School of Forestry update

Bruce Manley

Graduation 2016

A small cohort of 11 students completed their Forestry Science (BForSc) degree in 2015, while two students completed a Forest Engineering (BE) degree. Following the graduation ceremony a function was held to celebrate the achievements of the graduates and a number of awards were made:

Postgraduate

- Graham Whyte Prize for best performing postgraduate student (Adam Forbes)

Forest Engineering

- Top design project (Cameron Alderton)
- Top Forest Engineering student (Tony Li)

Forestry Science

- Max Jacobs Prize for Year 3 Silviculture (Acacia Farmery)
- University prize for Academic Achievement (Ryan Drummond)
- Dissertation prize (Adrian Loo)
- Schlich award for overall top Forestry Science student (Acacia Farmery).

Some current research at the School of Forestry

Dryland forests

The School of Forestry is a partner in the New Zealand Dryland Forestry Initiative (www.nzdfi.org.nz). The aim of this programme is to establish a new forest industry based on high-value naturally durable eucalypts. Core research is supported by the MBIE and industry-funded Specialty Wood Products Research Partnership, as well as NZDFI and the School of Forestry. Growth-strain research is funded by the Ministry for Primary Industries (MPI) and the forest industry through the Sustainable Farming Fund. Site-species matching is supported in part by an Agmardt Agribusiness Innovation Grant.

Research at the School of Forestry under this programme includes:

- Wood quality (Dr Clemens Altaner)

  Wood varies in its properties, but only heartwood which is rich in extractives and easy to process is of value. Good quality will be ensured through a breeding programme, where trees are selected at a young age for heartwood quality and quantity as well as low growth-strain. Research is being undertaken by four PhD students:

  — Nick Davies is currently screening the entire breeding population of two durable eucalypts for low growth-strain. This is only possible after the development of a novel and fast growth-strain assessment applicable to young trees (aged one to two years). By next year improved germplasm will have been propagated.

  — Fei Guo is developing a non-destructive and quick analytical technique to assess strain in solid wood. Current procedures to measure growth-strain are destructive and laborious. His work could make it possible to segregate logs which are suitable for solid wood processing from existing pulp wood plantations.

  — Yanjie Li is screening the durable eucalypts for heartwood. The sampling of trials is only manageable thanks to the development of a novel hand-held, battery-powered coring system. The

Probing of an *E. bosistoana* tree with the battery-powered corer developed for this project

Scattered secondary totara and larger forest patches on a Northland farm

cores are analysed for heartwood quantity and quality. Heartwood quality is only measurable (on the required number of samples) after developing a fast spectroscopic technique to predict extractive content. Extractives are the main factor giving heartwood colour and durability.

— Gayatri Mishra is investigating the process of heartwood formation in young trees. This process has not been studied before, but heartwood formed by young trees differs from that of old trees as does corewood from outerwood. Exploring the feasibility of early screening for heartwood (aged one to two years), i.e. before heartwood is formed in trees, is also part of her work.

- Site-species matching (Dr Justin Morgenroth and Professor Euan Mason)

  Different species of eucalypts have widely varying responses to environmental stresses like freezing air temperature or low soil moisture content. By modelling the growth of eucalypts as a function of topographic, edaphic (produced or influenced by the soil) and climatic site characteristics, we stand to improve our ability to select the most appropriate species for any given planting site. We aim to produce suitability maps for dryland eucalypts species based on micro-site environmental monitoring.

  PhD student Serajis Salekin is modelling growth and yield of *Eucalyptus bosistoana* and *E. globoidea* based on topographic, climatic and edaphic variables. He has measured over 20,000 trees at sites in Marlborough and the Hawke's Bay and has begun analysis to see whether the species are sensitive to within-site differences in elevation, aspect, radiation, temperature, and soil moisture, amongst other factors.

- Forest health (Dr Tara Murray)

  Around 30 insect species focus on eucalypts in New Zealand, including several that can cause significant damage, but susceptibility to insect attack is highly variable. By identifying the most insect tolerant and resistant trees able to withstand and recover from herbivory we aim to future-proof the NZDFI resource against pest damage. Mapping pest biology and phenology will further aid in the prediction and sustainable management of pest outbreaks.

  PhD student Huimin Lin is conducting defoliation experiments to assess the growth impact of severe and moderate herbivory when inflicted on five to six-year-old *E. bosistoana* in either the early or late part of the growing season. She is also assessing the degree of insect attack on different genetic families and mapping the phenology of key insect pests in the Marlborough region. Her work on defoliation impacts and local insect life-cycles will help us select more tolerant breeds and inform pest management practices.

- Breeding (Associate Professor Luis Apiolaza)

  Breeding exploits the genetic variability of our species to select, mate and deploy trees with superior growth, wood durability and low growth-strain. Breeding trials also provide the scaffolding that connects the different research topics in NZDFI. We collaborate with researchers in wood quality, growth modelling and forest health to account for the family structure (and its interaction with the environment) when explaining the varying performance of the NZDFI species.

Enhancing native biodiversity on NZ sheep and beef farms

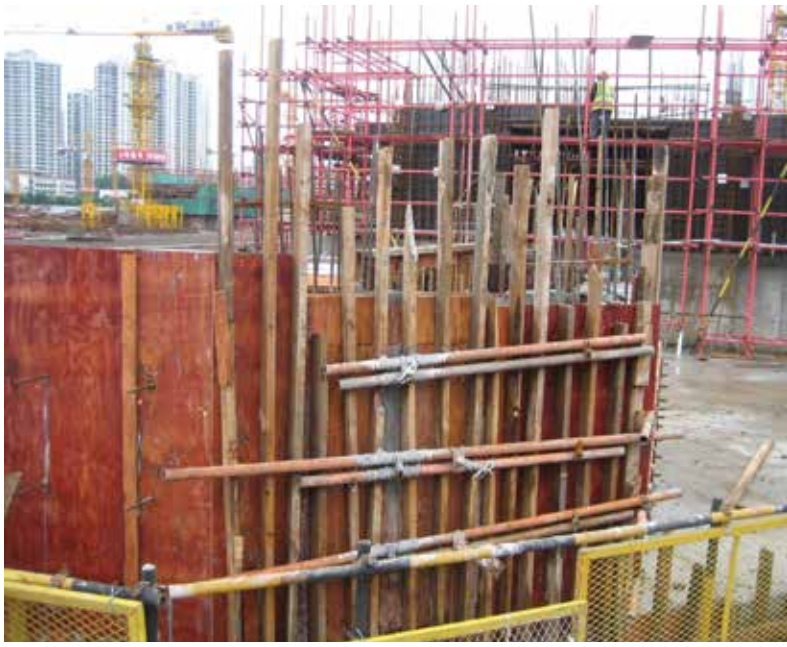
As part of their research on native biodiversity on sheep and beef farms, Dr Laura Young and Professor David Norton are investigating the distribution of native woody vegetation across Northland rural landscapes focusing on two scales. At a regional scale, they are quantifying the contribution that native woody vegetation on farms makes to regional conservation in terms of the area of native habitat and the role it plays in improving connectivity for native fauna.

At the farm scale, the research is quantifying the distribution patterns of native trees (from single trees to regenerating stands to remnants of the original forest) and their current composition to understand how well they contribute to region-wide biodiversity conservation. They are also working closely with the Northland Totara Working Group as the sustainable management of the Northland totara resource provides an economic rationale for retaining native forest, which also then contributes to biodiversity conservation.

This research is part of a broader research programme that is investigating win-win outcomes for native biodiversity and farming in both the North and South Island. Other elements to our work includes quantifying some of the ways in which native biodiversity can benefit farming (e.g. shelter for livestock, pasture growth enhancement under matagouri and tussocks, especially during dry summers), as well as investigating ways in which farmers can enhance and restore native biodiversity.

Harvested wood products

Professor Bruce Manley and Dr David Evison are working on an MPI-commissioned project to develop a robust methodology and models for tracking the volume and type of wood products produced from New Zealand grown roundwood in overseas markets. The objective is to enable MPI to make informed decisions around the options concerning the uptake and policy about harvest wood products (HWPs) in national level greenhouse gas (GHG) reporting and accounting, the emissions trading scheme (ETS) and policy development processes.



Shanghai construction site. The mainstay for the demand of radiata pine in China is for concrete formwork. Lumber and plywood are used repeatedly on the construction site until they are no longer fit for purpose. Lumber and plywood are used two to eight times over a three month period and material is then recycled into low-quality panels or burnt

The focus is on New Zealand's three major markets for logs:

- China (68% of 2015 log exports)
- South Korea (17%)
- India (11%).

The approach taken has included:

- A survey of New Zealand log exporters. Information was obtained about the grades that they exported, the probable products produced from the exported logs and their likely end use.
- Visits to each of the three countries. Visits were made to wood processing plants, wood product manufacturers, construction sites, ports, log yards, log traders, industry associations, researchers and government officials. These visits provided an overview of the material flow and end uses of the HWPs produced from New Zealand export logs.

Professor Bruce Manley is Head of School at the School of Forestry at the University of Canterbury in Christchurch. Email: bruce.manley@canterbury.ac.nz.