FORESTWATCH N.S.W. 1992

volume 1

volume 2

1.INTRODUCTION.

During 1990, The Wilderness Society (TWS) and the South East Forest Alliance (SEFA) began to contemplate conducting surveys to establish whether the Forestry Commission of New South Wales (FCNSW) had been adhering to its prescriptions.

These prescriptions are designed to ensure that the essential components of a forested ecosystem remain basically intact.

The "Forestwatch" study was instigated to test the commonly held perception that if the FCNSW was self regulating, then a blindness to any breaches would be prevalent on the ground.

The FCNSW is currently targeting forests registered as National Estate with the Australian Heritage Commission (AHC).

The Register is a list of places in Australia with a demonstrated set of significant values. For those forested places on the register, these values include.

#Variety or exceptional quality as an ecosystem, landform or feature;
#Demonstration of botanical, geological or geomorphological evolution
#Representativeness or diversity as an ecosystem, landform or feature;
#Habitat of an endangered species;
#Aesthetic qualities as a natural or modified landscape;
#Scientific value for research or reference purposes.

A discussion of the current management of the National Estate values of the forests in the study area is detailed in section 2.2

The Study is based on the Victorian Forestwatch series (Pittock 1988, 1989 & 1991) with amendments relating to the forests of south eastern New South Wales. The Victorian "Code of Forest Practices"(CFP) is very similar to the FCNSW's prescriptions and therefore this study follows Mr Pittock's work. It is the first time an independent check has been conducted on the FCNSW's prescriptions.

"FORESTWATCH N.S.W. 1992" was instigated as a campaign tool to have the Harris-Daishowa (Australia) Pty Ltd (HDA) export woodchip licence either revoked or substantially altered. Many conservation groups (IWS, SCFA, the Australian Conservation Foundation (ACF) and the Nature Conservation Council (NCC)) and individuals believe that the presence of the HDA operation at Eden is directly responsible for many of the ecologically-related problems in the forests of the South East.

HDA commenced their Australian operation in 1967, with the first shipload of woodchips leaving the facility at Eden in 1970, bound for Daishowa Seishi, the parent company, in Japan. Since then there has been a great deal of opposition to the operation from the local community.

The conflict became more widespread in the latter part of the 1980's when it became obvious that the FCNSW intended to begin harvesting Coolangubra, Nullica, Bondi, Tantawangalo, Cathcart and Nalbaugh State forests which are on the National Estate register as either interim listings or fully registered.

2. BACKGROUND

In October 1990 Mr Gerard Keenan approached SEFA with the survey concept, and requested support in the way of limited funding for petrol, some equipment and transport costs.

A SEFA conference in Canberra in October 1990 decided to back the study. A number of weeks were then spent designing the survey methodology. Dr P. Fairweather was consulted as to the validity of the methods, and these methods were revised accordingly.

Fieldwork commenced in October 1991. Subsequent field trips continued until April 1992. (see Appendix 6)

During January 1992, a number of people connected with the Australian Capital Territory branch of the Wilderness Society became involved, and a further amount of funding was made available by TWS to purchase equipment. This was to allow the Canberra TWS participants to undertake field trips from Canberra on weekends.

A complete list of field trips, showing locations, dates and survey staff is provided in Volume 2 as Appendix 6

2.1 STUDY LOCATION

The study was based in the forests of the South Eastern region of New South Wales. These forests are part of the Great Dividing Range coastal escarpment. They lie between the towns of Bega, Eden, Nimmitabel and Bombala. Each of the areas is on the AHC's register of the National Estate, with the exception of Yurammie State Forest.

Various studies (e.g. NPWS 1987, Kieth and Saunders 1990) have indicated that many of the landforms in the region are seriously under-represented in the current reserve system, with only __% of the escarpment forests conserved as National Park or Flora Reserve.

The geomorphology of each forest study site is detailed below:

1. Tantawangalo
(1 compartment surveyed)

The area is between 500 and 900 metres above sea level (ASL)

The climate is characterised by long, cold winters with many frosts and occasional snowfalls and short, mild summers.

The area receives approximately 1 000mm rainfall per year.

The soil structure is one of sandy to clayey loams overlaying a basis of Devonian biotite granodiorite.

Vegetation is characterised by both wet and dry sclerophyll forest types, with an understory of dense shrubby *acacia* species, *Bedfordia arborescens, Olearia, Pomaderris,* and grass species.

2. Cathcart
(2 coupes surveyed)

The area is between 320 and 900m ASL. The surveyed coupes are located in the upper section of the area.

The climate is the same as Tantawangalo, above.

The area receives an annual rainfall of 816mm per year (Recorded at Cathcart Post Office, approximately 5Km to the west of the study site.)

The soil structure is one of shale, hornblende granodiorite, and biotite granodiorite parent materials.

Vegetation of the area is characterised by a mix of open to dense, dry sclerophll types, with *Eucalyptus sieberii, E. fastigata, E. cypellocarpa* and *E. macrorryncha* forming the bulk of the tree species. The understory is comprised of species such as *Platysace lanceolata, Exocarpus strictus Acacia falsiformis, Lomatia myricoides,* and *Pteridium esculentum.*

3. Yurammie
(1 compartment surveyed)

The area is between 400m ASL in the eastern section and 820m ASL in the west

The climate of the area is somewhat milder than the higher escarpment forests, with the occasional drought of three to four months duration.

Rainfall is distributed evenly throughout the year, with an average of 800 to 1 200mm per year.

Soil structure is of the grey granite type, which is highly erodible. The parent materials are predominantly Devonian granitoids including tonalite, biotite, granodiorite and granite/adamellite.

The forest is dominated by *E. fastigata/E.viminalis, with E. sieberii, E. cypellocarpa* and *E. macrorryncha* occurring on the drier ridges. The understory is sparse and characterised by *Acacia spp, Persoonia linearis, Davesia ulicifolia, Poa spp, Danthonia spp,* and *Lomandra longifolia.*

4. Coolangubra
(7 compartments surveyed)

The area is between 600m ASL and 1 000m ASL.

Climate is characteristic of the higher parts of the region similar to Tantawangalo and Cathcart.

Annual precipitation is in the range of 800mm to 1 000mm.

Soil structure is poor quality with parent material of Devonian hornblende granodiorite.

Vegetation structure is a mixture of many forest types, with the main species being *Eucalyptus cypellocarpa, E. fastigata, E.maidenii, E. sieberii* and *E. obliqua*
The understory comprises those species associated with dry sclerophyll forests and include

5. Nullica
(1 compartment surveyed)

The area is between 300m ASL and 800m ASL.

Climate is milder than the higher escarpment forests, with three to four month droughts not uncommon.

Annual precipitation is in the range 800 to 1 200mm per year.

Coupes in the study area occur on mainly Ordovician sediments which occur mainly as shales, with some Eden Rhyolite present, forming very stable soils.

Vegetation of the Nullica forests is mainly *Eucalyptus sieberii, E muellerana, E. bosistoana, E. cypellocarpa* and *E. globoidea* overstory, with the lower story comprised of *Acacia cognata, Notelaea venosa, Polyscias sambucafolia, Lomandra spp.* and *Poa spp.*

6. Nalbaugh
(1 compartment surveyed)

The area lies between 700m and 1 060m ASL.

As the forest is in the highest area of the region the climate is characterised by short mild summers and long severe winters with many frosts and the occasional snowfall.

Approximately 1 000mm precipitation per year occurs in the area.

Soils are stable red granites with hornblende granodiorite parent materials.

A large proportion of the Nalbaugh forest area is wet sclerophyll dominated by *Eucalyptus fastigata.* The understory is comprised of *Acacia dealbata* and *Bedfordia arborescens.* The understory is sparse to absent. In the lower part the Forest is comprised of dry open sclerophyll forest, with *E. sieberii, E cypellocarpa, E. globoidea* and *E. maidenii*

7. Bondi
(1 coupe surveyed)

The area is between 400m ASL and 600m ASL.

The climate of the area is milder than that of the tablelands, with summers ands winters of approximatly equal duration. 40 to 50 frosts may occur in winter.

Annual rainfall is generally greater than 750mm per annum.

Soils of the area are characterised by deep red to grey granitic types underlain by granite parent materials. The grey soils are particularly susceptible to erosion.

Vegetation comprises tall, open, dry sclerophll forest with a open to sparse uncerstory.

2.2 MANAGEMENT OF NATIONAL ESTATE

The FCNSW is the body responsible for the management of the State's Crown Timber Reserves, more commonly known as State Forests. These forests are managed primarily for wood production, although a range of other values are acknowledged and managed accordingly. At the present, no distinct management policies exist for those forests on the register of the National Estate

The FCNSW have a range of management objectives including:

#to prcvide, in perpetuity, a yield of hardwood pulpwood of sufficient magnitude to supply a pulpwood industry located in or near [the Eden Native Forest] management area,

#to supply sawlogs to industry in the short term at a rate designed to meet commitments, and in the long term to sustain a yield of sawlogs commensurate with the productive capacity of the area,

#to maintain the management area.....under indigenous forest cover adequate to:-

1. conserve the soil resource and water catchment capabilities,
2. maintain a diversity of habitat suitable for wildlife indigenous to the area,
3. retain an aesthetic forest environment acceptable to the public generally.

#To maintain any unique or rare, ecological, historical, floral, faunal or other scientific values occurring within the area.

#To provide for the use of forests for public recreation in accordance with FCNSW general policy on recreation in State forests, and for educational purposes.

(extract from FCNSW Eden Native Forest Management Plan, 1982)

The FCNSW has designed a set of guidelines known as "prescriptions" which are intended to help the staff of the FCNSW to achieve the management objectives detailed above. These prescriptions are set out in Volume 2, appendix 5, in full, and the relevant sections are detailed immediately preceding each of the sections in Section 3.3.; "Prescriptions Surveyed"

2.3 EFFECTS OF HARVESTING OPERATIONS ON THE ENVIRONMENT

What environmental effects the woodchipping industry has on the environment has been one of the central areas of conflict over the previous twenty years. It has received much in the way of research in this period.

Much of this work has focussed on those areas which are easily quantified. Soils (e.g. Schuster 1979), water quality (e.g. Burgess 1988), flora (e.g. Kirkpatrick et al 1990), The invasion of weeds (e.g. Duncan 1985) and feral animals(e.g. ABRG 1984)

There are many gaps in our knowledge of forested ecosystems, and although more and more research is focussing on forests and their biota, the current rate of harvesting will mean that much of the high conservation value forests will disappear even though many research projects will be incomplete.

Most of the research is concentrated in a short period relative to the lifespan of trees, and much less than the expected rotation of the harvesting cycle of sixty to one hundred years. Therefore assessments of impacts on the forest biota have been limited in their extent.

The continuation of the integrated harvesting operation in the south east has been in spite of studies (e.g. Kavanagh and Webb 1986) which show that the current high impact silvicultural practice of ten percent canopy retention has a long term impact on those species dependant on arboreal nesting or den locations.

The FCNSW acknowledge that these animals are the most disadvantaged by this regime, yet there is much reluctance to a shift to practices of a less intensive nature.

However, as pressure increases, the FCNSW is altering their practices to better integrate the often competitive goals of wildlife management and silvicultural procedures. The end result is designed to "ensure that all forest species of plants and animals which were originally present in the forest are retained for the long term future. (FCNSW Resource Assessment Commission (RAC) submission, no. 200, p. 16.)

Discussed below are some of the areas which have had some impact on the forested areas of the south east, and the way in which the prescriptions are designed to alleviate these often deleterious effects.

IMPACTS ON SOILS

Timber harvesting effects forest soils by compaction caused mainly through machinery, log dumps and roads. This results in loss of porosity by increasing the density of the soil, leading to increased runoff and erosion. The chemical composition of the soil is altered resulting in increased salinity and loss of nitrates and other nutrients. This is due to the removal of large amounts of understory biomass (Attiwell 1981), and is especially evident in areas where the surface is scoured as in log dumps, road construction and useage and regeneration burning. (Raison et al 1986, Attiwell 1986)

The prescriptions relating to log dumps would have the desired effect of covering these larger, more heavily compacted and scoured areas of the coupe by returning the topsoil once the operation has finished. These dumps may take up to 5% of the area of the coupe, so the rehabilitation of these areas is significant.

The prescription relating to the rehabilitation of snig tracks (minor roads forming a network spreading outwards from the log dumps) and non-permanent roads was not covered in this study. However, the survey staff could not help but notice that the erosion along these tracks was of significant proportions. They did not seem to be affected by the prescription's intentions, which call for an "erosion bank" to be constructed perpendicular to the alignment of the road and at a specified distance apart, which depends on the slope of the road. Deep erosion gullies occurred between these banks, deep accumulations of sand at the toe of the bank and increased siltation around the outlet of the bank. A similar effect was noticed in the log dumps, with large pools of water common, often being several months old.

WATER QUALITY

This issue has been the subject of much analysis and the monitoring of runoff rates, increased siltation and suspended sediments such as salts, nutrients and chemicals is an ongoing management priority.

Studies indicate that on the effects of logging and subsequent regrowth on water yield show an initial period of markedly increased runoff lasting five to six years. The yield then falls well below that of a mature forest for many decades (Langford et al 1982)

However, if carefully managed prescriptions are placed upon harvesting operations, other effects such as changes in water chemistry and increased suspended sediment loads are minimised and could be said to be negligible. (Langford and O'Shaunessy 1977, Langford et al 1982 & Turner 1990.)

IMPACTS ON FLORA

Current silvicultural practices in the south east forests of New South Wales have followed the pattern of other integrated harvesting operations in Australia: 90% canopy reduction, a hot regeneration burn followed by direct seeding of the log dumps and natural seeding of the remainder of the coupe.

As with other areas discussed in this report, these techniques have only been in practice since the early 1970's. Little study has been made of the long-term effects on species of flora which comprise a forested ecosystem.

Some of the effects on flora which have raised some questions as to the suitability of integrated harvesting are:

#Changes in structural diversity.

This is caused by short rotation lengths and the removal of a large amount of the biomass. The forest resulting after harvesting is a structurally simple, even-aged stand of usually a monoculture of eucalypts.

#Change in species composition.

This is brought about by management regimes which specify the removal of the most valuable timber and an apparent lack of concern for the continuing existence of non-commercial species. These are the most disturbed section of the forest community. However, these deleterious effects may be lessened over time by the same biological mechanism that allow plants to recover after natural disturbances such as wildfires.(Loyn et al 1980, 1983.)

The FCNSW has a valuable database of rare, threatened and endangered species of plants in the south east, held in the regional office in Eden. The research on these species tends to concentrate on studying the effects after harvesting has taken place. Nationally there is a lack of knowledge as to minimum viable population sizes of threatened species and their conservation needs, so there is a need to address this gap in the FCNSW's harvesting policies. This is currently a low priority.

#Reduction in diversity of the gene pool.

This comes about by the removal of large amounts of the seed available for recolonisation. The timespan for trees to mature to seed-producing status is around forty years. This is around half the expected rotation period for harvesting. This may result in the seed bank being reduced to a level from which it may not recover. The prescriptions call for a number of mature trees to be retained as a seed bank. However, other pressures such as greater exposure to wind and disturbances to the soil around the base of these trees often leads to their prematu re demise, raising the question of the viability of this practice. The disturbance associated with integrated harvesting also favours those species which can recover very quickly. These are plants which tend to take over completely in their early stages, leaving little room for other slower growing plarts.

#Introduction of feral plants.

Most weed species spread through disturbed environments very efficiently, with their ingress hastened by logging machinery and the network of roads necessitated by a large operation such as the one conducted by Harris-Daishowa. The intense nature of the pine plantations adjacent to much of the native forest in the region is also a contributing factor, with fertilization responsible for a greater concentration of weed species close to the forest

#Effects on Fauna.

Old growth forests such as Coolangubra and Tantawangalo provide some 60% of mammals and 30% of birds with den and nesting sites in the large old trees characteristic of these type of forests. The hollows upon which these fauna rely do not begin to form until the trees are over eighty years old, and the larger hollows do not form until between 150 and 200 years. These old trees are the first victims in a harvesting operation and the expected cutting cycle will mean that such trees will not be in abundance in the future. Prescriptions calling for the retention of five habitat trees per fifteen hectares have little or no basis in scientific fact. For example, the Feathertailed Glider (*Acrobates pygmaeus*) can glide up to twenty metres through the canopy. In a logged forest the distarce between the large retained trees can be over 100 metres.

The FCNSW recognise this and base their filter strip prescriptions on the fact that many arboreal species are disadvantaged by harvesting procedures. Leaving a strip of up to eighty metres next to watercourses and logging coupes on an alternate basis may alleviate the problem in the short term, but the resultant forest after the second cutting cycle will leave only those trees in the reserves along watercourses for the arboreal mammals to rely upon. Animals which are then forced to recolonise do not seem to reestablish elsewhere. Individuals of some species such as the greater glider (*Petauroides volans*) dying rather than emigrating to other forests.(Kavanagh and Webb 1986, ABRG 1984)
There is also a reduction in the abundance of food supply characteristic of an old growth forest. This can be reduced by as much as 40% in the short term. Small ground-dwelling mammals suffer the effects of harvesting to a lesser extent, with most species able to recolonise a disturbed ecosystem after only two or three years. The populations of the more common species such as the bush rat (*rattus fuscipes*), brown antechinus (*antechinus stuartii*) and the white footed dunnart (*Sminthopsis leucopus*) increase markedly as these animals are able to exploit the dense regrowth more efficiently than other mammals (Braithwaite 1983, Lunney and Ashby 1987, Lunney and Leary 1989).
Fauna can also be affected by the resultant decrease in genetic and structural diversity of flora following harvesting.

Fire affects both flora and fauna by:

#Reducing total biomass

#Reducing phosphorous content, thereby disturbing the chemical cycle in the soil

#Reducing critical shelters needed by some animals

#The death of large hollow-bearing trees

#Altering the seed bank in the soil

#Destroying invertebrates which may have a vital role in nutrient cycling

#Altering the mixture of understory species if the forest is burnt too regularly, or not often enough.

2.4 PRESCRIPTIONS

The current FCNSW prescriptions resulted from criticism of silvicultural practices prior to 1980. Recher et. al. published a paper entitled "Effects of the Eden Woodchip Industry on Terrestrial Vertebrates with Recommendations for Management" in 1980. (FCNSW research note no. 42). These recommendations were designed to alleviate the ecological problems inherent in a clearfelling operation, the method of harvesting prior to 1980.

The suggestions were wide ranging, and not all were put into practice. The main recommendations were that a filter strip be left between the harvesting area (known as a "Compartment" which is subdivided into a "Coupe") and permanent watercourses, no tracked vehicles be moved across swampy or poorly drained areas within the coupe, a group of trees be left as habitat trees, another group be left as seed stock for the coupe and a third group be left so as to provide future sawlogs.

Recher's suggestions were put into practice and the task of overseeing their implementation was written into the FCNSW's charter by means of the prescriptions. These are designed to:-

1. To minimise potential erosion sources,

2. To ensure that the residual stands of trees maximise future harvesting potential,

3. To ensure that the flora and fauna of the area are conserved,

4. To preserve and improve the soil resource and water catchment capabilities,

5. To utilize the timber on crown land forests to the best advantage of the state.

(extracted from FCNSW 1988 E.I.S. volume 1, section 2, P.3)

3. METHODOLOGY

3.1 INTRODUCTION

Study sites were located in such a way as to give a broad geographic spread over the forests in the Eden Native Forest Management Area (ENFMA), and were not intended to place undue emphasis on any particular forest.

Fieldwork was carried out between October 1991 and April 1992, (see Appendix 6) with the help of many volunteers who travelled to the study sites mainly on weekends.

Two workshops were conducted during January 1992, in Malbaugh State Forest, to teach a number of volunteers the methods for the collection of data.

The data was collated and analysed during April 1992 and the report was presented to two scientists for verification of the analysis methods.

3.2 FIELDWORK

It was decided that only those prescriptions which were able to be physically measured would be surveyed, as well as some prescriptions where a presence/absence criteria could be employed. As many of the prescriptions rely on a qualitative assessment, it was decided to avoid these as many of the survey staff have little or no experience in forest management, and this type of assessment would open any survey results to criticism from the FCNSW and timber industry.

To this end, a Field Data Collection Manual was developed with clear, concise instructions as to methods to be utilised, Illustrations of the main prescriptions, examples of:

(a) field data books;
(b) field maps,
(c) the FCNSW prescriptions, and
(d) completed data sheets were included.

All those taking part in the study either attended the workshops in January, or were given a thorough briefing prior to their field trips commencing.

3.3 PRESCRIPTIONS SURVEYED

3.3.1 FILTER STRIPS

The maintenance of filter strips at their required width is considered to be of great importance in maintaining water quality and to prevent those problems associated with increased siltation in streams and rivers. Prescriptions applying to Filter Strips state:

> *A filter strip shall be retained on a stream or drainage line downstream from the point where its catchment exceeds the area listed below.*

AVERAGE GRADE OF CATCHMENT	*MAXIMUM CATCHMENT AREA*	
	EROSION HAZARD	
	AVERAGE	*HIGH*
LESS THAN 15 DEGREES	*50ha*	*40ha*
15 DEGREES - 20 DEGREES	*45ha*	*35ha*
GREATER THAN 20 DEGREES	*40ha*	*30ha*

> *The filter strip shall be a minimum of 20 metres each side of the watercourse for slopes under 18 degrees. Where the fall into the watercourse is over 18 degrees the filter strip shall be a minimum of 40 metres each side of the watercourse. The width and upstream extension of the strip may be increased as considered necessary by the Forester*

As those collecting data in the field found the table above (a) difficult to visualise and (b) even more difficult to measure, it was agreed to measure the filter strip from the point which it became obvious.

This was very obvious on all sites surveyed. The filter strip forms one or more boundaries of the coupes in the study, and did not begin within the coupe once.

The prescription is very clear in its intent: a tree must not be felled within the 20m. or 40m. limit. The following, therefore, was surveyed, with any breaches noted:

* The width of the strip was paced out from the coupe edge to the edge of the watercourse. (all survey staff were trained in converting paces to metres)

* The angle of fall from the edge of the coupe to the watercourse was measured using either a clinometer or a specially constructed 18 degree set square. When the clinometer was employed the actual angle of the bank was recorded. When the set square was used, a simple over 18' or under 18' indication was recorded.

* The above measurements were recorded at the beginning of the strip and thence every 50m along the length.

> *No tree shall be deliberately or negligently felled into a stream within a filter strip,....*

* The presence of any trees felled within the strip were noted.

> *....felling and snigging shall be excluded from filter strips except as specifically authorised by the supervising Officer.*
>
> *Trees may be felled into the strip provided that no part of the tree enters the bed of the stream and provided excessive damage does not occur to standing trees within the filter strip*

* Any trees felled into the strip, but having a stump outside the boundary of the strip, were recorded.

* Any trees within the filter strip showing signs of damage from the harvesting operation were recorded.

For the above three prescriptions, the presence of a breach was recorded as a yes and a chainage from the beginning of the strip was also recorded.

3.3.2 LOG DUMPS

These prescriptions have been put in place because the soil on the log dumps becomes heavily compacted during the harvesting operation, and those dumps with no remedial action carried out take much longer to recuperate.

> *....They (the dumps) shall not be located closer than 10m from a filter strip or drainage line.*
>
> *When ungravelled dumps are constructed and unless otherwise specified (in the harvesting plans), topsoil is to be stockpiled in a recoverable position, and either:*
>
> > *Upon temporary termination of logging, and no further logging is contemplated in the near future, the dumps are to be levelled unless otherwise authorised, drained so that the runoff is directed onto surrounding vegetation and ripped where specified.*
> >
> > *Upon completion of logging the dumps are to be levelled unless otherwise authorised, drained so that runoff is directed onto surrounding vegetation, and the topsoil spread evenly over the dump. The dump shall be revegetated and/or ripped where specified.*
>
> *Dump ripping is to be done progressively and unless otherwise approved by the supervising officer, commencement in a new compartment is not permitted until all completed dumps are resurfaced and ripped.*
>
> *The finished surface of the dump following ripping must be free from consolidated bark deposits.*
>
> *Surface soil is to be stockpiled around the dump such that upon completion of harvesting and removal of timber, the surface soil is readily available to be respread over the dump and the dump ripped to an average depth of 35cm, the rip lines being not less than one metre apart.*

Each log dump in the coupe was located and visited during the survey. the following was recorded for each dump:

* grid reference
* location on field map
* presence/ absence of:
    - (i) ripping
    - (ii) topsoiling
    - (iii) revegetation
    - (iv) percentage survival of seedlings

3.3.3 NON FILTER STRIP AREAS

Where a filter strip is not being retained, machines shall not be taken within 5 metres of any drainage line except with the specific approval of the supervising Forester.

Machines shall not be taken within 5 metres of the border of any swamp or area showing surface seepage or poor drainage.....Access tracks may be constructed through these areas only in circumstances where they can be adequately drained, as specifically approved by the supervising Forester and marked on the harvesting plans.

Each non filter strip area (NFSA) was located on the first walk through the coupe. Subsequently a visit was made to the NFSA to locate any breaches of the prescription.

If a breach was discovered, the area was marked on the field map, and noted in the survey staff's field note book.

3.4 TREE TRANSECTS.

Approximately half the time spent in the field was spent walking a series of transects through the coupe, to record the presence of habitat trees, and to provide a sample of the basal area of the trees harvested and the trees retained. It was felt that the transects were the most reliable and statistically correct way of recording this data.

Before the fieldwork was commenced, each compartment was transferred from the 1:125 000 scale maps from the 1991 Environmental Impact Statement (EIS) onto 1:25 000 scale topographic maps published by the Central Mapping Authority of New South Wales (CMA)

Once this was completed, each compartment was photocopied at a ratio of 2:1, to result in a compartment map at 1:12 500 scale. It was felt that this size would facilitate the locating of each survey component, as well as allowing simple divisions to be made for the placement of the transects.

Each CMA topographic map has a 1 000m grid marked. For the field maps, each 1 000m grid square was subdivided with another grid at 125m intervals in both north-south and east-west directions. Each 125m grid line was then accorded a number.

From this point the relevant transects were selected using a standard random number table. The number of transects then selected per coupe was a reflection of the relative size of the coupe on the 1:12 500 scale field map.

Generally, for the standard coupe size of eighty hectares, four randomly obtained transects were selected for the survey.

In the field, the start point of each transect was located by pacing from the nearest prominent landmark featured on the field map. This was usually a road or a coupe/creek interface.

The direction of the transect was established using a compass and the map. One of the survey staff was employed to record the data and keep an account of the distance travelled, while the second person keeping to the bearing and measuring the trees and stumps.

Staff recorded the following statistics for each tree and stump which fell within two metres of either side of the transect:

1.(a) Diameter at breast height (DBH) in centimetres, for trees larger than 20cm DBH.
*For trees in this category the following was also recorded:
(i) The condition, with note made of one of the following categories: Good overall condition; More than half the trunk burnt; If the presence of epicormic buds was apparent
(ii) Damage to tree, with note made of one of the following categories: No damage; significant crown damage (i.e. more than 50% missing or dead) ; Physical damage to trunk; physical damage to root system; obviously dead.
(iii) Weather the tree was considered to be a habitat tree or not.
1.(b) If it was decided by the survey staff that the tree was of obvious habitat value (established by checking for the presence of hollows on the trunk or in the crown for trees of (generally) more than 220cm DBH) the following additional data was recorded:
(i) the number of hollows present
(ii) the height of the tree

Two distinct methods were used for this:

if the survey staff had a clinometer, one person would pace between 15 and 20m away from the base of the tree keeping to the same contour. a reading of the angle to the top of the crown was recorded, as well as the precise number of paces. this was then converted to a height using the following formula:

$$\tan \angle \times d = h,$$

where $\tan \angle$ *is the angle on the clinometer,*
d = *the number of paces from the tree,*
and h = *the height of the tree.*

if a clinometer was not available, a 45 degree set square was used. The staff member would walk away from the tree until the top of the crown coincided with the top point of the set square when held level. The distance from the observer to the base of the tree was recorded as the tree's height.

table 1 Filter Strips.

Forest name	Comp no	No of strips	% of strips under width	over width	correct width
Coolangubra	1330	3			
	(FS01)		75%	50%	25%
	(FS02)		70%	30%	nil
	(FS03)		68%	26%	6%
	1333	1	6%	87%	6%
	1408	2			
	(FS01)		57%	40%	3%
	(FS02)		78%	22%	nil
	1434	1	32%	53%	15%
Nullica	705	1	nil	100%	nil
Cathcart	1370	1	53%	42%	5%
	1372	3			
	(FS01)		24%	53%	23%
	(FS02)		36%	64%	nil
	(FS03)		67%	16%	17%

Note: Compartments on Waratah Road were experimental coupes and the filter strips were over 150m. wide. They were not included, as they are not standard.

Table 2 Filter Strip Violations

Forest name	Comp. no.	No. of trees felled into strip	felled within strip	damaged in strip
Coolangubra	1400	9	3	7
	1333	3	nil	1
	1408	nil	nil	2
	1434	5	nil	5
Yurammie	962	1	1	1
Cathcart	1372	6	1	nil

Note: All compartments did not have (a) filter strips, (see note on table 1.0 above) and (b) violations under categories above.

Table 2.1 Trees

Forest name	comp. ro.	area in ha.	% of coupe trees in t/sect	retained	trees harvested
Coolangubra	1314	48.76	1.20%	212	N/A
	1315	43.78	0.90%	106	N/A
	1317	39.68	1.00%	109	N/A
	U/log	99.60	0.60%	118	N/A
	1330	32.10	4.40%	129	13
	1333	51.25	1.00%	61	37
	1408	52.03	1.50%	53	67
	1434	19.84	2.00%	21	23
Nullica	705	54.38	2.20%	29	35
Yurammie	932	86.25	1.20%	133	72
Cathcart	1370	58.67	1.20%	72	81
	1372	68.90	1.70%	104	114
Bondi	1727	23.98	1.70%	67	30

Trees Retained
Table 2.2

Forest name	comp no.	number retained	basal area in transect	basal area m2/ha
Coolangubra	1314	212	1625m2	9.2
	1315	106	651m2	14.9
	1317	118	827m2	20.8
	Unlogged	109	3954m2	39.7
	1330	125	128m2	4.0
	1333	61	896m2	17.5
	1408	53	446m2	8.6
	1434	21	287m2	6.9
Nullica	705	29	1107m2	20.4
Yurammie	982	133	1612m2	18.7
Cathcart	1370	72	525m2	9.0
	1372	104	1619m2	23.5
Bondi	1727	63	571m2	23.8

Trees harveste
Table 2.3

Forest name	comp. no.	number on transect,	basal area m2	basal area m2/ha
Coolangubra	1330	130	5280m2	164.5
	1333	37	1079m2	21.1
	1408	67	2382m2	45.8
	1434	23	1171m2	50.6
Nullica	705	35	1858m2	34.2
Yurammie	982	72	1421m2	16.5
Cathcart	1370	81	2487m2	42.4
	1372	114	4466m2	64.8
Bondi	1727	30	666m2	27.8

Note: As the Waratah Rd Compartments were harvested in 1984 the stumps were very difficult to locate, therefore they were not included in the study.

Trees: Condition and Damage Table

Forest name	Comp. No.	1.Good Condition	2.Dead	3.Damaged	4. (2 + 3)
Coolangubra	1314	97.6%	2.4%	nil	2.4%
	1315	95.2%	0.9%	3.9%	4.8%
	1317	90.4%	3.9%	5.7%	9.6%
	1330	62.4%	16.0%	21.6%	37.6%
	1333	60.3%	20.7%	19.0%	39.7%
	1408	69.8%	5.7%	24.5%	30.2%
	1434	43.8%	nil	56.2%	56.2%
Nullica	705	62.5%	4.2%	33.3%	37.5%
Yurammie	982	68.9%	16.5%	14.6%	31.1%
Cathcart	1370	56.4%	18.2%	25.4%	43.6%
	1372	72.6%	12.3%	15.1%	27.4%
Bondi	1727	14.3%	47.6%	38.1%	85.7%

Habitat trees
Table 2.3

Forest name	comp. no	number of hollows	no. of trees	average height, m
Coolangubra	1314	13	2	35.5
	1315	3	1	31.0
	1317	23	4	32.8
	U/log	27	4	53.8
	1330	46	8	38.9
	1333	4	1	28.0
	1408	nil	nil	nil
Nullica	705	4	2	32.5
Yurammie	982	15	8	34.8
Cathcart	1370	8	3	26.3
	1372	26	5	40.2
Bondj	1727	6	1	17.0

Log Dumps
Table 3.0

Forest name	comp. no and dump.	ripped Y/N	revegetated Y/N	Topsoiled Y/N
Coolangubra Waratah Rd. (see note)	B	n	y	n
	C	n	y	n
	D	?	n	n
	E	n	n	n
	G	n	n	n
	H	n	n	n
	I	y	n	n
	J	n	n	n
	1330/1	y	n	n
	1330/2	y	n	n
	1330/3	y	n	n
	1330/4	50%	n	n
	1333	?	y	n
		?	y	n
	1408/1	y	n	n
	1408/2	y	n	n
	1408/3	y	n	n
	1408/4	y	n	n
	1408/5	y	n	n
	1408/6	y	n	n
	1434/1	n	n	n
	1434/2	n	n	n
	1434/3	n	n	n
	1434/4	n	n	n

Nullica	705/1	y	n	n
	705/2	y	n	n
	705/3	y	n	n
	705/4	y	n	n
Yurammie	982/1	y	50%	n
	982/2	y	n	n
	982/3	y	n	n
	982/4	y	1%	n
	982/5	y	5%	n
	982/6	y	5%	n
Cathcart	1370/1	y	n	n
	1370/2	n	n	y
	1370/3	y	n	n
	1372/1	n	n	n
	1372/2	n	n	n
	1372/3	y	n	n
	1372/4	y	y	n
	1372/5	y	40%	n
Bondi	1727/1	y	n	n
	1727/2	n	n	n
	1727/3	n	10%	n
	1727/4	n	n	n

Note; Log dumps for Compartments 1314, 1315 and 1316 could not be positvely linked to the relevant coupe, so they have been tabled as they occur on Waratah road, from the northernmost intersection with Coolangubra Forest Way.

SUMMARIES

1. Filter Strips

Percentage of Filter Strips which are underwidth:	37.5%
Percentage of Filter Strips which are overwidth.	54.8%
Percentage of Filter Strips which are correct width	7.7%
Average width of Filter Strips in Study:	32.0m
Number of trees felled into Filter strips:	23
Number of trees felled within Filter Strips:	16
Number of trees damaged Within Filter Strips:	5
Total number of violations of Filter Strip Prescriptions:	104

2.TREES

Average area of compartments surveyed:	52.25ha.
Average area of transect:	0.7ha.
Average percentage of compartment in transect:	1.6%
Average number of trees retained:	86
Range:	16 in 1434 - 212 in 1314.
Average number of tree harvested:	49
Range:	23 in 1434 - 130 in 1330
Average basal area retained,	16.7m2/ ha
Average basal area harvested,	52.0m2/ ha
Ratio of trees retained to trees harvested:	26 : 74

Summaries Continued

2.1 HABITAT TREES

Average number left per coupe:	3 per 52.25
Range:	Nil to 8
Average number of hollows per habitat tree retained:	6
Range	1 to 10
Average height of retained habitat trees:	28m
Range:	17m to 57m

3. LOG DUMPS

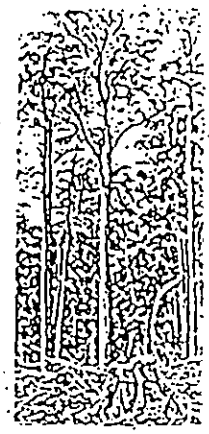
Percentage of dumps ripped:	50%
Percentage of dumps revegetated:	
Fully:	12.5%
With between 1% and 50%:	15.0%
With nil regeneration:	72.5%
Percentage of dumps topsoiled:	2.5%

4. NON FILTER STRIP AREAS

No. of violations recorded:	22
Average number per coupe:	2.4

SOUTH EAST FOREST ALLIANCE

c/ Total Environment Centre
18 Argyle St Sydney 2000
Ph: (02) 247 1737
Fax: (02)247 7118



fw

18 May 1992

Dear SEFA,

Enclosed is a copy of the draft Forestwatch document. Gerard has emphasised that this is the first draft and he has already made some changes to the document. Could you please read the report and return comments/ suggestions to me by Monday May 25.
Gerard has undertaken to complete the second draft by Friday May 29. The document will then be given to two scientists for comment. The report is due for final release on June 13.

Yours faithfully

Fiona McCrossin