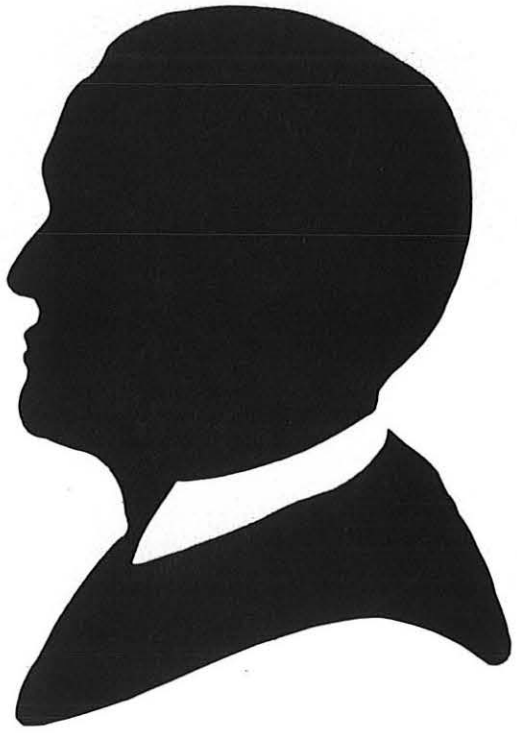
C.E. LANE POOLE MEMORIAL TRUST

LANE POOLE AWARD
STUDY TOUR, 1992 - 1993



A REPORT TO THE TRUSTEES

By
M. SMITH and D. WINTERS

C.E. Lane Poole Memorial Trust

The Lane Poole Memorial Trust was established to commemorate the work of Charles Edward Lane Poole, and, in particular, the connection between the former Conservator of Forests and the late Thomas Cullity.

Lane Poole was appointed Inspector-General of the Woods and Forests Department in Western Australia in 1916, and was responsible for establishing the legal framework on which the State's forestry operations have since been carried out.

That legal framework was the 1918 Forests Act. Before the Act was introduced there was no legislation to control the amount of timber cut, the place and manner of cutting, or to regenerate the forest after cutting.

When Thomas Cullity graduated from the University of Western Australia in 1918, Lane Poole offered him the newly created position of Utilisation Officer in the Forests Department, which he held for one year before leaving to start up Millars' new commercial kilns at Yarloop.

Thomas Cullity maintained an interest in forestry and timber for the rest of his life and founded Cullity Timbers in 1928 and Westralian Plywoods in 1943. From these companies WESFI was formed.

The Trust was initiated by WESFI Chairman Dennis Cullity in 1983, and was developed by a board of Trustees representing the former Forests Department and WESFI.

The current Chairman of the Board is the Executive Director of the Department of Conservation and Land Management, Dr Syd Shea.

The WESFI connection resulted from a belief held by Lane Poole that forestry needed an interdisciplinary approach to cater for the needs of society.

Contents

1

INTRODUCTION

The age of automation is upon us; technology is being purchased. Now the expectations have to be delivered.

It is with the word 'expectation' in mind that we submitted a request to the C.E. Lane Poole Memorial Trust. In order to develop our expertise in the field of automation, we asked the Trust to help with travel and accommodation costs to the Australian National University, (ANU) Canberra; ACT Forest, Canberra; Conservation and Environment in Victoria; Australian Pulp and Paper Manufacturing (APPM) in Burnie, Tasmania and the Tasmanian Forests Commission.

Forest Management Branch expects to develop or purchase software which would integrate planning departmentally. This concept will require significant input of manpower to program and implement. We attempted to foresee this development work with the six goals we set when applying for this award. These were:-

1. To gain knowledge in the assembly of an interactive graphical and textual database system and increase our knowledge in the use and requirements of such a tool in logging and other land-use planning.

2. To avoid the pitfalls experienced in other states in these forms of development.

3. To gain experience and ideas in the database analysis and linking of the textual database to the graphical information database.

4. To see how the system can be used as a logging and land-use planning tool and the queries it will be capable of answering.

5. To improve the level of knowledge in WA in relation to geographic information systems (GIS) development and applicability of GIS for short- and medium-term forest management issues.

6. To investigate the procedures for the dissemination of data between private forest owners and government, and consequently to assist in resolving the validity, versatility and data custodianship issues emanating from data exchange as it develops in WA

Itinerary

Australian National University (ANU) (Interviews 1 and 2)	23 November, 1992
ACT Forests, Canberra (Interviews 3 and 4)	24 November, 1992
Travel to Melbourne	24 November, 1992
Victorian Department of Conservation and Environment, Kew, Victoria (Interview 5)	25-27 November, 1992
Tasmanian Forest Commission, Burnie, (Field visit)	30 November, 1992
Australian Pulp and Paper Manufacturers (APPM), Burnie (Interview 6)	1 and 2 December, 1992
Tasmanian Forest Commission, Hobart (Interview 7)	3 & 4 December, 1992
Returned To Perth	5 December, 1992

M. SMITH
D. WINTERS

2.

Acknowledgments

We would like to acknowledge all the people involved with our tour. Their interest, openness and ability to disseminate information was exemplary. These were:-

Dr Ryde James and staff at ANU Canberra

Mr David Johnson, ACT Forest, Canberra

Mr Ian Wild and staff of Department of Conservation and Environment, Kew, Victoria

Mr Bill Incoll, Department of Conservation and Environment, Kew, Victoria

Mr Andy Warner and staff, APPM in Burnie, Tasmania

Mr Don Thompson and staff, Forests Commission Hobart, Tasmania

INTERVIEW 1:
DR RYDE JAMES
FOREST RESEARCH INSTITUTE,
NEW ZEALAND

Methodology for Yield Forecasting

The New Zealand experience shows preference to fixed area plots with an emphasis on exact area. Stratification is by soil types which generally conform to region (plantation) boundaries. It is acknowledged that New Zealand plantations are more homogeneous than those of Western Australia.

The New Zealand emphasis for mensuration is prior to harvesting for yield forecasting, then immediately post harvesting to monitor stems retained and damaged. A further measurement may be requested within two to three years post harvesting. Temporary plots are also used to augment areas of weak data, using the same principles of fixed area. Management abandon these once the yield data gap has been bridged. The temporary plots are valuable in the event of fire, insect attack, etc.

New Zealand develops software in a co-operative between industry and government, with an independent chairperson. The software produced is available for free or at a reduced cost depending on input. All plot measurements are done on a contract with plot remeasurement time increasing as the pines get older. Growth rates are determined already. Plot distribution is weighted towards middle-aged pines.

Staff involved in mensuration in New Zealand total about 15, consisting of two or three four-man teams working for three months each year remeasuring 5000 plots in two to three year cycles.

Forest Research Institute (FRI)

Dr Ryde James of ANU talked about an interactive set of packages developed by FRI. They were IFS, FOLPI, STAND MASTER, STANDPAK and MARVL.

- STANDMASTER stores information about a forest site (details of cutting, pruning, etc.) and allows simple statistical analysis of the data. Stand information can be collated under various headings. STANDMASTER is the input for both IFS and FOLPI while

STANDPAK provides yield tables and a more detailed list of volumes by log grades.

- IFS simulates the effect of implementing a specific management strategy on a forest estate and summarises the resulting flow of resources, such as log volumes or cash.

- FOLPI is a decision support tool for whole-of-forest management which allows managers to identify trade offs between alternate strategies in terms of such criteria as wood flow, cash flow and profitability.

- MARVL is a forest inventory system that provides a flexible environment in which to store data captured in the field and calculate the product volumes. It simulates a range of harvesting and marketing scenarios by analysing the same inventory data with a number of different cutting strategies.

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INTERVIEW 2: AUSTRALIAN NATIONAL UNIVERSITY (ANU) STAFF CANBERRA

1. ANU Experience With Forest Resources Information and Yield Regulations (FRIYR)

Staff at ANU had doubts as to the worth of FRIYR. These are expressed in a report by students after an evaluation project as part of their tertiary education studies. It was thought to meet Victorian needs very well but is not versatile enough for other users (e.g. biometrics growth models).

The structure of ANU's version was such that the biometrics were specific to Victorian growth models and it was very difficult to modify these formula to suit other states. An example of this was no facilities were available to apply fertiliser growth improvements within the biometrics.

However, ANU did have an old version of FRIYR and without a customer base to test software any package will have inherent problems. This problem is overcome to some extent by using Dave Johnson (ACT Forests) as a testing ground, although he hasn't developed the system enough to test in an operation environment. Dave Johnson was only one test of the system and ANU does not give feedback to Victoria. ACT doesn't allow direct (via modem) access by Victoria to fix or help with their problems. This, it seems, compounds operator concerns with the system. ANU lecturers expressed concern with the SIR database. While acknowledging SIR is capable of doing the mathematical processing it did mean that professional help was required if something faulted. The database is an Australian developed software. However, there are very few people available to give professional backup.

2. Problems Encountered

Students and lecturers at ANU expressed difficulty in using the system while acknowledging the lack of training a normal user would encounter.

2. "When obviously erroneous results were detected, the 'black box' nature of the software and labyrinth of menus made it difficult to locate the causes."

   We cannot see a way to overcome this problem. To make the system friendly enough for computer-illiterate users you will inherently create this black box analogy.

3. "Insufficient understanding of the conditions under which the software was designed to operate. For example, the applicability of the biometrics models to pine grown in the Tumut area was unclear."

   Staff said a knowledge of the SIR database was essential. Perhaps this would depend on one's use of FRIYR (i.e. as a forest planner or as an academic). FRIYR seems to be restrictive in that it was designed for the developers' environment, and modification for other users was not initially a high priority. We believe ANU has an early version of the software. Some of the versatility problems created by the developers could be overcome and no doubt have been in later versions of FRIYR. For instance biometrics modelling functions were initially 'hard wired' into the programs and have now become modularised, although species is still 'hard wired' in the system. The development is by no means complete. One major concern to Swan Region pine management is yield analysis after fertiliser application on the poor soils of the coastal plain. Even with our biometrics functions the system does not yet have the capabilities to handle this.

4. "The purpose of some mandatory procedures such as defining events was initially obscure."

   Again, lack of training.

3. ANU Recommendations

With the problems ANU had, they recommended in-house software development as follows:

a. Define the criteria a system within CALM would have to work within, i.e. question all potential users thoroughly to define customer demands.
   Analyse responses with specialist analysis and foresters using a panel of three to five members.

b. Establish a design and structure (building block approach) and develop modules easily attached to the whole system. Thought must also be given to the process of modification especially to the biometrics.

c. Get foresters to develop growth models, i.e. build models, develop simulation algorithms, develop thinning models, build software with GIS interface in mind.
Tasmania developed a working system within two years using a handful of people (three to six).

4. ANU Summary

Following our day with staff at ANU we felt that the version of FRIYR they were using was not capable of carrying out the functions required by CALM. There were deficiencies with the growth model and the SIR database for fault corrections. It must be said that the fundamentals of area, planting year and species were adequate and similar throughout all plantations.

INTERVIEW 3:
MR DAVID JOHNSON
ACT FOREST
CANBERRA

FRIYR in use

ACT Forests are still at a non-spatial data capture of their approximate 16 000 ha plantation at this stage. David Johnson is working mostly alone in transferring data from old paper-based systems to a FRIYR database. He did have the support of DCNR Victoria as ACT Forests was a test site for FRIYR. Needless to say, to get FRIYR up and running takes a considerable time. This was reflected in the progress with the system. David had only transferred data from the old paper-base system to the FRIYR database.

His experience (although limited as far as the DSS in FRIYR) was that it was easy to use and instilled confidence. He had experienced problems with the system, as he had limited knowledge with DSS in FRIYR, however the system instilled confidence as he slowly progressed. He was very happy with the DCNR support from the Victorians.

FRIYR was run on Unix-based HP workstation platforms. David Johnson recommended looking at a DEC system to run FRIYR purely from a personal experience viewpoint.

David Johnson is responsible for capturing the data for mill intake tonnages via a weighbridge computerised link to the Weston ACT Forest Headquarters.

INTERVIEW 4:
MR BILL CROW
ACT FOREST
CANBERRA

Spatial Data Capture

ACT Forest had not linked the spatial (or map) system with the FRIYR system. It appeared that there was no immediate need to integrate the two systems, however they acknowledge it would be ideal for the future.

Map production for logging planning was done on Auto cad software by Bill Crow. This was not linked with the HP workstation at all. The harvesting planning schedules would be developed within FRIYR and accompanying map work independently generated. To their credit, map production was totally organised with indexes to existing hard copies and photos in chronological order. This enabled relative ease of map production for harvesting planning with all their plantation being digitised and updated regularly to reflect current operations. Any proposed operation: thinning, roading, pruning, etc. had the pre-operation map produced by the Auto cad system.

3. ACT Forests Summary

Following our day visit, it seems that ACT Forest have a long way to go before any useful yield predictions or costing can be gained from the FRIYR system. It did however indicate that the negative comments from ANU may be a little premature. The positive comment on support for corrections by the Victorians was quite different as well.

We were concerned that the distance between W.A. and Victoria could adversely affect the support facility.

INTERVIEW 5:
MR IAN WILD AND STAFF
DEPARTMENT OF CONSERVATION AND ENVIRONMENT
KEW, VICTORIA

1. FRIYR Staff

The Victorians have had five to six full-time staff developing FRIYR since 1987. This equates to approximately 30 work-years or 1.5 million dollars worth of development expertise. They have one person full-time at Kew administrating the system and one person doing training.

2. FRIYR Concepts

The concepts behind FRIYR appear easy to grasp. FRIYR has two main parts.

MIS Management Information System - which encompasses data entry and data enquiry and
DSS Decision Support System - which encompasses simulation and financial analysis.

Both parts share the biometrics model and a common resources database.

Database integrity is maintained by copying the database for the user to update or interrogate on hypothetical schedules. Before any updated database copy can be used to replace the original it must have had a modification report run and checked. One person per district /region is then authorised to replace the original database with the updated copy.

Our interpretation of the menu system is that it is structured and user friendly, contrary to the feelings of students at ANU (see ANU Experience With FRIYR). However a knowledge of SQL and PQL appear essential to do any analysis outside the existing menu framework.

The concept of any event happening in the forest being given a code number appears easily understood and would simplify and aid data entry and regime definition. The scope of codes in the system appears adequate for our needs.

3. FRIYR In Use - Victoria

FRIYR is based on Victoria's DCNR prime computers. Whilst there, we experienced the slow response time this configuration produced. We also experienced problems with differing terminal types. Their best error-free results were achieved on Unix based hardware. ANU lecturers also had difficulty accessing FRIYR on their VAX. This all suggests that if FRIYR was purchased the right platform would need to be determined with installation to guarantee full working order. The acquisition of Unix based Sun platforms appears to be the desirable configuration, but this has yet to be proven.

3.1. Notes From Discussion At Kew

The system was designed so the database is updated at districts. The users are required to put in the data. The staff at Kew emphasised that districts maintained the system therefore they only get out of the system what they put into it.

Plot measurement data is captured on CPM based Husky Hunter portable computers and downloaded once per week.

Husky data capture does come with the system however we must adopt their mensuration methodology or refine our plot measurement methodology. Their data capture programs appear (on a user face) to be much simpler than the ones we currently use. The information is not captured at all on the Husky Hunters for instance. Our past experience with Huskies shows there is limited memory for pine plot capture programs but with simplified programming this may not be the case. This would also allow a week's worth of measurement before downloading the plot data as Victoria DCNR does.

This does not save paper, as reports and checking are still needed. A modification report is run after the database is updated. (This is only an update on a copy of the database). Once modification reports are correct only one authorised person in each district updates the database from the copy.

Database integrity is left to regional level control. Basically, district and regional staff collect, input and use data in the system while head office maintain, train and guide usage of the system.

4. FRIYR and Geographic Information System (GIS)

No link currently exists between FRIYR and a Geographic Information System (GIS). A one-year development period is expected to achieve integration of FRIYR and GIS. This will be completed within the FRAMES scenario (mentioned later).

We didn't see harvesting planning at a region or district level so it is not clear where maps accompanying harvesting plans are produced. The Forest Management Division at Kew is in the process of capturing its softwood plantations on ARC/INFO. At this stage we assume map production is done by a "mapping branch".

5. FRAMES - A Methodical Approach To Building An Integrated System

DCNR Victoria have travelled down the same road CALM Western Australia has in their use of computers for information management. They found several groups within the department were developing, or had developed, site specific systems with little consultation with others outside their immediate work area. They saw a necessity to take this progress and direct it under one umbrella which they call FRAMES (Forest Resource And Management Evaluation System).

They set up a body to 'co-ordinate standards, definitions and protocol for biophysical dataset used by DCNR'. The body would manage the four components that make up FRAMES. They are:

- Management of raw data with its validation and appropriate storage standards for delivery to other systems.
- Data conversion to information.
- Compilation of integrated information for analytical options and decision making.
- Monitoring and scheduling of operations with associated cost analysis.

An example of using FRAMES to integrate systems is the use of FORPLAN. FORPLAN uses yields calculated in FRIYR to develop strategic plans that are used as input to FRIYR. They are using ARC/DB to develop a GIS level into their planning. But under the FRAMES concept this will be integrated into the FRAMES system rather than using GIS to develop one big system. This seems to be the way to go. As

discussed later with the Tasmanian approach, one big system is too big and costly to develop. Many small systems, integrated under a FRAMES concept, could be the wise approach.

INTERVIEW 6: MR ANDY WARNER AUSTRALIAN PULP AND PAPER MANUFACTURERS (APPM) BURNIE, TASMANIA

1. APPM - The Private View

APPM was a refreshing look at how a private company with similar responsibilities to government forest departments manages information pertinent to resource planning and management.

2. Associated Forest (Holdings) Burnie (AFB) - Off The Shelf Software

AFB (the mensuration and planning branch of APPM) had no purpose-built in-house software. They prefer to use commercially available and proven software for resource management and planning. 'An integrated suite of microcomputer programs which has been built up over the last decade, facilitates rapid incorporation of new data into the system.' AFB's approach to software in forest management is software that works together without creation of some 'mega system'. They run their system of packages (including PC ARC/DB) on a client/server local area network that everyone can access.

3. Packages Used By AFB

As a geographic information system they use PC ARC/DB. They refer to this as the nucleus for planning and management of information. The spatial data is accurately captured with the use of a sophisticated surveying package (GEOCOMP), and more recently a GPS (Trimble Pathfinder) is used to gain spatial data on new roading, etc. This is a standard field procedure which is proving to be quick and efficient.

Databases are created on specific entities. Database overlay is handled with PC ARC/DB. That is, no relational database analysis is required. The software simplifies the complex relations between the type of databases required by overlaying the spatial data and the relating database attributes.

They choose software with compatibility and ease of use in mind. For example they use Lotus 3.1 with R&R Report Writer. R&R does database reports with a Lotus-type menu, making the learning curve for R&R easier.

Husky Hunter portable computers are used for field inventory work with data downloaded in the office to microcomputers for processing and immediate inclusion in their management system databases.

INTERVIEW 7:
MR DON THOMPSON AND STAFF
TASMANIAN FOREST COMMISSION
HOBART

1. Their System

Tasmanian Forestry Commission have developed a GIS integrated with a scheduling and yield estimation facility. The system took approximately eighteen months to two years to develop and uses ARC/DB as their GIS. The data was converted to ARC/DB format from their initial spatial database with the development of Plantation Integrated Management System (PIMS).

2. Plantation Integrated Management System (PIMS) Component

PIMS consists of the Plantation Inventory System (PIS) and the Plantation Area System (PAS). They have a dedicated 2400 baud line around the state. They are now finding this insufficient. All updating of the database is done on a Unix workstation then transferred to the database on their PRIME computer to do analysis work.
At a regional level PIMS allows fictitious figures (e.g. MAI) to be entered for simulations. Map production seems to be done at a regional level.

3. Plantation Area System (PAS)

PAS is based on 'inventory units' which are basically homogenous stands defined by species, site quality, planting year and stand condition (stocking, times thinned, age at last thinning and pruning height). The "inventory units" are generated from approximately 22 themes held in the system. They are then further divided to meet administration boundaries, e.g. compartments. It was our impression all updating of PAS is done at the regional office.

4. Plantation Inventory System (PIS)

PIS is based on the measurement of temporary plots of 0.06 ha in size and at a rate of one plot per four ha. The plot data is linked to the spatial data in PAS. Once linked, volume estimates, operation area selection and scheduling can be carried out. Plot data is captured on Husky Hunter portable computers and downloaded at a district level on the network.

CONCLUSIONS

1. The Approach

We were of the opinion that those forest managers we spoke to were trying to achieve the same results while facing the same problems as CALM in W.A. Although other bodies have attempted to automate the forest management process none have done it completely. We are aware working groups are in existence to exchange ideas, however no such group is set up to pool resources. It would seem that a pooling of resources and expertise (maybe with each state/group given a module to develop) to achieve a flexible and universal system would save enormous money Australia-wide.

The localised approach of APPM would appear to work best and could be analogous to our Region/Forest Management Branch set up. Any whole-of-forest analysis would still be done at State Operational Headquarters on copies of the original regional data. The trend in computing is towards decentralisation, with a minicomputer at each regional office, hence the only problems would be ones of data currency when whole-of-forest analysis was done.

2. The Technique

a. The only true GIS (spatial/textual database system integration) being used was some form of ARC software. Although, since our return, we have seen Microstation software show signs of heading down the same analytical track as ARC software, PC ARC/*** seems to be the most cost efficient way to develop a GIS-based system. This is because of the cartographic advantages, the possibility of spatial data being captured in an Intergraph/Microstation environment and the analysis being done in some form of PC ARC/***. As we already have Microstation workstations in each of the three regions spatial data capture can continue or begin immediately.

   NB: ARC/*** represents ARC as the graphical database with any compatible textual database e.g. ARC/INFO and ARC/DB.

b. The experience from ANU suggested that any computer generated, integrated planning concept which was being considered for development should seriously consider using the services of a trained programming specialist. Their thoughts were that the programme structure was as critical as the biometrics formulas, and therefore should not be given less importance.

c. The Victorian experience verified that the effectiveness of the computer technology depended on the interest of the staff who ran the system. The staff who had an interest in maintaining the reliability of the data and a flair for computer technology performed better than other staff. Hence, the importance of selecting the correct person for this type of work and training them properly. This point was made in A. Rynasewycz, Lane Poole report dated 1990-91.

3. **The Goals**:

In hindsight we feel that we achieved about 70 per cent of our original goals as defined in the introduction. Our expectation of seeing a truly integrated package is still a year or two away. The Tasmanians were the closest to achieving a true GIS and database planning.

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