40% crown cover or more to be included. Some areas below 40% were included if grazing pressures did not appear present or to be impacting on the stand, but no lower than 20%CCP, however there were very few of these areas.

2.2.6 Field Work

Fieldwork was undertaken on all 1:100 000 map sheets. However, this was limited to public roads as there was no arrangement to enter private lands. This made field work somewhat limiting as often roadside reserves were quite different to timbered areas some distance from the roads.

A field pro forma was developed to collect field data. However, much of the field information was recorded on the photos or on maps to speed up the process and to help later interpretation.

Stand measurements for six properties within the study area, collected by the Native Forest Adviser also aided interpretation. They included detailed stand measurements derived from strip assessments, with calculations of product volumes.

2.2.7 Transfer and Capture of API Polygons

Polygons on aerial photos were transferred to the 1:25 000 satellite image maps. Generally this was done by eye as the vegetation pattern or shape on the photo matched exactly the shape on the landsat scene. In difficult areas it was necessary to trace the polygon onto an overlay from the photo and transfer the polygon to the map from the overlay on a light table. This also was quick and easy.

An example of the satellite image with overlaid information and forest polygons is shown in Figure 1.

Each 1:25 000 standard map sheet was treated as an individual unit. Polygons on the boundary of map sheets, even if they ran onto the next adjoining map sheet, were closed off at the map sheet boundary and given a code applicable to the section within that map sheet. The polygon on the next map sheet would have a new number and the code was usually different to the section on the previous map sheet. In a seamless coverage this would show large polygons split by a straight line, being the map sheet boundary. This was not seen as a problem in the project design and was considered necessary to reduce digitising problems at the start of the project when the digitising methodology had not been determined.

Each polygon on a map sheet was given a number starting at 1, as the unique identifier was to be the sheet number plus the polygon number. Some sheets had as few as 5 polygons, whilst some had up to 95 polygons.

While the minimum polygon size was 20ha there were some exceptions:

- smaller polygons could be used if there were a lot of small polygons in the same area, close to each other, and all contributed to a possible resource.
- the polygon was adjacent to or close to a large timbered area, and could compliment that resource
- the polygon was on the edge of a map sheet and joined a larger area on the adjoining map sheet.

Specialist staff at the Department of Land and Water Conservation's North Coast Regional office captured the polygons as a GIS layer. Data was captured with "Arc Info" as it was suggested that this would give the best result for later analysis.

2.3 Air Photo Interpretations (API) Specifications

The following detail was collected for each polygon from API sources.

2.3.1 Species types

The resource is made up of higher altitude hardwood species that are broadly termed New England Hardwoods. They contain a range of eucalypt species that have commercial value:

New England Stringybark

Messmate Stringybark

Red Stringybark

Silvertop Stringybark

Diehard Stringybark

Youman's Stringybark (but not McKie's Stringybark which is a scheduled threatened species)

New England Blackbutt (both the eastern and western forms)

Brown Barrell

Ribbon Gum (the eastern escarpment form)

Sydney Blue Gum

Tallowwood

Shinning Gum

Narrowleaved Ironbark

Silverleaved Ironbark

Caley's Ironbark *and* potentially Grey Box, where this has sawlog form.

Because of the need to keep polygon complexity to a minimum, but still allow for individual species to be recognised where possible, the following species type labeling system was used:

Code/Label	Description
01	Rainforest (Non Commercial)
04	Foothill/Gorge types, very poor dry hardwoods, generally less than 10m height and non commercial, containing Gums, Red Gums, Stringybarks Apples etc
09	Pinus Plantation
10	Western types, Box, Stringybarks, Gums, Ironbarks, Callitris
11	Box dominant, grey or white, (with Gums, Ironbark, or Stringybarks)
12	Bendemeer White Gum (non commercial)
13	Mixed western types, Ironbark, Gums, Stringybark, Boxes, Callitris (may not all be present always and one species may dominate over various areas
14	Red Stringybark, with or without Gum, Ironbark, Box, Callitris (Western type as against type 21)
20	Low Tableland types, Stringybarks, Gums, Peppermints, New England Blackbutt, Box
21	Stringybarks of upper tablelands, generally New England stringybark, Red Stringybark, or Silvertop stringybark
22	New England Blackbutt
23	Gum, Peppermint, generally non commercial
24	Snow Gum (Non Commercial)
30	Eastern Types, Stringybark (Diehard, Silvertop), Sydney Blue Gum, Ironbark, New England Blackbutt, Angophoras
31	Stringybark, Diehard
32	New England Blackbutt (off tablelands proper and on eastern slopes)
40	High Site Quality Types, Messmate, Gums, Stringybark, Fastigata (Brown Barrell), New England Blackbutt, Sydney Blue Gum, Tallowwood
50	Wattle/Shrubs (Non Commercial)
60	Cleared i.e. less than 40%CC(generally coded as Ex)

This type of numbering system allowed for the inclusion of additional types if found. It also allows for amalgamation of types. For example, types 21 to 24 could all be amalgamated as broad type 20. The areas shown as type 21, for example, are not the only areas of type 21, but are the only ones that could be separated by API under the project constraints, especially field work. Type 20 may contain many areas of type 21 or 22 or 23 or 24. Similarly types 30,31 and 32 can be amalgamated as broad type 30. Type 40 was not sub-divided, as this was too difficult by API.

These amalgamated types, that is 10, 20, 30, 40 are the types used for analysis and are the types used in the tables in this report. The broad type 10 included type 14. In some tables type 14 is separated from broad type 10, as type 14 was the only significant commercial type present in that group.

2.3.2 Commercial Potential

Simply coded as Y (Yes) or N (No) based on species and or height. Most white box was coded as N as it is a threatened/endangered forest type according to the CRA.

Types included as non-commercial were as follows: 01, 04, 09, 23, 24, 50, and 60.

2.3.3 Height Classes

Stand height is a good measure of site quality and therefore productivity. Height was delineated as one of four classes that are appropriate for native forests in this area:

0	Less than 10m
1	10 to 15 m
2	15 to 25 m
3	25 m plus

Less than 10 m was always considered non-commercial. However, a few stands in class 1 i.e. 10 – 15 m were also classed as non-commercial, often due to form, and/or species.

2.3.4 Density Class

Two stocking classes were used.

H	Fully stocked i.e. 60 to 80 % Crown cover.
L	Moderately stocked i.e. 40 to 60 % Crown cover.

N.B. A fully stocked eucalypt stand is considered to be fully stocked when circular crowns are touching, i.e. at 80% crown cover. Refer McDonald et al.

2.3.5 Growth Stages

Four broad growth stages were used. The polygon was coded for the dominant growth stage present. The classes were as follows:

R	Regrowth
E	Early Mature
M	Mature/Overmature
U	Uneven aged forest, i.e. mixed growth stages, with two or more dominant.

2.3.6 Disturbance

This class was used to show the presence of disturbance and NOT the intensity of that disturbance. Because of the opportunistic nature of logging on private property and the desire to increase grass/grazing after logging, rather than the continued management for timber production, the disturbance is clearly evident and usually quite intense.

The following symbols were used for disturbance, and one or more symbols could be used together. For example CLP was a very common indicator used.

C	Clearing, as partial thinning or as small patches within a large area of timber
L	Evidence of older logging in the form of snig tracks, dumps etc.
P	Evidence of pasture promotion or pasture improvement within the stand where it has been opened up by clearing, thinning or logging. It also includes small patches of clearing within the stand.
X	Current or very recent logging in progress at photo date

2.3.7 Voluntary Conservation Areas

Initially it had been intended to exclude VCA areas but this was abandoned when the location of these could not be ascertained. The agreements are understood to involve a very small proportion of the study area and it was considered that these would be better factored into the owner intent considerations.

Some landowners have included their native forest in a growing network of “Citizens Wildlife Corridors” to link remnant bush-land with National Parks. While the location of these are available, they were not excluded as commercial forest management is not in conflict with conservation management and some owners may wish to take this option.

2.3.8 Access

Each polygon was classed as follows:

A	Accessible, i.e. roads present or very close to the area
F	Feasible, i.e. no road into area, but easily roadable
N	(or No) Not economically or environmentally feasible to road, usually because of large creeks/rivers or steep terrain.

2.3.9 Gross Area

The gross area of each polygon as calculated by the GIS computer program.

2.3.10 Exclusions

Exclusions were classed into two broad groups**,**

1. 2000 IFOAP, i.e. the 2000 Integrated Forest Operations Approval Package. Any areas determined by API to be in this category were included as exclusions. Stream/Filter strip areas were calculated by determining the length of creek in each class and then multiplied by width of filter strip required to get an area. These were all added and include under this exclusion. Steep areas >30 degrees, and inaccessible areas below 20ha which could not be harvested, were included here.
2. Other. This exclusion was mainly intended to cover small areas of clearing, below 20Ha.This was done to avoid many small polygons and to reduce the overall number of polygons. This class may have included small areas of non-commercial types, rocky areas and sometimes small inaccessible areas etc. The two Exclusion classes did get a bit blurred at times and should probably be combined into one exclusion class.

This class was also used to help smooth the polygon boundary. Rather than have a very convoluted boundary, which excluded every small bit of clearing, the boundary was smoothed and the included bits of clearing counted in the exclusion area. This was done to try and reduce digitising time and cost.

All exclusion areas, except linear filter strips, were estimated by API with the use of overlays showing various sized areas as circles, squares and rectangles.

While State Forests and National Parks have been easily excluded from the study, it is possible that some relatively small areas of “Crown Timbered Lands” (as defined in the Forestry Act) may have been included in the study. These include leasehold tenures that may not have been converted into freehold, or land still held under “Profit à Prendre”. In most instances Travelling Stock Reserves have been readily identified from photographs and excluded from any polygons.

With ready access to cadastral information on the satellite maps used in the study it has been possible to adjust the gross area of each polygon for any 20 metre wide crown reserve roads that may be present.

2.3.11 Actual Product Volumes

1. Sawlog Volumes.

This was an estimate of sawlog volumes within each polygon. It is based on fieldwork undertaken within the area & relies heavily on stand assessment measurements within individual client’s properties made by the Board’s Forest Adviser in the course of his work. The volume includes High quality sawlogs, equivalent to SF NSW “quota quality”, and low quality sawlogs, generally acceptable to sawmills.

2. Other Products

This is mostly low grade wood from harvesting residues or silvicultural culling that may be suited to a range of uses including:- bio-energy, charcoal, fuel wood, alcohol production, oriented strand board, or pulpwood. The only requirement being reasonable soundness and piece sizes suitable for mechanical harvesting, say minimum 3m length and 15cm toe diameter. Again estimates were based on limited field work and client data.

2.3.12 Growth Rates

Growth rates for all commercial species types were determined in conjunction with the Forest Adviser, and represent estimates of what could be achieved with appropriate silviculture. They broadly equate to one quarter of productivity estimates adopted by the Bureau of Resource Sciences in its map of hardwood plantation capability in northern NSW.

The following table shows the growth rates adopted. The rates are inclusive of all wood quality classes, and may need to be halved if only the sawlog rates are considered.

Type No	Description	Growth Rate m3/Ha/annum
01	Rainforest	N/C
09	Pinus Plantation	N/C
10	Western Types	0.5
11	Box, Western	0.5
12	Bendemeer White Gum	N/C
13	Mixed Western	0.5
14	Western, Red Stringybark etc	1.5
20	Low Tableland types	0.5
21	Tableland Stringybark	2.0
22	New England Blackbutt	2.0
23	Gum, Peppermint	N/C
24	Snow Gum	N/C
30	Eastern Fall types	3.0
31	Eastern Stringybarks	3.0
32	New England Stringybark	3.0
40	High SQ Tableland	4.5
50	Wattle/Shrubs	N/C

2.3.13 Potential Volumes

Potential volumes of sawlogs and other products are calculated, from the GIS data, for each forest component using the above growth rates. It is assumed in the first instance that the appropriate silvicultural practice has been applied and a market for the full range of timber products is available. The management intent of forest owners is crucial and this is largely related to the availability of markets.

2.3.14 Silvicultural Condition

This was assessed to try and modify the potentially available volumes. The assumption initially was that the appropriate silvicultural practice was applied to give future volumes. This is unrealistic under the current conditions. A more realistic assumption may be to look at the silvicultural condition and then modify the potential volume according to this data.

Classes used were as follows:

- P Poor silvicultural condition, unlikely to yield much future volume without some substantial silvicultural treatment. Most areas fell into this class.
- M Some silvicultural practice has been applied, even if only some logging, which may promote some regrowth and hence future potential volume. This may have only been patchy application of the treatment, or only light, i.e. not heavy enough to promote full potential
- G Good silvicultural practice applied and can expect full potential in the future. Commonly these were areas of extensive regrowth, or very heavy past logging.

3 Inventory Findings

3.1 Overview of the Forest Cover

The proportions of private land under full forest cover within the study area reflect the dominant land use of the tablelands for grazing. Less than one quarter of the 1,372,000 ha surveyed was forested (22%), as forests were defined for this study, and only half of this (11%) has any potential for timber production.

The distribution of the remaining native forest is not even, and tends to be concentrated around the steeper eastern escarpment zone or on the poorer soils with broken topography west of the Great Dividing Range. Table 1 below provides a summary of forest cover within each LGA and Maps 2 to 6 show the location of the forest polygons.

Table 1: Areas of Forest Cover within Local Government Areas

LOCAL GOVERNMENT AREA	Within study area ha	Forested area ha	Percentage of LGA surveyed	Potentially commercial ha gross	Percentage of LGA surveyed.
Armidale Dumaresq	306,454	42,105	14%	27,694	9%
Nundle	129,154	33,636	26%	30,421	24%
Parry	201,202	63,291	32%	19,390	10%
Uralla	283,875	47,418	17%	5,395	2%
Walcha	451,308	110,857	25%	71,248	16%
TOTAL	**1,371,993**	**297,303**	**22%**	**154,148**	**11%**

3.2 Broad Forest Types within Shires

As anticipated, the Walcha LGA has clearly the most potential for encouraging better private native forest management, with some 65,000 ha of forest types on private lands with potential for timber production. The LGA contains a high proportion of the better timber producing types on the higher rainfall eastern escarpment, - escarpment hardwoods and tableland hardwoods over 25m height. There is also a substantial component of the drier hardwoods within the pastoral lands of the tablelands that are less than 25m.

While it is one of the smaller shires in the survey area, Nundle Shire has 30,000 ha of the higher altitude escarpment and tableland types, mostly located along the Great Dividing Range (GDR). Armidale/Dumaresq LGA also contains some private forest on the eastern escarpment, but most of the 27,000 ha with production potential are tableland hardwood types – under 25m – within the pastoral zones of the tablelands.

The two LGA's that are mostly west of the GDR have lesser, but significant potential. The south higher altitude eastern section of Parry Shire, has 10,000ha of tableland hardwood forests with a balance of the better types over 25m and the drier/poorer stands that are less than this. With 33,000ha, Uralla Shire has a large area of private forest with some potential to grow wood. There is some tableland forest within the pastoral zone but the area is mostly made up of the western hardwood stands on poorer soils where growth rates will be lower.

Table 2 below provides greater detail

Table 2: Forest areas (Ha), commercial and non-commercial by broad forest Type

LGA	Area Ha	SPECIES TYPES 01 Rainforest	4 Gorge Hardwoods	10 Western Hardwoods	20 Tableland Hardwoods <25m	30 Escarpment Hardwoods	40 Tableland Hardwoods >25m	Pinus Plantation	Totals Excludes Pinus
Armidale-Dumaresq	N/Comm*	184	7638	4367	2411				14600
	Com Grs *				21169	2776	3749	54	27694
	Com Net *				17912	2411	3122		23445
	Total	**184**	**7638**	**4367**	**41492**	**5187**	**6871**	**54**	**65739**
Nundle	N/Comm*	24		2542	294		228		3088
	Com Grs *				4135	8033	18234	146	30402
	Com Net *				3121	6564	15459		25144
	Total	**24**		**2542**	**7550**	**14597**	**33921**	**146**	**58634**
Parry	N/Comm*			43209	228				43437
	Com Grs *			1529	5140	380	3061	1391	10110
	Com Net *			1415	4322	285	2480		8502
	Total			**46153**	**9690**	**665**	**5541**	**1391**	**62049**
Uralla	N/Comm*		315	2954	312				3581
	Com Grs *			33379	2560			36	35939
	Com Net *			2685	2118				4803
	Total		**315**	**39018**	**4990**			**36**	**44323**
Walcha	N/Comm*	279	35182	500	1702	235			37898
	Com Grs *				22584	24244	17350	1189	64178
	Com Net *				18842	20852	14829		54523
	Total	**279**	**35182**	**500**	**26168**	**45131**	**32179**	**1189**	**156599**

*__N/Comm__ = Non Commercial.
*__Com Grs__ = Commercial - Gross
*__Com Net__ = Commercial - Net

While the inventory has ostensibly looked at native hardwood forest, the opportunity was taken to identify the extent of pine plantations on private land, at the photo date. Narrow windbreaks and small wood-lots under one hectare however were not mapped. Any recently planted areas, not visible from air photos (about 10ha in Armidale/Dumaresq) also were not included. Refer to 2.2.2. for photo dates. Refer Table 2 for areas of Pine Plantation.

3.3 The Silvicultural Condition and Growth Stage of the Forests

These characteristics are somewhat inter-related, and can be assessed fairly accurately by aerial photographic interpretation where the canopy layer can be seen stereoscopically. Young vigorously growing trees have well balanced pointed crowns that are well spaced and deep. Alternatively, trees that are obviously overstocked, have shallow rounded crowns that are restricted by adjoining trees.

A range of canopy sizes indicates the stand is uneven aged and the presence of large broken crowns, with dead limbs, often protruding above the general canopy level reveal over mature senescent trees – essential for some wildlife – but of no value for timber.

Table 3: Growth Stages by Species Types.

		SPECIES TYPES				
LGA	**GROWTH STAGE (Hectares)**	14 Red Stringy bark	20 Tableland Hwds <25m	30 Escarp-ment Hwds	40 Tableland Hwds >25m	**TOTALS**
Armidale-Dumaresq	Regrowth		394	193	174	761
	Early Mature		204	157	663	1024
	Mature		14167	2264	2412	18843
	Uneven aged		6404	162	500	7066
	Total		21169	2776	3749	27694
Nundle	Regrowth		674		387	1061
	Early Mature		192		250	442
	Mature		1642	7381	10880	19903
	Uneven aged		1627	652	6717	8996
	Total		4135	8033	18234	30402
Parry	Regrowth		225		226	451
	Early Mature	77	31	56	50	214
	Mature	772	11482	163	1268	13685
	Uneven aged	680	2682	161	1517	5040
	Total	1529	14420	380	3061	22451
Uralla	Regrowth					
	Early Mature	77				77
	Mature	1910	2352			4262
	Uneven aged	848	208			1056
	Total	2835	2560			5395
Walcha	Regrowth		284	382	223	889
	Early Mature		4	685	1284	1973
	Mature	382	16438	17335	11129	45284
	Uneven aged	42	3841	5253	4714	13850
	Total	424	20567	23655	17350	61996

Note that the forests are almost universally older mature or uneven-aged, and the proportion of younger regrowth or early mature is mostly less than five percent of the total. The pattern is similar for all species types and LGAs.

Table 4: Areas of Silvicultural Classes by Species Types.

LGA	Silvicultural Class (Area ha)	SPECIES TYPES				TOTAL
		14 Red Stringy bark	20 Tableland Hwds <25m	30 Escarp-ment Hwds	40 Tableland Hwds >25m	
Armidale-Dumaresq	Good		308	385	793	1486
	Medium		1893	272	1319	3484
	Poor		18968	2119	1637	22724
	Total		21169	2776	3749	
Nundle	Good		33		1700	1733
	Medium		1084		7424	8508
	Poor		3018	8033	9110	20161
	Total		4135	8033	18234	
Parry	Good		171			171
	Medium	757	1426	380	1671	4234
	Poor	772	12823		1173	14768
	Total	1529	14420	380	2844	
Uralla	Good					
	Medium	744	105			849
	Poor	2091	2455			4534
	Total	2835	2560	0		
Walcha	Good		831	1190	2613	4634
	Medium		2419	4988	6650	14057
	Poor	424	19334	18066	8087	45911
	Total	424	22584	24244	17350	
	Grand Total	4788	64868	35433	42177	

The pattern is depressingly similar with almost three-quarters of the native forest in poor silvicultural condition. The forest in good condition is very sparse, ranging from virtually nil west of the GD Range, to somewhere between five and seven percent on the eastern fall.

Table 5: Areas of Logging at photo date Ha.

LGA	SPECIES TYPES			TOTALS
	20 Tableland Hardwoods<25m	30 Escarpment Hardwoods	40 Tableland Hardwoods>25m	
Arm-Dumaresq	206	263	310	779
Nundle			1754	1754
Parry			783	783
Uralla				
Walcha		243	1891	2134
TOTALS	206	506	4738	5450

Evidence of recent or current logging on photographs was recorded as a disturbance indicator. Most of the logging recorded was fairly intense and probably may have been up to several years old. It does not include selective logging by a landholder where only a few trees are removed over a long period. This disturbance would not be visible by API.

If it is assumed that the class covers two years logging at photo date, then the annual area logged in the study area would be 2725ha, which is only 1.6% of the gross commercial forest area. Some 87% of the logging is within the high site quality type 40.

3.4 Current Standing Timber Volumes

These are detailed in the following table. As estimates these should obviously be treated with some caution and are therefore somewhat indicative. They highlight the massive volumes of low grade wood that is present – over two million cubic metres or tonnes – that inhibit the commercial potential of private native forests, and have not been recognised in the Regional Forest Agreement.

The sawlog volumes that are present, without any additional silvicultural treatment, are adequate to support the small timber mills that operate in the study area, but will decline in quantity and quality without incentives to improve timber management.

Table 6: Estimated timber volumes at the date of photography

Estimated standing timber volumes – cubic meters x 10^3			
LOCAL GOVERNMENT AREA	**SAWLOG VOLUME m^3*10^3**	**OTHER TIMBER VOLUME m^3*10^3**	**TOTAL TIMBER VOLUME m^3*10^3**
Armidale Dumaresq	71	286	357
Nundle	257	506	763
Parry	68	208	276
Uralla	10	50	60
Walcha	495	1,113	1,608
TOTAL	901	2,163	3,064

The distribution of those volumes by forest types are shown in the following table.

Table 7: Estimated Standing Timber Volumes by broad forest types.

		SPECIES TYPES					TOTALS	
LGA	**Volumes 1000 Cubic m**	14 Red Stringy bark	*4 Gorge Types	20 Tableland Hwd <25m	30 Escarpment Hwds	40 Tableland Hwds >25m	Sawlogs	Other
Armidale-Dumaresq	Sawlog			29	19	23	71	
	Other			185	44	57		286
Nundle	Sawlog			11	36	210	257	
	Other			38	91	378		506
Parry	Sawlog	4		42	2	20	68	
	Other	17		145	6	41		209
Uralla	Sawlog	7		4			11	
	Other	27		23				50
Walcha	Sawlog	0.5	16	80	204	194	495	
	Other	3	37	247	441	384		1112

*4 Type 4 possibly mistyped, should be type 20

3.5 Potential Annual Timber Yields

The potential of private forests to grow commercial wood is also an estimate that has been derived on the basis of several assumptions and is therefore also an indicative value.

Two values are presented

- one assuming that ideal silvicultural treatment has been applied to every hectare of potentially commercial forest. It is a maximum possible value that would require total participation from all landowners – and that is clearly unattainable. This value is shown as the THEORETICAL MAXIMUM annual yield in Table 8 below. The 1991 BRS survey, discusses in section 1.7, indicates landowner intent to manage for timber is possibly only 50 percent.
- a modified maximum growth rate that takes account of the present silvicultural condition of the private forest estate. Potential growth rates have been adjusted by the following factors:

  1.0 if the silvicultural condition was good. e.g. Regrowth with pointed heads to indicate that they are actively growing.

  0.5 if the condition is moderate i.e. there appear to be some trees present that have potential to grow on to better trees, and

  0.25 if the stand has a poor silvicultural class ranking, and there is little prospect of useful growth increments.

This value is less dependent on landowner intent, and could represent an attainable target for the study area. It is shown in Table 8 below as the MODIFIED MAXIMUM annual yield.

Table 8: Theoretical maximum annual yield from private forests assuming full silvicultural treatment and full landowner participation.

Volumes in thousand cubic meter units.

		FOREST TYPE				
LGA	**Product Type**	**14 Red Stringybark**	**20 Tableland Hwd <25m**	**30 Escarpment Hwd**	**40 Tableland Hwd >25m**	**Total**
Armidale-Dumaresq	Sawlog		9	7	14	30
	Other		11	9	18	38
Nundle	Sawlog		3	20	70	93
	Other		4	24	87	115
Parry	Sawlog	2	13	9	11	35
	Other	6	16	11	14	47
Uralla	Sawlog	4	7			11
	Other	5	9			14
Walcha	Sawlog		9	64	67	140
	Other	6	11	79	83	173
Total	**Sawlog**	**6**	**41**	**100**	**162**	**309**
	Other	**11**	**51**	**123**	**202**	**387**

Table 9: Modified Maximum Annual yield from private forests adjusted for their silvicultural class.

Volumes in thousand cubic meter units.

		FOREST TYPE				
LGA	**Product Type**	**14 Red Stringybark**	**20 Tableland Hwd <25m**	**30 Escarpment Hwd**	**40 Tableland Hwd >25m**	**Total**
Armidale - Dumaresq	Sawlog		2	3	7	12
	Other		3	3	9	15
Nundle	Sawlog		1	5	24	30
	Other		1	6	37	44
Parry	Sawlog	1	3		4	8
	Other	1	4	1	5	11
Uralla	Sawlog	1				1
	Other	2				2
Walcha	Sawlog		1	22	31	54
	Other		2	27	39	68
Total	**Sawlog**	**2**	**7**	**30**	**66**	**105**
	Other	**3**	**10**	**37**	**90**	**140**

The do nothing option where only the higher quality stands would have any growth increment are expected to result in about 10 percent of these modified values. The result would be a further decline in the contribution that the timber industry makes to the region's economy.

Even with a sharp improvement in forest silviculture, the turnaround in the rate at which forests grow would be gradual, as stands composed of old and stagnant trees are replaced by young vigorously growing ones. This may require several cutting cycles.

While the annual increments that are indicated as feasible may appear modest, they represent approximately four times the sawlog input that are currently supplied to the Walcha timber mill from publicly owned forests.

4 Summary and Discussion

Unlike Europe, where there has been a tradition built over centuries of integrating good forest management with agriculture, Australia has a short experience of land use in a very different environment that will need to be adjusted if our use of the land is to become sustainable.

The commercial focus on freehold land management of intensifying agricultural production has frequently been at the detriment of the environment, with soil erosion and biodiversity loss. The focus on grazing on the tablelands, with it's open grassy forests, has a cumulative impact on the remaining native forest that can only be overcome with a change to active forest management, and enables the natural process of regeneration to resume.

Maintaining adequate forest cover on privately owned land will be a crucial element in sustainable land use, and while the proportion will vary with each landholding, an average of one third of productive agricultural land could be the minimum needed to maintain long term hydrological cycles, both above and below ground level.

With a resource base of this scale commercial use is a necessity. Elevating farm forestry to a legitimate land use on freehold land with a sound economic base has wide social and economic implications that would benefit this and other regions.

The 2001 Private Forest Inventory has established this potential for the New England Tablelands.

4.1 The Existing Resource

The Inventory has highlighted the current state of poor forest management on the tableland and the existence of very large quantities of low-grade wood, which is an impediment to better forest management.

In an ideal world, forest management needs to have all of those trees that do not need to be left as growing stock or retained for habitat, removed from the forest in a single harvesting operation. The resultant timber yield would then be graded to remove all of the higher quality wood – leaving the low-grade wood available for some useful purpose.

The prospect of ever finding a commercial market for this low-grade wood is not good. Bio-energy, with a plant centered in Walcha received mention in the 1999 Forest Agreement for the Lower North East Region, however it is understood that timber sourced from native forests will not qualify as sustainable for "green" power generation.

The low density, open pored woods of the tableland are not well regarded as fuelwood, however the stringybark species do make good charcoal – and this potential use has received some support in the NE NSW Regional Forest Agreement.

The pale colour and soft wood of the tableland species do make them ideal for papermaking, however the New England region is on the outer perimeter of the supply zone for exporting woodchips from Brisbane or Newcastle and there is consequently little or no market for chips.

Other potential uses such as ethanol production or oriented strand board would require years to develop. Felling to waste is also not an alternative as this creates a barrier to

movement, increased fire hazards and a harbour for unwanted noxious plants and animals. Firewood could be useful, but it takes years for wood to season from green.

Tree poisoning would involve the owner in additional costs, but would permit harvesting for firewood at a later date. There are safety and environmental considerations involved and the aesthetics are not good.

4.2 The Forestry Potential of the Tablelands

Without a market for low-grade wood, the opportunity to manage private native forests for timber production is severely restrained. While it may appear to be a paradox, the availability of a market for the full range of timber grown in native forests would provide the most effective incentive to encourage improved forest management.

With an increasing demand for timber and forest products predicted, such a market will develop, but it may be a decade or more before this eventuates, and any improvement in the growth of higher quality timber during this period will be delayed.

Under the current regulatory environment there is little incentive for private forest owners to commit to forest management as Regional Vegetation Management Plans have not been finalised and there is no certainty of future harvest rights. A supportive regulatory environment is essential if the forestry potential of the area is ever to be realised.

4.3 Plantation Potential

Any incentive for improved private native forest management would also stimulate plantation development, as plantations of both hardwoods or pine are not able to reach their full potential without progressive thinning or culling operations.

The potential for hardwood plantations are best on the wetter eastern escarpment where the cold adapted species like Shining Gum – *Eucalyptus nitens* make excellent growth.

On the exposed pastoral lands of the tablelands *Pinus radiata* shows most promise, and can handle the harsh winter frosts on a wide variety of well-drained soils.

Plantation development ideally needs to be included into an overall farm plan, like those produced through the “Farming For the Future” program, which consider land capability and the plantation “Code of Practice” requirements.

4.4 Community Perceptions

While the Regional Forest Agreement has recognised that well planned forestry operations are not in conflict with flora and fauna conservation, there appears to be some reluctance in the broader community and the regulatory agencies to guide landowners towards this end.

Regional Vegetation Plans that require owners to seek Development Consent for each forestry operation and take away principles contained in the RFA appear to be imminent. They are a clear shift away from the self-regulatory approach to timber management on private lands.

Community education, that provides a balanced approach to forest management, is essential, however this has not been helped by a partisan media, intent on presenting forest destruction, nor an education system that provides an over-simplified view of conservation. Forestry operations are highly regulated while there is an unquestioned acceptance of agricultural commodities that come from land management systems that are clearly unsustainable and come with large unpaid environmental costs.

The House of Representatives Standing Committee on Environment and Heritage in its "Public Good Conservation" report, released in September 2001 had this to say:

"The evidence the Committee received indicated that the present policy were not addressing these concerns. As a result, less public good conservation was occurring than was desirable given the depth of the environmental problems facing the nation. Moreover, the landholders who made submissions to the inquiry and gave evidence indicated a high level of frustration and reported anger and resentment in the rural community as a result of what were perceived to be inappropriate policies.

The evidence suggested to the Committee that nothing short of a re-configuration of land use practices in Australia is required. Crops and products produced at present will need to be produced in different and more sustainable ways. New industries will need to be developed and new markets may well be created."

And

"*The Committee considers that the problems facing land use in Australia present opportunities to our farming community and the nation. Those opportunities will be realised only if the transition from dangerous land management practices to sustainable land use practices is managed sensibly and pragmatically."*

In its 1998 report on "*Our common future*" the United Nations Bruntland Commission on Environment and Development concluded:

"The time has come to break out of past patterns. Attempts to maintain social and environmental protection will increase instability. Security must be sought through change."

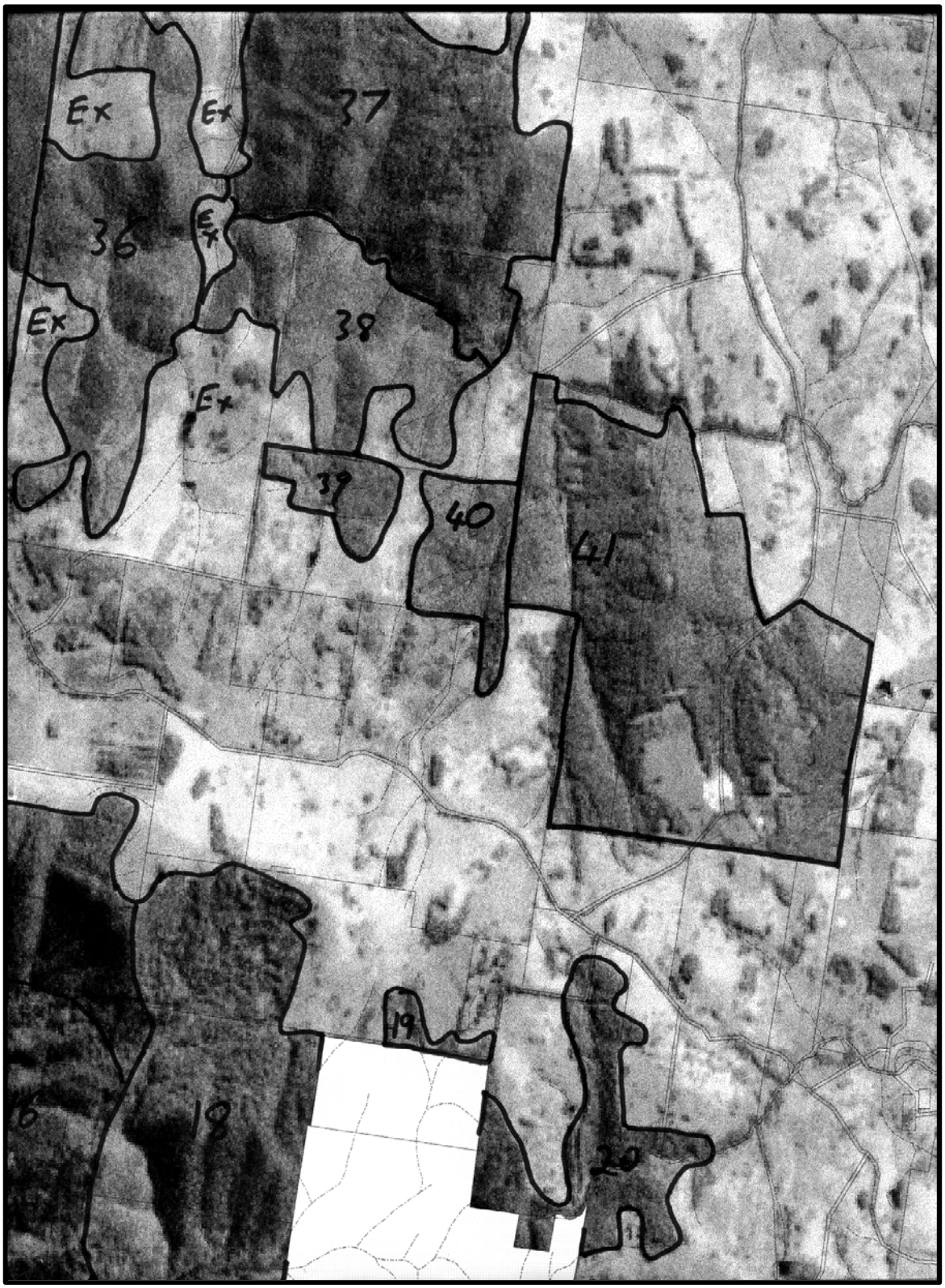

Figure 1: Part of Niangala Landsat Map showing forest polygons (not to scale).

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Data Storage and Availability

The NE-NW Regional Development Board at Armidale holds the base satellite maps, with polygon line-work.

The project data, which includes this report, the original Landsat images, Local Government Area maps and the survey data-sets are available in digital form on CD, but some files will require Arcview to access.

Inquiries should be directed to the Executive Officer of the New England – North West Regional Development Board in Armidale.

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