



Resource Monitoring Unit

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In 1993, the New Zealand Forest Research Institute established an interdisciplinary Resource Monitoring Unit in response to the increasing national and international focus on forests, and the rapid improvement in the technical capabilities for measuring and analysing the extent and change of natural resources. The objective of the unit is to conduct research into techniques for measuring, understanding and utilising spatial information as applied to New Zealand's indigenous and plantation forest resources, from seedlings through to wood processing.

RATIONALE

The world's forests are the focus of increasing attention. Individual countries, including New Zealand, will be required by the international community to monitor and sustainably manage their forest resource. Management depends on reliable information about the resource. Its extent, its changes through time, and its response to management, including the effects of the processing industries, need to be monitored accurately. The information required to do this depends on data with a spatial component, that is the geographical location of forests, roads, stands and trees, etc. Research into measuring, understanding and utilising spatial information involves the specialist disciplines of Geographic Information Systems (GIS), photogrammetry, remote sensing and image processing that are rapidly making major technical advances. Applications range from the large-scale assessment and monitoring of national forest resources, to the cost-effective sampling of small areas of plantations. They include such diverse topics as modelling the spread of a forest disease and image processing of logs. Use of these applications will enable policy makers and managers to meet stringent requirements to more effectively manage the forest resources in a sustainable and environmentally friendly way, whilst still improving profitability.

The New Zealand Forest Research Institute (NZFRI) has been using and conducting research on digital spatial information techniques for several years now.

In August 1993, NZFRI formed the Resource Monitoring Unit (RMU) with a small number of staff from the Forest Technology Division and the Logging Industry Research Organisation. These researchers had the required expertise in GIS, photogrammetry, remote sensing, and image processing but were working more or less separately. By creating a specialist research unit, interaction between the related disciplines has become more effective, and expensive equipment better utilised.

The objectives of the RMU are to research the techniques for measuring and understanding spatial information, and to apply these techniques to forestry research in order to meet the needs of land management agencies and the forest industry. The Unit achieves this through its own core research programme, through collaboration with the programmes of other researchers both within and outside NZFRI, and through work for industry and other organisations.

SPATIAL RESEARCH AT NZFRI

GIS has been used in many research projects. These include the New Zealand Nutritional Atlas for Radiata Pine; species mapping; stand records and forest planning, including research of spatio-temporal issues; forest site productivity and sustainability (environmental and spatial factors affecting tree growth); harvesting research and logging plans; rural-land-use planning; and studying spatial variability of indigenous tree species. Consulting work has been done on GIS for the forest industry as well as internationally. In addition, NZFRI is the New Zealand agent for TerraSoft, a full GIS on a personal computer (PC). In New Zealand, this system is used by NZFRI and Landcare Research, the Department of Conservation, P.F. Olsen & Co. Ltd, Timberlands West Coast and New Zealand forest managers.

NZFRI has a well-established photogrammetry facility. Systems in place include cameras and mounts for the acquisition of aerial photographs, and a well-equipped dark room for film processing. Photo-interpretation and precise mapping, particularly the preparation of digital terrain models, is carried out using an AP190

analytical stereoplotter. The AP 190 can also be interfaced to TerraSoft to utilise its analytical and plotting capabilities. Applications enable the production of accurate forest road and harvest plans and can provide perspective views of intended operations. Other specialised photogrammetric applications include developments for the tree nutrition research.

NEW DEVELOPMENTS

Research into the operational use of airborne videography is now showing how this new technique can be used for forest health assessment and the monitoring of silviculture and logging operations. Video images have been captured and integrated with maps from GIS, and can be integrated with digital data from stand records.

Image processing is a field in which NZFRI has become more involved. Combined with airborne video and other sources of digital images, the automation of image classification techniques to detect characteristics such as nutrient stress and tree stocking is being developed. Image processing techniques are also used at NZFRI for the analysis of fibre, timber and log images.

Visualisation of forest development, particularly new planting and logging, is becoming increasingly important to managers of natural resources. The capability of the RMU in the field of data visualisation is developing through a joint programme with the USDA Forest Service and several USA universities.

By integrating ground-based forest inventory with the analysis of satellite imagery and GIS, forest stand parameters may be predicted for large-scale applications such as national forest inventory, or for very small-scale uses, such as merchantable volumes within a logging setting. Research is being carried out in conjunction with Landcare Research and the National Forest Inventory section of the Finnish Forest Research Institute.

Global Positioning Systems (GPS), which use satellites to locate positions, are a rapidly developing technology. Their use, capability and effectiveness within forests and for forestry applications is frequently evaluated by staff of the RMU.

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