UPPER CATCHMENT ISSUES

TASMANIA

First edition feature — Upper Catchment Issues in the North Eastern Highlands

Journal of The Community Based Risk Assessment Group of Tasmania

Vol. 1 No. 1

ISSN 1444-9560
Disclaimer:

Articles from any person, group or organization are accepted for publication at the discretion of the Editor, and the opinions expressed therein may not necessarily reflect the views of the Editor.

Copyright:

Readers of this publication are reminded that all material appearing in The Journal, including any specially composed article, is covered under the copyright laws of Australia and may not be reproduced or copied in any form or part whatsoever or used for any promotional or advertising purpose without the written consent of the Editors, author or artist.

Submissions — Guide for intending authors

We welcome submissions on topics concerning any aspect of upper catchment issues. Consult a current issue of the journal for style and layout of submissions. Intending authors are reminded that a very diverse audience reads the Journal and so highly technical or specialised terminology should be carefully explained. Finally, responsibility for spelling, punctuation and referencing shall remain with the author.

Submissions should be addressed to:

The editor,
8 Lenborough Street
Beauty Point
Tasmania 7270
Australia

Desktop Publishing:
Resource Publications
(ABN 66 828 584 972)
9 Lenborough Street
Beauty Point, Tasmania, 7270
Phone: (03) 6383 4594
Fax: (03) 6383 4895
E-mail: peter@resource-publications.com.au

Front Cover: Tree felling near Diddleum Plains

Deadlines for Submissions

January, 7
# Table of Contents

Editorial ................................................................................................................................. 4  
Catchment Issues in the North Eastern Highlands Of Tasmania - A Community Based Case Study ................................................................. 5  
  Introduction .......................................................................................................................... 5  
  Context for the study ......................................................................................................... 6  
  Biophysical Capability ....................................................................................................... 6  
  Case Study Area ................................................................................................................ 6  
  Research Methodology ..................................................................................................... 8  
  Methods Used to Gather Data .......................................................................................... 11  
  Outcomes from the Action Research Process ................................................................ 11  
  Rationale for Identifying Environmental Aspects and Significant Impacts .................. 11  
  Conclusions ....................................................................................................................... 12  
  References ........................................................................................................................ 14  
A Note Regarding Appendices ......................................................................................... 16  
APPENDIX 1 ........................................................................................................................... 18  
REPORT ON WATER QUALITY ISSUES, ............................................................ 19  
  COUPE SF156B, BASS ................................................................................................. 19  
    BACKGROUND ............................................................................................................. 19  
    TOPOGRAPHY, GEOLOGY, VEGETATION AND RAINFALL ..... 19  
    SOILS AND DRAINAGE ............................................................................................. 19  
RISKS AND RECOMMENDATIONS .................................................................................. 20  
  Harvesting ........................................................................................................................ 20  
  Cultivation ......................................................................................................................... 21  
  Spraying and fertiliser ...................................................................................................... 21  
  Alternative outcome ......................................................................................................... 21  
  REFERENCE ..................................................................................................................... 21  
APPENDIX 2 .......................................................................................................................... 24  
APPENDIX 3 .......................................................................................................................... 34  
  Report on the property of Mrs Anne Gschwendtner — effects of proposed forestry operations on water supply ........................................... 36  
    1. Water Yield ............................................................................................................... 38  
    2. Water Quality ............................................................................................................ 41  
    2. Buffer Zones .............................................................................................................. 42  
    Summary ....................................................................................................................... 43  
    References ..................................................................................................................... 46  
APPENDIX 4 .......................................................................................................................... 48
ProSilva: quality management in our forests

Abstract
Introduction
Vision
Philosophy
Roots of ProSilva

Forest Management Principles
Principle 1: Recognition of ecosystem potential
Principle 2: Suiting species and structures to the site
Principle 3: Sustainability
Principle 4: Single stem cultivation and utilisation
Principle 5: Permanent laneways

System Management Principles
Principle 6: TQM
Principle 7: Persistent and intensive management
Principle 8: Value of market products
Principle 9: Landscape recovery & reintegration

Worldwide trends
Relevance to Australian conditions
Relevance to private forests

Benefits and Challenges of ProSilva
Benefits
Challenges

Developing a ProSilva strategy
Action plans
Implications for forestry and land management

Addendum to Upper Catchment Issues Tasmania Vol. 1 No. 1
Editorial

These proceedings are a tribute to a committed and talented group of community minded individuals who have worked tirelessly to bring upper catchment issues to the attention of the broader public.

The project, led by Ann Gschwendtner and Kim Eastman, drew upon the expertise of a number of respected professionals, including numerous submissions by Forestry Tasmania. The result has been a well grounded Community Based Risk Assessment that will, without doubt, function as standard for the rest of our community as it grapples with the issues emerging from the pro-growth model of sustainable development currently with us.

As with all good research there are more questions than answers, more tensions seeking resolve and above all, more valuable learning for us all.

Declaration

The Editor and research team wishes to make it very clear that any comment and conclusions relating to Forestry Tasmania have been made in best of faith and are not intended to attack, deride, embarrass or cast aspersions on the professional conduct of the Corporation or any of its servants or agents. To that end the following paper attempts to report the key process and outcomes of the investigation in a just and unbiased way.

Research Team
Introduction

The area shown in Fig 1 (Forest Coupe SF156B) has been selected by Forestry Tasmania for logging and subsequent tree plantation. The area is adjacent to a certified organic farm and is thought to be a significant contributor to water recharge for the Brid and perhaps other rivers. In conventional forest management regimes clearfelling is extensively used, as are chemicals (fertilizers and pesticides) during the establishment phase of plantations. Accordingly, the potential for adverse impacts on the nearby organic farm (certified A Grade to the National Standard by the Tasmanian Organic-Dynamic Producers) was thought to be real and worthy of further risk assessment. When dialogue with the logging proponents failed to reveal concrete risk assessment data it was proposed that an enquiry be initiated. As water quality and quantity appeared to be at risk Dorset WaterWatch (DWW) also took an interest and became a member of the research team. DWW was also concerned about impacts in the general area as well (a total area of 180ha, which included the area of the coupe).

An Action Research approach was used to guide a year long study into the risk aspects of a proposal to log the area located at Mt. Scott (grid reference 542300E/5427500N), known as State Forest Coupe SF156B. Action research was seen as capable of bringing together local community knowledge of the site and other “scientific knowledge” generated by experts from perhaps a number of fields. Harding (1998) argues that ‘knowledge’ is a result of an ongoing interaction between those holding ‘local knowledge’ and those holding the so-called expert ‘objective knowledge’. In short, Harding argues that there are many forms of knowledge and that the local knowledge’s within a community cannot be ignored. Along similar lines Tattersall (1991) argued for strong community participation in the auditing of the environment, stating that

1 Organic farmer Diddleum.
2 Dorset WaterWatch.
3 Journal Editor, Secretary T.O.P. and Senior Project Consultant
4 Social Ecologist.
“Community Based Sampling is designed to provide that community with a powerful resource, that when used properly will bring about changes in the way we as a society behave toward our environment and each other.”

Context for the study

The North Eastern Highlands are situated on the northern side of Mt. Barrow at an elevation of approximately 800m. Yearly rainfall averages around 1700mm. Land use includes cattle and sheep grazing, forestry, tourism and fishing. There continues to be a growing interest in the establishment of organic farming in the catchment.

Key river systems rising in the catchment include the Greater Forester, Brid, St Patricks and Ringarooma rivers.

Biophysical Capability

Soils Soils, developed principally from granite-diorite, are found at elevations between 600m to 800m. These soils are prone to erosion and are thin and friable. Soils are held in place by a diversity of shrub and tree species.

Water Flow In the higher rainfall periods the existing forest systems help to moderate runoff and recharge into riverine systems.

Flora and Fauna The catchment contains an abundance of flora and fauna, including Eucalyptus spp, sections of pure rain forest, rare land snail Anoglypta Launcestonensis, goshawks, wedge tail eagles, native cat, tiger cat, platypus, Bennett’s and Rufous Wallaby and wombat and a range of other species

Case Study Area

The case study area (Forestry Coupe) of area 56ha bears many of the aforesaid properties, being rich in fauna and flora and exhibiting complex hydrogeological conditions. The organic farm is situated 50m down slope from the coupe. Dorset WaterWatch is also concerned about an area of 180ha that includes the coupe itself.
Research Methodology

**About Action Research** A participatory approach was preferred as it was thought to empower participants to contribute towards shared understanding. In this way the community members as *experts* within the local settings and the researcher as an outside *expert* each share their expertise to improve collective understanding of the situation. Consideration was given to the choice of a methodology that would, as far as possible, accommodate the above requirements and at the same time display responsiveness and flexibility.

The approach selected was one of action research involving the community (Dorset WaterWatch, Ann Gschwendtner, and other community members), and experts (Forestry Tasmania reports, letters and face to face dialogue, Philip Tattersall [Tasmanian Organic-Dynamic Producers Co-operative], Duncan Mills [Social Ecologist], Assoc. Prof Brian Finalyson [Centre for Environmental Applied Hydrology, Department of Geography and Environmental Studies, The University of Melbourne], Pat O’Shaughnessy [O’Shaughnessy and Associates] and Dr Owen Ingles [Soil Engineering & Risk Management Consultant]). Action research was chosen on the basis that it meets the requirements of dialectical enquiry and participation, touched on in the previous paragraph, on the following bases:

- An action research methodology involves an iterative process of planning, action and reflection (Dick 1992/93, pp. 3-18) to improve the understanding of both those in the research setting and the co-researchers in relation to the research hypotheses. The methodology utilises multiple methods for the collection, analysis and interpretation of human, biophysical and financial data in a similar way to the approaches used by other researchers (Stringer, 1996; Rossman and Wilson, 1985).

- Action research accommodates participation in a number of senses. Firstly, it allows for research to be conducted on-site. Secondly, it encourages a range of levels, or degrees of co-operation. Involvement can vary from the more traditional roles of community and researcher-as-expert to a fully co-operative community-researcher partnership. Thirdly, the methodology is able to utilise a broad range of data (qualitative and quantitative) as it is capable of embracing a whole range of expressive forms (Reason, 1994, p.334). In short, data derived from lived, everyday experience (experiential) and that derived from scientific or technical measurement are each seen as equally valid samples of *reality*. Finally, participation enables the building of strategies for
ensuring trustworthiness (mentioned earlier) as it enables the researcher to check findings with other co-researchers in the research setting.

The choice of action research and the overall approach came out of considerations about the complexity of the way in which humans conceptualise systems, and the nature of the relationship between a community and its environment. This led, in turn, to considerations about the importance of studying situations in their context. The study in context would tend to be more holistic, interactive and relevant. It was considered that this would be best accomplished through a participative approach. Action research also allows for the modification and adaptation of research process in order to respond to new areas of enquiry and in so doing accommodates a process of growing understanding, such that there is increasing clarity as the enquiry continues. The approach is therefore, potentially emergent and responsive (Dick, 1992/93).

The methodology can also accommodate an iterative and cyclical process, drawing upon localized experience and theory to construct understanding. For the purposes of this research this was considered to be an important strength when working with community groups in the context of their environmental issues.

There are several approaches to action research. The one employed in the present project used a cyclic process of Planning-Action-Reflection. Planning involves developing ideas and hypotheses about ways to approach enquiry based upon previous experiences in a given context. This gave rise to actions, which were then reflected upon. The reflection usually involved critical appraisal of both findings and methods used to generate them and, sometimes, the methodology itself. This reflection then gave way to informed planning which, in turn, led to further action and so on (Dick, 1992/93). Fig.2 shows an example of enquiry cycles, visualized as a spiral of deepening understanding.
STAGE AND STEPS

Pre entry stage

Scoping and reconnaissance

CYCLE 1

**Scoping and proposal**

CYCLE 2

**Data gathering and interpretation**

CYCLE 3

**Final confirmation of interpretations.**

**Conclusions and reflections.**

KEY OBJECTIVES FOR EACH STAGE

Developing thoughts and ideas about the perceived, settings and methodology.

The site, the issues, making sense as to what is going on.

Discovery: confirm the issues. Where are the mismatches – why is this so: what to do

Actions to challenge interpretations: new beginnings and realities. Where to from here. Reflect together on next steps.

Fig 2  Action Research process used in the research project
Methods Used to Gather Data

Data was sourced from reports, field excursions, community experience, and expert reports. Reports from Forestry Tasmania (FT) were examined in detail by the research team and questions were generated on the basis perceived mismatches between community experiences and FT assertion/findings. Experts were asked to examine literature on the proposed logging site, including reports from FT. In one case a recognised expert was asked by the research team to visit the site and provide a report as well as advise other experts. Finally, all reports were supplied to Assoc. Prof Brian Finlayson (The University of Melbourne) for the purpose of an overall report.

At each stage the research team critically examined the key findings of each expert and formulated questions back to FT for response. In this way issues were constantly refined and refocused so as to ensure that any hypotheses were rigorously tested, and at the same time there was opportunity to raise other lines of enquiry.

Outcomes from the Action Research Process

Phase 1: The main task was to identify key environmental aspects and their significant impacts, including how possible impacts would be manifest. The method used was based upon a similar approach used in ISO 14000 auditing (SGS, 2000)

Rationale for Identifying Environmental Aspects and Significant Impacts

1. **Environmental aspects** Key environmental aspects identified included:
   - High rainfall in the proposed coupe area;
   - Fragile soils in the coupe area;
   - The coupe is an important element of river recharge;
   - Forest management practices adopted on the site, including clearfell, chemical use and burn off operations;

2. **Identification of potential negative environmental impacts** Potential negative impacts were classified on the basis of ‘within catchment element’ and ‘external to the catchment element’. ‘Within catchment element’ is defined here as in the immediate area around, and including the coupe (i.e. the 180ha site) and external to the catchment element’ includes areas remote from the coupe that may suffer negative impacts as a result of logging and plantation activities occurring within the coupe (including future impacts).
The classifications were as follows:

Impacts within catchment element
- Extinction of flora and fauna;
- Water Quality: Movement of Chemicals and soil into water;
- Water Quantity: Interference with water yield from site;
- Mass landslip and possible slumping;
- Soil Erosion in the form tunnel and sheet erosion.
- Noise pollution due to long working hours.

Impacts external to catchment element
- Negative impact on water quality for down stream users;
- Negative impact on water quantity for down stream users (short high peak flows leading to flooding and riverbank erosion and possibility of reduced flow in dryer months, with some minor streams drying up);
- Log truck damage to municipal roads and bridges.

The significant impacts identified above formed the key hypotheses that required exploration during the next phase of the enquiry.

**Phase 2:** Gathered data from FT (See Appendix 1 for report), conducted site visits, interpretation and reflection sessions with members of research team, entered process of cycle of questions to FT, LCC, Dorset Council. Generated a specific list of impacts. Initial consultants reports re potential risks (based on probable impacts) were generated. (See Appendix 2 for reports from Dr Owen Ingles). Dr Ingles confirmed that water quality would be an issue and at the same time raised concerns over the erodibility of the soils in the area as well as water yield.

**Phase 3:** Commissioned other experts to look at various aspects of the impact of the proposal. From this we generated further questions for FT, LCC and Dorset Council. Pat O’Shaughnessy visited the site over a number of hours and essentially confirmed, on an independent basis, the findings of Dr Ingles. All information was then pulled together in final report after on-site visit. (See Appendix 3 for reports from Pat O’Shaughnessy and Dr Brian Finlayson).

**Conclusions**

The significant potential impacts identified by the expert consultants included, impacts on water quality/quantity, possible movement of chemicals onto the certified organic farm, and soil erosion. The research team is still engaged in an assessment of potential damage to Community infrastructure (roads, bridges and costs to clean up drinking water and Biodiversity).
In his report, Pat O’Shaughnessy raised concerns about water yield and expressed reservations as to the suitability of certain areas of the coupe for tree plantation. Dr Finlayson expressed a number of concerns related to water yield, quality and dismissed each of the three FT options put to Mrs Gschwendtner in their letter of March 14, 2000. (see appendix 4).

This left the research team with the growing concern that FT may have not adequately addressed the risks relating to their proposed operation on the coupe. It was clear that three independent experts agreed on many of the environmental impacts identified by the research team. FT was informed of key findings throughout the research process. Despite this FT did not appear able to come to grips with the situation in which they found themselves, i.e. that the proposed coupe may not be suitable as a logging site.

Key Findings and Recommendations

1. The expert reports and field studies by the research team indicated that FT has, to date, failed to conduct a complete risk assessment;

2. FT did not appear to be able to factor in community concerns, particularly in respect of the special nature of industry sector concerns and broader issues relating to community water use issues;

3. One emergent finding, although not discussed, was the way in which local government appeared to be frustrated, despite their best efforts to participate in the direction and management of their upper catchment systems;

4. If the issues at the centre of the present case study are typical of what is happening in the rest of the state then the case study team recommends the establishment of community based audit teams to audit forestry practices against the Forest Practices Code and ISO 14000;

5. We would argue that the present impasse is resolvable. Rather than look upon the current stalemate between FT and local Community as unresolvable, our team proposes that the proposed logging area be set aside and managed by the community under a ProSilva (see appendix 5) model. For its part the Tasmanian Organic-Dynamic Producers would be interested in certifying the area under its new Ecological Certification Classification. Also, with the changes in policy regarding the use of the residue from forestry operations as a source of energy, ProSilva has become, more than ever, a viable option for low impact forest management.
References


SGS, 2000, Internal Certification Services, Interna; EMS Auditor Training Course.


A Note Regarding Appendices

The following appendices have been electronically scanned and the editor has tried to ensure that each report is error free. Should errors or omissions be found the editor shall assume responsibility.
APPENDIX 1

Report on Water Quality Issues, Coupe SFI56B, Bass
P.D. McIntosh - Forest Practices Board
BACKGROUND

Mr Paul Rosevear, Forestry Tasmania, Scottsdale requested advice on potential effects on water quality from logging planned on the coupe, which is centred on map reference 420275 on the Maurice 1:25 000 map. Clearfelling for *Eucalyptus nitens* plantations is planned. Plantation establishment will involve the use of glyphosate at the rate of 1.5 litre/ha (active ingredient) and Brushoff (metsulfuron) at the rate of 30 g/ha (active ingredient) after cultivation (to kill weeds and regrowth) and a second spray of glyphosate at a rate of 1.1 litre/ha one week before planting. No insecticide spraying is planned. The fertiliser application rate will be 125 g of diammonium phosphate (DAP) per tree 6 weeks after planting. The neighbouring farm is managed using organic methods for beef production and concerned was expressed by the landowners that the quality of water from a domestic intake from a stream in the coupe might be affected by harvesting, spraying and fertiliser. To assess these risks the western part of the coupe was visited on 17 August 1999, in the company of Paul Rosevear and Sean Blake (FT) and the neighbouring landowners (Ann and Martin).

TOPOGRAPHY, GEOLOGY, VEGETATION AND RAINFALL

The land is mostly undulating to rolling (0-11°), flanked by hilly slopes (12-19°) with a westerly and northwesterly orientation. Altitude varies from 630m to 730m. The soil parent rock is strongly weathered granodiorite (Tasmanian Department of Mines, Geological Atlas 1:250 000, Launceston). Vegetation is wet forest dominated by *Eucalyptus delegatensis*. *E. regnans* and myrtle (*Nothofagus cunninghamii*) occur in gullies. Mean annual rainfall is approximately 1600 mm.

SOILS AND DRAINAGE

The predominant soils seen in road cuttings in the area are gradational soils similar to Diddleum soils described by Laffan et al. (1995). These soils are deep and well drained and have a low erodibility rating.
Two streams drain the western slopes of the coupe. Both are Class 4 streams. Stream 1 (Figure 1) is derived from springs that start at the western margin of the coupe, at a “headwall” which has clearly been formed by progressive collapse behind the area of springs. The headwall is a very steep slope about 3 m high. The springs themselves are conduits up to 5 cm in diameter and occur 10-20 m downstream of the headwall. According to the landowners Stream 1 flows at about 5-9 litre/sec. Stream 2 starts as springs within the coupe about 30 m upstream from the domestic water intake. There is a similar headwall upstream of the springs, but it is not as high as the headwall upstream of Stream 1. According to the landowners Stream 2 flows at approximately 2 litre/sec. If an average 2 litre/sec flow is assumed, and an infiltration rate of 600 mm per year, then this stream will have a catchment of about 8.8 ha, i.e. the water in the stream will be derived from an area with dimensions approximately 300m x 300m on the rise and plateau area immediately to the southeast of the headwall. It is not necessary to invoke seepage from further upslope to explain the observed flow.

Over the nine years that the domestic water supply has been operating the dam of approximate dimensions 4m x 4m x 0.6m depth, or 9.6m$^3$ in volume has almost filled with sandy sediment. Assuming an 8.8 ha catchment area, this gives an approximate erosion rate for the granodiorite at this location of 0.1m$^3$ per hectare per year. As there is little sign of surface erosion, this sediment production is assumed to be derived from erosion of the subsurface conduits. Little of the sediment produced flows down the stream, which generally runs clear. Sediment is not at present a problem for the domestic water supply.

**RISKS AND RECOMMENDATIONS**

**Harvesting**

Because the soils have low erodibility and good drainage they also have a low erosion risk and conventional harvesting following Code provisions is unlikely to have any effect on water quality. However, because of the risk of damage to underground water conduits, it is recommended that for this coupe the following additional provisions be followed:

- headwalls as described above to be marked on plans
- no harvesting within 50 m of headwalls
Cultivation

Cultivation poses more of a risk to water quality than harvesting, because of the amount of bare soil exposed for considerable periods. The provisions for low erodibility soils in table 12 of the Code will apply. Cultivation should be along the contour and should not be done on slopes exceeding 19º. The following additional recommendations are made:

- no cultivation within 50 m of headwalls
- no cultivation within 30 m of the domestic water intake

Spraying and fertiliser

Because the soils are well-drained, and deep, and drainage is largely subsurface, the soils should act as excellent filters for any chemicals applied at the surface. The soil volume available for roots is large and there is a good opportunity for trees to absorb applied fertiliser. The Forestry Tasmania Pesticide Application Manual Update “Buffer Zones Revisited” specifies no aerial spraying within 50 m of creeks and sensitive boundaries, no ground-based tractor and boom within 30 m, and no hand application within 10 m. Three additional recommendations are made to protect the domestic water supply and the organic farming enterprise:

- no spraying (by any means) within 30 m of the domestic water intake
- treat the western boundary as a “sensitive boundary”: no aerial spraying within 50 m of boundary, no ground-based tractor and boom within 30 m, and no hand application within 10 m
- consult with FPB if spray regimes different from those mentioned in the introduction to this report are planned

Alternative outcome

The above recommendations are minimum recommendations. The alternative, discussed in the field, is to leave the native forest on hilly land (12-19º) adjacent to the organic farm intact. This procedure, in combination with a 50 m no-harvest zone around the headwall of stream 2, would also ensure adequate protection of the domestic water supplies and the organic farm.

REFERENCE


SIGNED P.D. McIntosh DATE
APPENDIX 2

Reports — Dr Owen Ingles
Dear Ms. Geschwendtner,

**IMPACT ASSESSMENT of FORESTRY OPERATIONS on ORGANIC FARM**

Pursuant to your request for a risk assessment for your property near Diddleum Plains, in respect of proposed forestry operations to the north and east thereof, I offer the following initial comments which at this time I prefer to call an impact assessment, since the risk factors involved are so poorly defined in terms of operational procedures of the Forestry Commission. For legal reasons (indicated later) those operational procedures could form a basis for a claim in negligence arising from the many and varied risk factors.

In what follows, I have assumed the correctness of the proposed line of roading as shown on the map (No.17) which you supplied to me; and that your property is lot 0211 on the Tasmania 1: 25000 series, Maurice sheet.

Your property and the neighbouring proposed coupes are situated on Devonian granodiorite (Tas. Dept. of Mines, Alberton sheet, 1993) which my experience tells me weathers to a coarse sandy soil with very minor clay content, kaolinitic. This is confirmed by the Tas. Dept. of Agriculture, Land Systems of Tasmania, Region 4,1980- which describes the area soils as “loose and friable, often with coarse sand texture” (code 641341) and adds - as would be expected for such a soil - that it has moderate permeability. In my experience this soil’s permeability would be between $10^{-1}$ and $10^{-2}$ cms/sec; or in imperial measure, more than 2 miles per year. Thus soluble contaminants can travel great distances in a short time in such a soil.

The Agriculture Dept. indicates that an average depth of soil on the steeper slopes would be 60 cms, and on the flatter levels, about 150 cms. They note as a hazard warning that severe sheet erosion can occur on the steeper slopes. I would assume that this stated hazard warning imposes a duty of care on any
developer, statutory or private, to ensure that erosion does not cause damage to others.

Erosion is, of course, caused principally by rainfall (in your area, $\geq 1250$ mms/year) and the natural erosion rate depends on topography (slope angle), and vegetation (or absence thereof), and can be seriously increased by inappropriate construction or usage practices. As an example, consider the following data (Dryness, 1967):

<table>
<thead>
<tr>
<th>Site Factors</th>
<th>Mass movements (%)</th>
<th>Total Area (%)</th>
<th>No. of events per 1000 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undisturbed forest</td>
<td>10.6</td>
<td>84.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Logging of forest</td>
<td>17.0</td>
<td>13.6</td>
<td>3.9</td>
</tr>
<tr>
<td>Road Construction in forest</td>
<td>72.4</td>
<td>1.8</td>
<td>125.9</td>
</tr>
</tbody>
</table>

The topographic maps show slopes of circa 11° to the N,W, and S of your land, and slopes of circa 22° to the East. Your land extends across the headwaters of the Brid River, and according to another official Government publication (Land Capability Survey of Tasmania, Pipers sheet, K.E.Noble, 1990) falls into classes 4 and 5, described on p.31 of that survey as “can be easily eroded under poor management”. Another clear warning: as concerns liability, note especially the words ‘easily’ and ‘poor’ in that official phrasing.

What, then, is the likely technical impact of the proposed developments? This is as follows:

1. **ROADING.** The road alignment has been sensitively chosen to have virtually no impact on either your land or water. What is often a major concern (see table above) is in your case of negligible impact.

2. **LOGGING.** There may be a very minor effect on the extreme NE corner of your land, and there will be some erosion effects, inter alia, at the SE corner of your land, especially affecting the Brid river water. Because of the nature of the local soils, the water QUALITY will not be affected initially by logging, but its QUANTITY will be changed, and erosion considerably increased. There is no risk of contamination from the logging operation per se.

3. **USAGE.** The post-logging period, and reafforestation time will be times of severe erosion on these steep slopes if clear-felling is adopted (Japan uses selective logging rather than clear felling, which is so destructive of steep slopes in high rainfall areas). The net result will be a loss of soil which
will ultimately render the slopes unproductive for timber yields (barren) in a relatively short space of time (soil formation is very slow on granodiorite). Some of the soil washed off the higher slopes will probably add to the depth of soil on the lower slopes (your land) to your ultimate advantage? Therefore, the only risk I can foresee is in the use of chemicals on the neighbouring higher land.

Use of chemicals and/or fertilisers on land to your east will undoubtedly lead to contamination of your land by those additives, both because of the high soil water transfer rates (see p.1) and by your usage of Brid river water for irrigation. The contamination will be to some extent transient rather than permanent, because of the low clay content in the soil and the high rainfall. However, it might not be innocuous for organic farming requirements. Hence my advice would be that you examine closely your legal rights in respect of post-logging usage rather than roading or logging procedures.

I appreciate the difficulty of challenging a statutory authority such as Forestry Tasmania, but it may not be without prospects of success as you will see from some xerox material which I append herewith as a sort of “starter kit” for your chosen legal adviser. In particular, I would suggest that you should obtain a written assurance that no chemicals or fertilisers will be allowed to escape from their area of operations; and failing that in writing, get such a statement from an officer of the Commission in the presence of witnesses.

In conclusion, “A landowner may not allow his land to be put to a use which unreasonably interferes with the use or enjoyment of his neighbour’s land” (R.A.Buckley, “The Law of Nuisance”, Butterworths, 1981). Also, Barwick.J. in Benning v. Wong 122CLR @ 255, “It should now be regarded as settled that a person who brings onto land a thing or substance likely to prove dangerous to land or persons if it is not confined to that land is absolutely liable to the owners or occupiers of land to which that dangerous thing or substance escapes for damage done by that thing or substance to that other person’s land or to that person, or a person for injuries to whom that person is responsible, on that land.” Finally, where an action for nuisance lies, a landowner may obtain an injunction to prevent the offending use of the defendant’s land.

The addenda will serve to show you when and where the offending use may reach even against a public authority. I especially commend to your notice the second paragraph on p.19, concerning the liability of public authorities for information. Hence I suggest that your principal protection lies in sound legal advice more than in risk analysis at this time.

Yours sincerely,

Owen G. Ingles (Dr.)
ASTM certificated Environmental Site Assessor.
Tasmania 6394 4688

Mrs. Ann Gschwendtner,
RSD 460, SOUTH SPRINGFIELD,
Tasmania 7261.

Dear Mrs. Gschwendtner,

Re: Proposed Forestry Operations in coupe 1568

Thank you for your letter of 26 March, and enclosures, especially copy of the letter from Mr. Farmer of Forestry Tas. offering leasehold areas with an unspecified deadline for acceptance. I regret pressures of other work have delayed my reply, and I trust this will still reach you in time.

Please find enclosed the two maps which Mr. Farmer sent you; and on which I have taken the liberty to superimpose by full and dashed red lines on the “area A” map, and by a dashed line on the “area B” map those areas which would be necessary to exclude from timber harvesting if (a) your water supply was to be protected - full red line and (b) your property was to be protected from contamination - dashed line. Areas WITHIN for case (a), or TO THE LEFT for case (b) should be excluded.

You will notice that area A is insufficient in size to protect your water intake, and I therefore consider this lease offer quite inadequate. It would help (it’s better than total logging) but it would not, in my opinion, have the value currently placed on that lease by a factor of more than 2. On the map of area B, you will see that the area necessary to protect your property is likewise quite inadequate (by about a factor of two) to the SOUTH of your water intake; but, rather curiously, includes a large zone NORTH of your intake which has no effect of any significance on your property and would not need to be leased. So, again the offered lease area has no substantial value for you unless you could persuade Forestry to exchange an area on the north end for a roughly similar area at the south end.

I will write separately in a few days time re the possible contaminants, and with comment on the McIntosh report. Meanwhile, I would suggest that you advise Mr. Farmer and also your solicitor of the contents of this technical advisory note, in the hope that Mr. Farmer will re-examine the details of his offered leases, which currently appear to have insufficient merit for your commercial needs.

Yours faithfully,

Owen G. Ingles (Dr.)

5 April 2000
Mrs. A. Gschwendtner,
RSD 460, SOUTH SPRINGFIELD,
Tasmania 7261.

Dear Mrs. Gschwendtner,

I have now been able to consider the McIntosh report, and comment as follows.

I have so far been unable to trace the exact chemical formulation of glyphosate and metsulfuron, so cannot comment on their likely travel distance or active lifetime at present. Di ammonium phosphate is harmless fertilizer (non-toxic according to my chemical hazards list).

I agree with McIntosh’ remarks on topography, geology and rainfall in general, but qualify that by saying that he underestimates the maximum slopes by 3° (should be 22°), which is a serious matter as regards erosion: also the annual mean rainfall may be as much as 20% below his estimate (forest felled).

On soils and drainage, I most definitely differ in one vital respect - these soils are of HIGH erodibility. The headwalls which he describes are almost certainly landslips, and clearing will start a whole lot more. Whilst the area is under natural bush the erosion will, indeed, be minimal because much soil is root bound; but after clearing and killing regrowth the erosion rate will increase dramatically - see my previous letter’s table. I believe the rate will be at least tenfold what McIntosh estimates, even without allowing for the inevitable landslips.

On his recommendations & risks:- I agree that initial logging is unlikely to affect water quality -but there is certainly a HIGH erosion risk. I believe any slope with inclination equal to or greater than that where headwalls have been noted should NOT BE LOGGED. There will be serious landslips if they are (and I speak as a national landslip expert here). I also stress that there is no margin of safety whatsoever in that recommendation of mine, other than that the slips will be of limited size and randomly spaced due to the temporary
binding of the (felled) vegetation roots (this was recognised along the West Tamar as early as 1847 in published technical papers).

I agree with his comments on cultivation, but again with the proviso that there be NO cultivation on any slope equal to or greater than one on which a headwall occurs. Also, the provisions for low erodibility DO NOT APPLY (see my earlier remarks on erodibility). I would increase the distance from the domestic water intake, as it seems to have no margin of safety.

Re spraying and fertilising: I strongly disagree that these soils will act as filters. There is too little clay in them, and what clay they have is of the lowest uptake class (i.e. kaolin). Please refer to my earlier mapped zones to see what I believe is necessary to avoid contamination of your water supply and land. I do not agree with McIntosh on this aspect.

Finally, I do endorse McIntosh’ “alternative outcome” paragraph, with the added headwall exclusion area which I described above. They are indeed minimum recommendations.

Yours sincerely,
Owen G. Ingles (Dr.)

APPENDIX 3

Reports — Pat O’Shaughnessy and Assoc. Prof Brian Finlayson
4 August 2000

Dear Ann

I have attempted to delineate the catchment above your source and it could be 2-3ha in area. I have shown it on the enclosed tracing. The vegetation is largely a rainforest type comprising a myrtle beech and treefern overstory with a small eucalypt patch on the eastern side. The area is approximate only as I would need a 60% photo overlay to get a stereo i.e. 3 dimensional image.

In your area with an average rainfall of about 1500mm the vegetation would use about 800mm a year leaving a surplus for streamflow of 700mm, or 7 megalitres per ha, or a total of 14-21 megalitres per year depending on the contributing area. This amounts to an average of 38 000 to 57,000 litres per day available for streamflow (Spring flows could amount to 3 times Autumn flows)

If the rainforest area in the catchment to the off take were excluded from planting and no fertilizer used, the water you use should remain free from added chemicals. Given the saturated conditions of the site and its generally eucalypt free status it is very doubtful whether the site is suitable for plantation tree use. I would recommend making a strong claim that the site be kept clear from planting if for no other reason than it is not suitable for eucalypt.

With best wishes

Pat O’Shaughnessy
Report on the property of Mrs Anne Gschwendtner —
effects of proposed forestry operations on water supply

Associate Professor Brian Finlayson
Centre for Environmental Applied Hydrology
Department of Geography and Environmental Studies
The University of Melbourne.

This report is written in response to a request from the Environmental Defender’s Office (Tas) Inc. to provide comment on the impact of logging operations on the supply of water to the property of Mrs Anne Gschwendtner at South Springfield, Tasmania.

The Gschwendtner’s run a certified organic farm at South Springfield on the block labelled 0211 in Figure 1. They source their water for the farm and their domestic supplies from a catchment in State Forest adjacent to their property. The spring from which they draw their water is shown on Figure 1 (marked as Spring 1) as is an alternate possible water supply from the same area of State Forest (marked as Spring 2).

I have not had the opportunity to visit this site and in preparing this report I have used documents supplied to me by the Environmental Defender’s Office in Hobart. These consist of a letter from Ms Susan Gunter, Principal Lawyer, outlining the problem and posing questions about this case; two versions of a report by Dr P.D. McIntosh to the Forest Practices Board about this case; and letters and maps from Forestry Tasmania to the Gschwendtners offering to lease parts of the logging coupe to them to protect their water supply. I have also had a meeting with Mr and Mrs Gschwendtner in Melbourne in which I was able to obtain first hand information about this site.

This area has a mean annual rainfall of around 1650mm and bedrock is granodiorite. Topographically, the catchments of both these springs consist of first order streams with valley side slopes up to 20°. The valley floors are wet areas and in places the stream flow is underground. The slopes are dominated by Eucalyptus delegatensis and E. regnans which was apparently selectively logged in the 1930s and only poorly regenerated. The valley floors support a community of rainforest species including tree ferns and myrtle.
Figure 1 Catchment area to the two springs with headwall near the Gschwendtner property. Grid squares are 1 km. (Extract from the Maurice 1:25 000 topographic sheet)
In terms of geology, soil development, topography, vegetation and climate, this area can be considered closely similar to the catchment of the Watts River in Victoria. The advantages offered here by this similarity are that there is a considerable body of experimental data available for the Watts catchment and in this report I will draw on that experimental data to support the contentions I make about the likely behaviour of the catchment at South Springfield.

Three matters will be addressed in this report which arise from the questions posed in the letter from the Environmental Defender’s Office. They are:

1. The likely impact of logging of this coupe, and its subsequent conversion to plantation, on the quantity of water available at the springs from which the Gschwendtners take their water supply;
2. The likely impact of logging and plantation establishment on water quality;
3. The likely effectiveness of the buffer zones offered by Forestry Tasmania as leasehold to the Gschwendtners to protect their water supply.

1. Water Yield

Yield of water at these springs is a function of the climatic water balance of the topographic catchment which lies upslope from them. On Figure 1 I have drawn in the boundaries of the catchment for each spring. These are not strictly accurate because of the limitations imposed by the scale of the map available to me but they are sufficiently good to form the basis of this analysis. Spring 1 has a catchment area of approximately 1.4 ha and Spring 2, 2.4 ha. These catchment areas are probably accurate to within a few tenths of a hectare.

Langford and O’Shaughnessy (1977) provide water balance data for small experimental catchments at North Maroondah in the Watts River catchment. Using that data it can be assumed that for the South Springfield catchments with rainfall of 1650 mm there will be approximately 600 mm of runoff. On this basis, Spring 1 has an annual average yield of 8 Ml and Spring 2, 14 Ml. There will be a seasonal pattern to flow with highest flows in winter and early spring and low flows in summer and early autumn. In this area the dominant influence on the seasonal pattern of flows is the seasonal pattern of evapotranspiration such that any change in the evapotranspiration of the vegetation cover would have greatest influence on the summer flows.

---

5 Ml = Megalitres or million litres
Dr McIntosh has approached the issue of water yield from a different perspective. He has taken estimates of the instantaneous flow rates of the springs and extrapolated these to annual totals and then used an assumed water balance to calculate a catchment area for the springs. The problem with this approach is that the result is critically dependent on the estimate of instantaneous flow rate from the springs\(^6\) which is not well known. His calculations give an estimated catchment area for Spring 1 of 8.8 ha. A catchment of this size contributing water to Spring 1 is not possible since the maximum area available based on the topography, and as calculated based on the catchment area shown on Figure 1, is only 1.4 ha. Dr McIntosh’s catchment area of “approximately 300 m x 300 m on the rise and plateau area immediately to the southeast of the headwall” requires water from across the drainage divide to flow to Spring 2. This is physically impossible.

Dr McIntosh’s report also states that “it is not necessary to invoke seepage from further upslope to explain the observed flow”. That is true in the sense that he has calculated an area larger than is available topographically anyway, but it reveals a difficulty in his analysis of this problem which will become important in Section 3 of this report. The point is this. In an area where the water balance is such that there is a climatic excess available for runoff, that runoff will travel downslope either over or through the soil along the line of steepest slope. The whole of the topographic catchment (as shown in Figure 1) will contribute runoff to each of these springs but areas outside that catchment will not. Therefore, only logging in the catchment areas shown on Figure 1 will affect the water supply to the two springs.

The immediate effect of logging these catchments on flow at the springs will be an increase in streamflow. The canopy trees are responsible for most of the transpiration and their removal allows that to be converted into runoff. This effect will be most noticeable in summer as that is the season when transpiration is at a maximum. This initial increase in water yield is temporary and disappears as the forest regenerates. In this case, ‘regeneration’ will be as a plantation of Eucalyptus nitens.

The research in the catchment of the Watts River in Victoria, referred to above, has shown that stands of Ash-type Eucalypts have an age-dependent water yield, the general form of which is shown in Figure 2 (Jayasuriya et al., 1993). It is difficult to give estimates of the impact, long term, of the conversion of this site to an E. nitens plantation, though E. nitens is an Ash-

\(^6\) A second difficulty with this approach is that it uses two sets of assumptions to solve a problem which can be solved using only one.
type Eucalypt and can be expected to behave similarly to the stands of E. regnans which were the subject of the studies in the Watts catchment. While the development of a plantation is not the same as the regeneration of a forest after fire or natural regeneration after clearfelling, it is the case that tree growth in the plantation is promoted by artificial fertiliser and weed suppression. Growth of the plantation is therefore expected to be vigorous so the curve in Figure 2 should provide at least a schematic representation of the pattern of water yield through time.

Figure 2. The relationship between water yield and forest age for Ash-type eucalypt forests. (Source: Jayasuriya et al. 1993)
Figure 2 shows that water yield from an Ash-type Eucalypt forest is at a maximum for old growth forest (>150 years old) and is at a minimum for forests of 20 to 50 years of age. Management of the E. nitens plantation to be established on this site will probably have a rotation period of around 20 years. In this case, the water yield will be maintained at close to the minimum so it can be expected that the impact of logging this area and converting it to E. nitens plantation will permanently reduce the water yield from the catchments which supply the Gschwendtner’s farm by around 50%. Further, most of the impact will be on summer flows so it is likely that flow will cease altogether during summer.

2. Water Quality

I have not been provided with a management plan for the harvesting and replanting of this area but an indication of what is planned can be gained from Dr McIntosh’s report. He recommends protection of water quality by the establishment of a 50 m buffer zone around the headwalls at the two springs. However, only the sector of the buffer zone which lies upslope of the spring will offer any protection to the water supply and that is not enough anyway.

The wet areas of these catchments are, based on the descriptions I have been given, similar to the soak area in Myrtle No 1 catchment which is one of the experimental areas in the Watts River catchment described by Langford and O’Shaughnessy (1977). Finlayson and Wong (1982) have provided a detailed description of the wet area in Myrtle No 1 and discussed its hydrological behaviour and Finlayson (1981) has pointed to importance of subsurface flow paths in these kinds of geological materials. They described the wet area as a channel fill composed of bedrock boulders, partly decomposed logs, vegetal detritus, lenses of sediments deposited by the stream and mantled by a sparse ground cover of ferns with substantial areas of bare ground. They describe this material as highly permeable, penetrated by underground conduits which in places carry all of the flow, and honeycombed by the burrows of freshwater crayfish (*Engaeus*) which further enhance permeability. It is clear that any disturbance to an area like this by logging operations or by replanting will have a substantial and immediate effect on water quality. Further, the importance of subsurface conduit flow in this material means that any applied chemicals will be delivered to the spring site without any opportunity for buffering by the soil.

Grayson et al., (1993) describe the impacts on water quality of clearfelling an old growth Eucalyptus regnans forest. This experiment was carried out on the
same Myrtle catchment described by Finlayson and Wong (1982). The results of this study showed that harvesting and regeneration did not have a major impact on stream physical and chemical water quality. However, this outcome was only achieved by strict adherence to standards higher than those set by the Victorian Forest Code of Practice during the logging operations. Important aspects in this case were:

- suspension of logging during wet weather;
- protection of the wet areas with 20 m wide buffer strips around them;
- all roads, snig tracks and log landing areas were drained into areas of high infiltration capacity;
- there were no road or track crossings of the creeks;
- compacted areas such as log landings were deep ripped.

It is also the case that no chemical sprays were used at any time in the operation and no fertiliser was applied to the regenerating forest.

It can therefore be concluded that in order to prevent any adverse impact on water quality at the springs used by the Gschwendtners, the following provisions will need to be included in the management plan for logging and replanting of this area:

- identification of the wet areas in the catchments of the springs;
- establishment of a buffer strip at least 20 m wide around the wet areas;
- total exclusion of the wet areas and buffer strips from any impact of logging or replanting (ie these must be total ‘no go’ areas);
- careful management of snig tracks and log landing areas to divert any runoff generated from compacted ground into places where it will infiltrate;
- deep rip any compacted areas;
- cultivation for replanting must be along the contour.

2. **Buffer Zones**

Forestry Tasmania have offered the Gschwendtners three options to deal with the impact of logging on their water supply. Option 1 is that they simply remove their intake pipe and cease taking water from Spring 1. Option 2 is the right to lease a notional area on which to bury their water intake pipe. Although not stated in the letter from Forestry Tasmania, the map provided for Option 2 (reproduced here as Figure 3) shows an area around each spring which appears to be the 50 m zone to be protected from logging recommended by Dr McIntosh. Option 3 is that they lease 11.2 ha from
Forestry Tasmania (the area shaded red in Figure 4). I will discuss these three options in turn as they affect the Gschwendner’s water supply.

**Option 1**
This option has the effect of denying the Gschwendtners access to their existing water supply from Spring 1, and presumably Forestry Tasmania see this as discharging any obligations they have to the Gschwendtners as regards the supply of water. Under this option, the Gschwendtners would have to source their water from Spring 2 which is on their own property anyway. Logging the catchment of this spring and establishing a plantation will reduce the flow by up to 50% and probably cause it to cease altogether in summer, and have a detrimental impact on water quality.

**Option 2**
As described above, a buffer of 50m around the springs will give no protection to the water supply either in terms of quantity or quality. Under this option the Gschwendtners will pay $500 per annum for a reduced and polluted water supply.

**Option 3**
Most of the area offered for lease under this option is downslope of the springs and therefore excluding this from treatment will not provide any protection to the water supply at the springs. I can see no logical reason why this area has been offered for lease to the Gschwendtners. If they accepted this option they would pay $750 per annum for 20 years and still suffer reduced water supply and a deterioration of water quality.

**Summary**
1. The catchment areas of the two springs which drain the area to be logged are shown on Figure 1. These are the areas which must be managed to provide protection to the water supply at the springs.

2. Logging of these catchment areas and replanting will reduce the annual water yield of the springs by up to 50%.

3. Logging of these catchment areas and replanting will adversely affect water quality. Increased turbidity can be expected until the plantation has become well established. There is a strong likelihood of chemical contamination from spraying.

4. None of the three options provided by Forestry Tasmania to deal with the problems of water supply and water quality provide any protection to the water supply at all.
Fig 3. Forestry Tasmania’s map of the land to be leased to the Gschwendtners under Option 2.
Fig 4. The area shaded red is the area offered for lease to the Gschwendtners under Option 3.
References


APPENDIX 4

Letter from FT to Mr and Mrs Gschwendtner regarding options for sourcing water from the forest site
Dear Ann & Martin,

I refer to your letter dated 3rd March 2000.

A number of issues need to be addressed in resolving this matter:

1. The lease aims to legitimise your occupation of State forest.
2. The lease will provide the opportunity for you to legitimise your harvest of water at the point of current intake.
3. I will be seeking a long term lease over the larger buffer zone otherwise that forest which is not required to protect water quality (as a function of Peter McIntosh advice and the Forest Practices Code) will be harvested.
4. The timing of harvest is inconsequential to the negotiation.

As such 3 options exist and the matter needs to be resolved as soon as possible. My deadline and the date of commencement as previously advised still apply.

**Option 1:**

No lease at all and you remove all your equipment.
**Option 2:**
Lease “area A” which is the minimum area to be set aside in the harvesting plan. Area A is not an actual area per se but rather a right to locate your siphon and pipe on State forest to harvest water. The right is not exclusive. I am prepared to accept a 5 year lease over this area at a cost of $500/annum. The pipeline will need to be buried at least 700mm below the surface.

**Option 3:**
Lease “area B”, the area attached to area A. This will be a long term lease (minimum 20 years). The cost for such is $750/annum (inclusive of A & B). Area B would be marked on the ground and subsequently managed as a protected area should you take up this option.

Please advise me of your decision.

Yours faithfully,

Brian Farmer

DISTRICT FOREST MANAGER

Anne,
I suggest that you make an appointment to come in & see me next time you are in town.

Thanks,

[signature]
APPENDIX 5

Report ProSilva by Strie, Sprod, Mills, Leech and Harris
**ProSilva: quality management in our forests**

Frank Strie, Schwabenforest PL; 14 Brady’s Lookout Rd, Rosevears, 7277
Daniel Sprod, DPIF; P0 Box 46 Kings Meadows, 7249
Duncan Mills; Leverington, Epping Forest, 7211
Mark Leech, Private Forestry; P0 Box 46 Kings Meadows, 7249
Andrew Harris, Launceston Environment Centre; 34 Paterson St, Launceston 7250

**Abstract**

ProSilva is a name given to a form of forestry management based on subtle intervention into natural processes. Similar approaches are emerging around the world because of their capacity to accommodate immediate and long term market objectives in addition to long term ecological sustainability. The fundamental principles necessary to achieve this, and the outcomes arising from it, are discussed in detail. Consideration is given to the potential for its use in Australia, in particular the advantages that the Australian context offers. Suggestions are made for immediate introduction to private forestry practice in Australia.

**Introduction**

**Vision**

A forest that offers a finely tuned, proven and stable environment for growing trees, with simple low impact techniques....

A forest that can be managed for market and ecological objects, with minimal risk, to produce a range of services to the ecology and products, occupations and experiences for the market....

To many this will sound like a romantic dream, and yet there is a practically based, emerging philosophy of forest management that can do just that. It is called “natural” forestry or ecoforestry and is being promoted by a European entered international network calling itself “ProSilva”. It has the potential to bridge the gap between outright preservation of our native forests and potential destruction.

The challenge is for us to turn this into a communicable and workable vision.
Philosophy

Science is showing much more there is to know and the magnitude of mistakes in our management of our natural world (refer ozone depletion, Greenhouse effect). Given that management has been effected largely by well meaning people over the years, the possibility is that the very foundations of our management may be fatally flawed\textsuperscript{1} Evidence is accumulating that reductionist science can help us identify the problems -but given the complexity and dynamics - it may never solve them in time.

This is leading to talk of a “paradigm shift’ - not only in forestry - but in broader society and in the way we conduct science.

The prevailing paradigm has been a power postured, techno/economic worldview encouraging the view that complex systems could be understood by knowing enough about their parts, and pasting this knowledge together. As the inadequacies in this view have surfaced, a systemic, holistic and ecological view has been sought.

This fundamentally different view - holism - looks outwards from the problem to bodies of knowledge, and weaves strands from disparate disciplines into a single cloth, instead of looking inward at a problem from the vantage point of professional specialisation\textsuperscript{2} In creating this awareness, deficiencies in language and conceptualisation appear. But so too does an interlinked understanding that almost automatically integrates such previously contrasting disciplines as economics and ecology (see Figure 1).

“ProSilva” or “for the forest”, provides a cogent easily communicated name to a philosophic approach to forest management that has the potential to
bridge the gap between outright preservation of native private forests and potential destruction.

It differs from accepted forestry practice in raising the emphasis of cautionary principles, long term and holistic valuation and a decreased emphasis on short-term profit maximisation, which by its very nature, is short sighted.

It differs from the hard line conservation view of ecology, in the acceptance that science, trading and the market place are an integral part of humankind’s social system, and this is in turn a part of the broader ecosystem.

Inherent in the philosophy of ProSilva is the recognition that it fits within a new social development strategy (Table 1).

- To develop community empathy with bush values.
- To encourage a more ecologically sympathetic land use.
- To provide as many fulfilling occupations as economically practical in perpetuity.
- To ensure all economic evaluations satisfy ecological considerations and precautions.
- To encourage the development of holistic intellectual skills and understandings of the dimensions of quality in human lives, at all levels of the human development process (Education)

Table 1: A ProSilva social development strategy

Roots of ProSilva

Following the 1990 windstorms that devastated European forests, windthrow scattered 115 millions cubic metres of timber onto the ground and into the market^4. 
Forests managed under ProSilva principles by private owners were considerably less damaged, and this promoted public and professional debate as to the validity of the current management in publicly owned forest.

As a result, all German, Austrian, and Swiss public forest Authorities reviewed their methodologies and are in the process of implementing changes to management under ProSilva principles. These principles are those that have been employed by many forest cultures through-out history and around the world4.

Toward the end of the eighteenth century, timber became scarce in Germany: it had been exported, used as fuel for the budding metal and chemical industry and in ship building. Further, farmers had scoured the forest floors for litter to bed domestic animals, and nobility over-stocked forests with deer, who grazed any regrowth. In recognition of the continuing need for wood products, the world’s first forest academy was in operation by 1811 in Tharand, Saxony, promoting monocultural cropping of trees to feed growing industrial needs.

Karl Gayer challenged this view in *The Mixed Forest* (1886), but it was not until Alfred Möller’s *The Natural Forest Concept* (1922) demonstrated the efficacy of the “Plenter” system that private forest owners began to pay attention. The “Plenter” system involves managing on a single stem basis, and was developed by Swiss, Austrian and Bavarian alpine farmers because of their need for a continuous steady flow of forest and ecological products.

These ideas have progressively been implemented by private forest owners throughout central Europe.

In September 1950, forest professionals and land owners from south-west Germany formed “Nature-Based Forest Management” (*Arbeitsgemeinschaft Naturgemaesse Waldwirtschaft*), and in September 1989, professionals from 10 European countries founded ProSilva.

This organisation has since spread to Canada and Chile.

**Forest Management Principles**

**Principle 1: Recognition of ecosystem potential**

As the basis for production is the soil, attention is given to ensure the fertility is maintained or enhanced. Thus massive soil disturbance, land slip, erosion and leaching must all be avoided. This precludes such operations as large-scale clear-felling, destructive skidder operation, and mitigates against
compaction and harvesting in the wet with ground based systems. Fire, recognised in Australia as an integral force in forest ecology, is still rather a blunt tool, and as such needs careful consideration before use. Favoured methods are those which build organic matter, optimise standing biomass and diversity, encourage regeneration, permit successional forces to proceed and maximise energy flow.

**Principle 2: Suiting species and structures to the site**

Each site offers unique potential for species diversity, tree form and timber quality. Where one site will produce tall *Eucalyptus* veneer and *Eucryphia* honey, another will produce highly figured *Casuarina* for cabinet-work and slow-grown *Eucalyptus* for fuelwood. Recognition of these potentials in Australia is made easier by pre-existing ecosystems that are still largely intact. Much discussion has focussed on local provenances, but ProSilva encourages suitting species to the site, no matter where they come from. While first choices will normally be local provenance, “superior” varieties, species from other places within Australia, and exotic spp may be used for particular purposes, taking into account ecological impacts.

**Principle 3: Sustainability**

Inherent in natural ecosystems are the properties of resilience (eg drought, fire), capability for self-correcting succession (under eg. climate change), biodiversity (for genetic information and market diversity) and complexity (eg. variety of niche and ecological structures, feedback loops). When forest managers intervene in natural ecosystems, it is essential that these properties be maximised to preserve sustainability.

**Principle 4: Single stem cultivation and utilisation**

This is possibly the single most important management precept in ProSilva. Each tree is considered individually for future potential in the context of its neighbours. Stems may be retained for sawlog potential, “nurse” effects, seed potential, genetic value, physical location, visual and aesthetic effect, habitat value or biodiversity value. Growing, extraction, selection thinning and regeneration all occur simultaneously within the same patch of forest. Emphasis is placed on extraction of fewer, larger trees of higher value (the “plenter principle”). A forest maintaining a self-pruning, mixed age stand, with a stable microclimate will yield a continuous flow of products, services, occupations and experiences.
Principle 5: Permanent laneways

Extraction and maintenance “laneways” are established as permanent access through the forest. These minimise damage to growing stock and soil, and concentrate disturbance to minimal areas. They aid forest workers in selection of trees, in choosing the direction in which they are to be felled and in inventory management.

Actual spacing relies on site-specific factors such as species mix, age at extraction, equipment available and product quality and may vary in practice from 20 to 100 metres. Width is the minimum necessary for the extraction system.

System Management Principles

Principle 6: TQM

Total Quality Management is a set of concepts that has revitalised many industries, particularly the service and customer-orientated producing industries. The central idea is of workers throughout the chain of production focussing on their contribution toward the final customer satisfaction. In the very long-term context of forestry, this means that the forest worker must understand the consequences of thinning, felling, roading, etc; impacting on the final wood products - products that may take more than a human generation to produce.

Inherent in such a system as ProSilva is the potential for a stable career path and real self esteem for all forest workers through the valuable services given to industry and to the community. Working in stable and harmonious ecosystems are further rewards in themselves.

Principle 7: Persistent and intensive management

Methodologies employed are biologically pro-active and cost effective. Where the prevailing paradigm sees massive disturbance in a long time frame, ProSilva uses the continuing basic processes of nature, enhanced by gentle and persistent intervention to procure desired outcomes - quite a different scale of disturbance. This implies thorough planning, training and understanding the processes at work.

Equipment needs to be designed to be ergonomic, precise, flexible and appropriate for low environmental impact in the arenas of soil impact, pollution potential and energy use.
Principle 8: Value of market products

Higher management costs accrued through intensity of labour and the low rate of infrastructure cost recovery require higher value in the products. Thus the focus is on producing premium quality - not only in the range of species’ raw logs, but in the milling and processing. Marketing must yield premium prices. Thus the substance of Ecologically Sustainable Development and “clean, green” must be reflected in adequate pricing.

All market products are valued, including genetic information, recreation, education, research and ecotourism, clean water and unused waste assimilation capacity.

Principle 9: Landscape recovery & reintegration

Emphasis is given to designing forest infrastructure around catchment units, minimising access points, boundaries and ecological arid aesthetic impacts. Thus roading hugs land capability boundaries and ridges, avoids straight lines, runoff concentration and minimises cut and fill. Visual management systems are used, with the advanced application of topographical and geographic information systems for design.

Landscape arteries such as river systems are protected, not by total preservation, but by sensitive use of appropriate machinery and management.

Corridors enabling genetic flow and animal migration are retained, or in some instances, reinstated. This, especially in forest fringes, may entail changed land use. Certainly there are many instances where marginal, high rainfall agricultural country would be reinstated to more productive forest use.\(^3\)

Worldwide trends

Generic terms are appearing in the literature describing a shift in forest management from a wood fibre commodity driven base to a sustainable systems base providing diverse products. *New Forestry* has been the main term used in the US to describe this shift. Other samples of the new jargon from around the world are *ecologically sustainable forest management, sustainable integrated multiple use, total canopy*, and *ProSilva*. It appears that although the terms are used in different ways to mean different things, there exist many similarities in the management approaches. Certainly the philosophic basis for the apparent move for change is the same - an inherent need to provide society with the greatest sustainable net worth from forests.
Many changes are implied, which become inherent as a resource which society relies on, diminishes. The need to improve utilisation at all levels is paramount as it decreases the area based pressure and improves the ‘total product’. Research has revealed that the complexity of linkages in natural forest ecosystems are much more complex than foresters or scientists believed them to be. New approaches add knowledge and techniques to existing approaches, thereby generating more management options.6

The future will see an increasing understanding of how it is possible to achieve a variety of social goals on the same lands without sacrificing the quality of anyone. The forestry profession has an ethical responsibility to promote continuous improvement in forest science, policy and practice: but this cannot be achieved without risk.7, 8

James R. Lyons, America’s Assistant Secretary of agriculture for natural resources and environment, with primary responsibility for the USDA Forest Service and Soil Conservation Service sums it up:

*I think you are going to see a renaissance of forestry, that is, foresters developing site-specific prescriptions for how to manage public and private forestlands using all the silvicultural tools that they were taught.*9

**Relevance to Australian conditions**

Despite some quite profound differences, such as a fire-adapted ecology, based heavily on evergreen *Myrtacae*, these ideas emanating from other parts of the world find fertile ground in which to grow in Australia.

Management of native forests in Australia has followed the classical path of exploitation, control and active management. As society now demands more than a commodity base from its forest, and given the majority of the Australian population live in near proximity to the major native forests, expectations and pressure on this finite resource is ever increasing. The successful (integrated multiple use! Ecologically sustainable) management of these forests is now a task of great importance to the profession and practice of forestry.

Since the Routley’s wrote *The Fight for the Forests* in 197310 and were seen as traitors to the profession of forestry, the debate has broadened, the community has become more aware and research has shown the lack of understanding of the long term impacts of forest use. There have been many changes to the once autocratic forest services and a plethora of conflicts, public enquires and decision making processes relating to forest land use have
been undertaken. As the US Forest Service embarked on its New Perspectives program, Tasmania was struggling with its Forest & Forest Industry Strategy, a consultative landuse decision making process.

The Resource Assessment Commission has identified three major issues following its exhaustive assessment of the national situation:

1. that there is no justification for ceasing wood production in native forest,
2. there is uncertainty regarding long term impacts and a need to integrate resource management & conservation and
3. a lack of research into impacts of forest use on ecological process.

The adoption of new site specific silvicultural practices in the management of Australia’s forests will take place. There is a need to base the management of the future on high scientific objectivity. However, it is observed that some of the proposed applications or proposed practices can be viewed as working hypotheses or experiments until they are verified.

The importance of biological legacies discussed in the recent literature is of fundamental importance in the Australian biota where fire, particularly in the forests of the south-east, has provided repeated catastrophic events. The debate in adopting any non-fire/low fire management options, is intensified when fuel load management is introduced following a devastating fire event. This must be given a high priority in evolving systems of ecologically based sustainable forest management. Historically the various forest ecosystems in Australia have a broad spectrum of natural fire frequency, intensity and patchiness. However, 200 years of use of the forests has created a different environment with a changed set of values. The inappropriate use of alternative silvicultural methods may result in a long term loss of sustainability if a higher risk of a catastrophic fire event is not included in the equation. The use of appropriate systems, including fire, to strategically address the maintenance of asset values given by society must form part of any new and sustainable management system.

There is much collaborative multidisciplinary research being undertaken in Australia to balance ecosystem conservation and sustained wood production. Much of the effort has been based on allocation or separation of use to achieve the balance. The way of the future sustainable systems will be an increasing move towards truly integrated multiple use, to produce the greatest net benefit on any given site.
The debate in the US and Europe of the need for and rate of change is very intense within and without the forestry profession. Australia has rapidly embraced new appropriate technologies and leads the world in many areas. Let us as a nation be leaders and not be in a position where we are caught by a shift in consumer demand. If the concept of forest product certification based on a number of sustainable criteria is introduced more comprehensively by the major trading nations the issue of ecologically sustainable forest management will be forced on us or become a major barrier to trade.

Australia is well placed to facilitate new, more site specific practices. As the world demand for quality hardwoods increases, the expected increase in their value should allow more intensive site specific silvicultural systems, which are currently not feasible to be applied in the future.

We have some unique advantages:

We still have some sound forest ecosystems that retain their biodiversity and structure, and provide us with working ecosystem models. Central Europe never had this biodiversity due to early Holocene ice sheet scouring, the barriers to colonisation presented by the Alps, and the subsequent ecosystem simplification wrought by human activity\(^2\).

Even in synthetic and degraded ecosystems such as those now occupied by agriculture and plantations, we still have sufficient genetic material, information and modelling techniques to construct an approximate structure of the original proven forest ecosystem.

We are perhaps more open to change and adaptation than older cultures as attested to speed of adoption of technology (e.g. VCR’s, microwave cooking and second highest PC ownership in the world). Our sense of community and compassion for the weak or disadvantaged is also strong - a sensitivity that is vital in caring also for the forest community.

Two perceptions of central European, or northern hemisphere forests must be addressed:

1. These forests are not only softwoods. High quality deciduous hardwood such as oaks, beech, maple and ash are just as important.

2. Equally, different species in the northern hemisphere display the full range of shade intolerance as do our species. For instance, in our forests, myrtles and blackwoods lie at one end of the range, *Eucalyptus delegatensis* and *E. obliqua* around the middle, and *E. regnans* and *F. nitens* at the other.
Relevance to private forests

ProSilva is especially suited to implementation in private forests. Diversity of ownership spawns diversity in forest management objectives, and thus provides a rich ground for the uptake of “experimental” ideas.

Private owners benefit from a timely flow of products and services from their property: the ability to harvest one log to meet a payment on a machine, or several to satisfy the tax-man particularly suit them.

They furthermore have a deep commitment to long term future of own property. Most farmers consider the future generations in their actions, as they have often seen the impact of previous generations on their own profitability, and will be likely to forego a quantum of present profit for their children’s future’s sake.

Benefits and Challenges of ProSilva

Benefits

Benefits fall into three major categories: economic, thorough production of premium quality, diversified products; sociological, thorough provision of fulfilling, sustainable, well-placed jobs; and ecological, through enhanced landscape stability. Some variables to measure progress toward these goals are listed in Table 2.

<table>
<thead>
<tr>
<th>Prices paid for products</th>
<th>Employment per hectare.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber grade categories.</td>
<td>Forest worker turn over.</td>
</tr>
<tr>
<td>Annual timber volume increments</td>
<td>Forest worker accident rates.</td>
</tr>
<tr>
<td>Organic matter accumulation</td>
<td>Human population stability in rural and forest communities.</td>
</tr>
<tr>
<td>Species inventories.</td>
<td>Conflict assessment (letters to paper, protest, polls, forest industry job applications).</td>
</tr>
<tr>
<td>Variability of catchment flows,</td>
<td>Visitor numbers.</td>
</tr>
<tr>
<td>Stream turbidity.</td>
<td>Visitor assessments.</td>
</tr>
</tbody>
</table>

Table 2: Examples of important forest variables.
1. **Economic**: Given a forest production cycle of 30 -60 years, who is able to predict market demand? Diversity based on the balance of natural communities, providing in general terms a low cost, low risk strategy. Failures in regeneration compound reductions in mean annual volume production due to short rotations - estimated in some instances to be only 60 - 80% of that possible under longer rotations.\(^{13}\)

2. **Marketing quality timber**: As basic human needs of shelter and materials are satisfied, the aesthetic values of forest and timber become the focus of more sophisticated human demands. Extrapolating current economic growth, the demand for aesthetic based forest products is destined to grow. Already in Europe, the market has paid over $20,000/m\(^3\) for select veneer quality timber, with the median price for standard oak being $400M/m\(^3\).\(^{14}\)

3. **Sociological**: Complex, diverse production systems are very people intensive (both labour and intellect), requiring care, skill and understanding. From the careful considered felling of each individual stem, to the thinning and culling of regrowth and activities like fire prevention, such intensity offers a multitude of fulfilling occupations. This helps meet the need for jobs created by productivity growth and job shedding in the manufacturing and service industries, and furthermore provides jobs in depressed rural settings.

4. **Catchment quality**: Minimal disturbance, limb and leaf drop mulching and maximisation of leaf area are associated with diversity and successional processes, and favourably affect catchment quality. Encouragement of fast growing pioneer species such as the Acacias to shade grasses and create surface mulches provide non chemical means of weed control, as well as timber and ecological benefits.

5. **Landscape, biodiversity and aesthetic quality**: The principles of ProSilva allow for a higher value to be assigned to these historically undervalued benefits, whilst still allowing extraction. Areas which are managed in this way will complement areas retained for their true wilderness quality. Some of these benefits overflow into ecological services for agriculture such as nectar sources for parasitic flies and wasps, habitat for insect eating birds and animals, and climate modification.

**Challenges**

1. **Greater demand for skills**: Compared to the current simplistic culture of extractive use, the concept of quality management must be developed amongst the forest managers and operators. Smaller management and
ownership units found in private forestry lend themselves to this type of management. In Europe, there is an average of one professional field forester to 6000 hectares compared with one to 100,000 hectares in Tasmania.  

2. **Slower infrastructure cost recovery**: Infrastructure costs must be recovered over a longer time frame. Capital costs cannot be subsidised by exploitation of “natural gifts”.

3. **Complexity of marketing system**: Management of production forests for multiple species and multiple products varies from one plant community to another, requiring a much more sophisticated and coordinated processing and marketing system.

4. **Supervision costs**: People intensive businesses as distinct from capital intensive industries are inherently riskier and difficult to run successfully, particularly in a dispersed workplace such as a forest. Consequently ecoforestry requires a more sophisticated, self motivated, professional culture by all workers. However, ethical goals and quality associations offered by ecoforestry inherently make it easier to attract and keep forest staff of high calibre, potentially offsetting problems of a more people intensive industry.

5. **Training costs**: Developing the levels of skills and understanding required by the forest workers will be substantial. However once a “New Silviculture” is established, much can then be passed on through on-the-job experiential means and by traditional apprenticeship.

**Developing a ProSilva strategy**

**Action plans**

Forestry is at a cusp. Movements from around the world are starting to point in a similar direction - a direction that integrates multiple use of our conditionally renewable forest resources and recognises human and non-human requirements and values. We have the opportunity to develop networks for rapid sharing of hard-nosed, practical experience, but these will not happen of their own accord. Thus is proposed that an organisation be started to achieve these ends.

Table 3 enumerates actions that can empower individuals in management of their own private forests.

A fresh organisation may have the ability to weld together previously disparate groups into a cohesive whole, setting up trust and linkages, where now there is conflict.
Certainly one of the most important actions to take is developing good educational links. This can occur through existing forums such as field days organised by forest consultants or Private Forestry Corporations, but more probable is involvement in a ProSilva network.

Other forums may be provided through Whole Farm Planning for practicing land managers, or University for potential professionals.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Establishment and maintenance of an ecoforestry network.</td>
</tr>
<tr>
<td>2.</td>
<td>Location and listing of demonstration forests</td>
</tr>
<tr>
<td>3.</td>
<td>Forest manager orientation courses and field days.</td>
</tr>
<tr>
<td>4.</td>
<td>Preparation of ProSilva forest practices code.</td>
</tr>
<tr>
<td>5.</td>
<td>Forest operator training courses.</td>
</tr>
<tr>
<td>6.</td>
<td>Certification of forest managers.</td>
</tr>
<tr>
<td>7.</td>
<td>Forest product endorsement and labelling scheme.</td>
</tr>
<tr>
<td>8.</td>
<td>Public education program.</td>
</tr>
</tbody>
</table>

**Table 3: Potential actions for developing ProSilva**
Implications for forestry and land management

“ProSilva” is both the nametag and a possible vehicle for the practical extension of the worldwide paradigm shift that is taking place in natural resource management. For our forests it offers the hope of peace and fulfilment for our community. There are many values that the market process cannot guarantee, so practical community shared philosophy and ethics must be the framework for the management of our forests.

This paradigm shift is reflected by the ProSilva philosophy, requires a fundamental ethical shift from every individual, from power towards care oriented roles. It is possible that it is the ultimate test of humankind, a test that must be passed, if future generations are to be assured a life of quality and dignity.

1 Bawden, R.J., Systems Thinking and Practice in Agriculture, USA J. Dairy Sci. 7(7), 1991
3 Young, M.D., Sustainable investment and Resource Use UNESCO/Parthenon 1992
4 Der Dauerwald #8, June 1993, #9 December 1993
5 Sauders, D Reintegration of Fragmented Landscapes
6 Franklin, J.F: Scientific basis for New Perspectives in forests and streams. in Watershed management; Balancing Sustainability and Environmental Change.1992
7 Clark, R.N. 1990 : The emerging web of integrated resource management
8 Difley, J.A. : 1993 President’s Commentary American Journal of Forestry Dec 1993
10 Routley, R & V, The Fight for the Forests, 1973
13 DeBell & Curtis, Silviculture and New Forestry in the Pacific Northwest, J. For., Dec 1993
15 Anon, Forestry Comm Tas, An Rep 1992/3
Addendum to Upper Catchment Issues Tasmania Vol. 1 No. 1

Since going to press Forestry Tasmania have released the Forest Practices Plan for coupe SF156B. Assoc. Professor Brian Finlayson has reviewed the document and his comments are set out below.

1. The first dot point in Section 5 states that "......Class 4 watercourses, additional to those located prior to logging, may occur within the coupe." Surely in an area of only 55ha the watercourses should be known at the time the plan is prepared. Did the person who prepared this plan visit the site?

2. Concerns over the spillage of fuel and oil (Section 5) are focussed on preventing direct movement into watercourses. Fuel and oil spilt on the ground can still find its way into drainage water through the soil.

3. The "granite headwalls" are given a 50m radius exclusion zone. I can only assume that this has been specified to protect these springs from spray drift since the bulk of the actual catchments of these springs is left unprotected. This is despite the provision in the Code (Section D2.2, p. 58) for protection within 2km upstream of a domestic water intake. This section makes particular mention of cases "where a domestic water supply is derived wholly or predominantly from within an area of forestry operations." I assume that this applies in the case of the Gschwendtners.

4. Why are the "granite headwalls" given a 50m exclusion zone and the domestic water intake only 30m?

5. Note that the habitat clumps in this coupe are also the 50m exclusion zones around the "granite headwalls". Do they contain appropriate trees and materials for habitat clumps?

6. What is the status of the proposed lease area on the FPP map? As I pointed out in my original report, it is hard to see what benefits this area would offer to the Gschwendtners other than provide a wider buffer from spray drift.

Associate Professor Brian Finlayson
Head
School of Anthropology, Geography and Environmental Studies
The University of Melbourne
Victoria 3010, Australia
Ph: +61 3 83446333
Fax: +61 3 8344 497
Soil Tech to run forest practices audit workshops

Depending on the level of interest Soil Tech Research proposes to run environmental auditing workshops for interested members of the public. This move is in response to community perceptions that there continues to be poor adherence to FPC, particularly in upper catchment logging operations.

The aim will be to train audit teams to audit forest practices against the FPC and FPP's and there will also be training on using an ISO 14000 approach to audit operations (i.e. aspects and impact identification) so as to crosscheck the rigour of the FPC.

It is proposed that the one day course will be delivered in three locations around the state. A minimum of 6 participants per course will be required. The cost will be $10 per head.

Interested parties please contact Soil Tech on 0408 171 473.