School of Forestry update

Bruce Manley

Student numbers growing

Student numbers are good and increasing at the School of Forestry. We are expecting at least 20 students in each of the four years of the BForSc degree in 2018 and over five students in each of the three professional years for the BE (Forest Engineering). First-year enrolments in the BForSc are likely to be in the 25 to 30 range. A large number of students come to us by word of mouth – it is great to see sons and daughters of our graduates following their parent's footsteps. Career opportunities are still great with active recruitment by Australian, as well as New Zealand, forestry companies and organisations.

Postgraduate numbers have also been increasing. Currently we have 35 postgraduate students enrolled from 16 different countries (Figure 1).

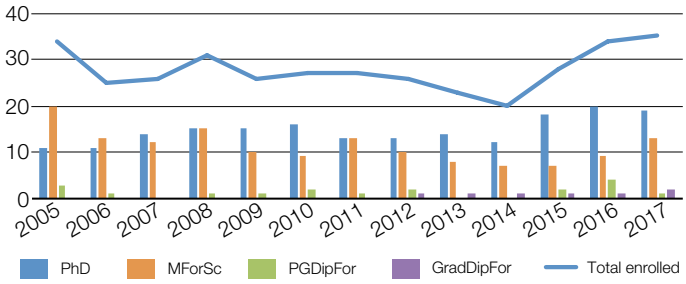

Figure 1: Postgraduate enrolment totals 2005–2017

Forest Growers Levy Trust support of forest engineering (by Rien Visser)

In 2014, the Forest Growers Levy Trust allocated $100,000 per annum for an initial five-year period to support forest engineering at the School of Forestry. The School has both a dedicated forest engineering programme (BE Hons), but also a forest science (BForSc) degree option that has a strong forest engineering component. Forest engineering spans the themes of harvesting systems, transportation, infrastructure and harvest planning, but also covers the important topics of environmental management and safety.

The levy funding is supporting all aspects of teaching, research and outreach. However, the need for funding was primarily to recruit a suitable candidate to support the programme, as well as to provide funding for scholarships to help recruit quality students. The teaching support component was critical for the IPENZ (now Engineering NZ) re-accreditation of Forest Engineering. It is also important in sustaining the BForSc programme.

The last five-yearly BForSc review in 2013, based primarily on feedback from employers, highlighted the importance of forest engineering skills for all graduates and encouraged the School of Forestry to strengthen that component. In response, the fourth-year Harvest Planning course was made compulsory for all BForSc students and the majority also elect to take the Forest Roads and Transportation course. In addition, more BForSc students are now undertaking their final-year dissertation projects on forest engineering topics.

In terms of the use of the funding to date, we recruited Dr Kris Brown into a post-doc position at the beginning of 2015. He has taught the Forest Roads and Transportation Course for the last three years and has been very well received by the students. Kris has also guest lectured and assisted with field lab exercises for Introduction to Forest Engineering, Harvest Planning and recently the Environmental Forestry course.

He has also established a successful research track record, winning the School of Forestry Young Researcher Award for 2015 and successfully gaining funding for work looking at Sediment Pathways (NZFOA), as well as small-scale forestry (with the NZ Farm Forestry Association). His work includes a project that surveyed haul road stream crossings throughout New Zealand to characterise road and crossing design, evaluate water control and surface cover best management practices, and estimate the potential for sediment delivery to streams.

With Kris's support in teaching, both Rien Visser and Hunter Harrill (employed as a Senior Research Assistant on FGR grants) have been able to make time

Post-doctoral Fellow Kris Brown (left) inspecting stream crossings in Southland

to teach professional development workshops to the New Zealand forest industry. Course themes have included cable logging/harvest planning, and winch-assisted steep terrain harvesting courses around the country. Rien, Hunter, Kris and Justin Morgenroth have successfully taught four-day professional workshops at the School of Forestry in August 2016 and again in August 2017. In total more than 500 industry people, forest workers, council staff and WorkSafe inspectors have attended workshops.

The levy funding has also directly supported a scholarship. We were able to recruit Thornton Campbell, a BForSc graduate, to complete his Masters. His topic was to review the potential opportunities for modern medium-sized yarders. Through additional support he was able to both present his research findings at a major international conference and carry out a small research project in the Austrian Alps. We are in the process of recruiting another Masters level student, but will also be providing some support for a PhD student who will focus on health and safety. For the coming year (2018) we will also be offering three $5,000 scholarships to second-year ('1st Pro') Forest Engineering to attract additional students who have a high average grade and interest in the programme.

The support for forest engineering through the Forest Growers Levy Trust contribution is greatly appreciated. It has ensured that forest engineering has maintained a stronger and sustained presence in our teaching programmes and has had positive benefits for our industry.

Hybrid mensurational/physiological modelling for precision forestry (by Euan Mason)

The School of Forestry has initiated a project to use eco-physiological principles and high-resolution GIS layers to estimate productivity of plantation forest estates and improve growth and yield models. This project is supported by Forest Growers Levy funding, Swedish research funding, a PhD scholarship from Chile and also direct funding from forestry companies. Two outputs of the project are:

- High-resolution estimates of site index and 300 index at 15 x 15 m resolution as raster layers (Figure 2), combined with associated layers at the same resolution that indicate what is limiting productivity across the estates
- Hybrid mensurational/physiological growth and yield models for partners' estates that are sensitive to climatic and soil conditions.

Initial estimates of productivity are expressed as potential radiation use, and employ data from the

Masters student Thornton Campbell at his Active 70 study site in Taupo

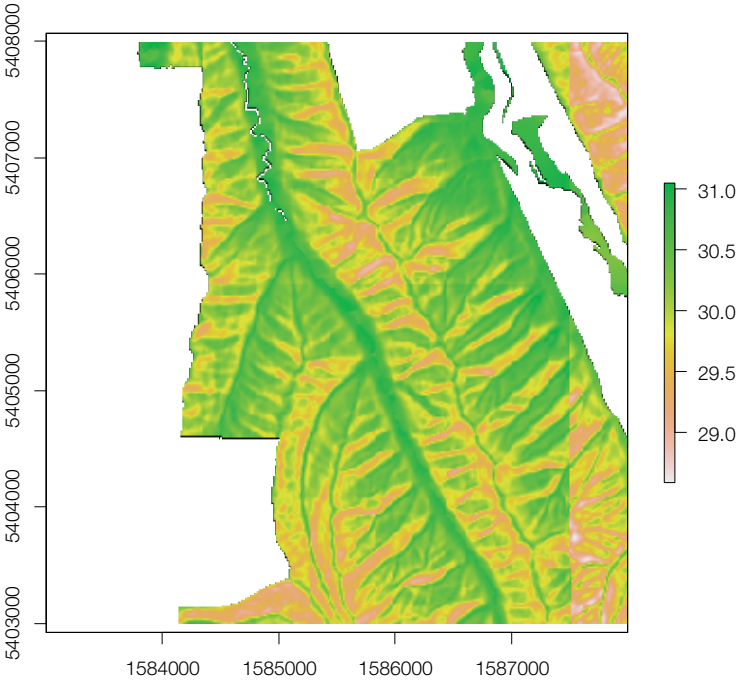

Figure 2: A portion of a 15 x 15 m raster layer showing a site index in the Nelson Forest Management Ltd estate, estimated from radiation use efficiency and with some extra topographical influences added during calibration

National Institute of Water and Atmospheric Research (NIWA), soil data from Landcare Research, and digital elevation models (DEMs) provided by participants. DEMs are typically derived from LiDAR scans of landscapes. The first step is to determine how best to localise estimates of climate, which NIWA provides on a 5 x 5 km grid (called the Virtual Climate Station Network or VCSN) across New Zealand. Then localised climate estimates are included, with the best available soil and topographical data, to run a model that estimates potential photosynthetic rates on a monthly basis for periods during which trees are growing. The final step is to calibrate estimates of radiation use in megajoules/m² with site index and 300 index estimates from permanent sample plots.

Radiata pine increment cores are used to evaluate acoustic velocity, density and shrinkage properties

Growth and yield models in New Zealand and in Uruguay have been shown to be more precise as mensurational physiological hybrids than traditional time-based growth and yield equations, and so stage two of the project is to make such hybrids for some companies in New Zealand. Work is also ongoing to improve our estimates of the impacts of soil, topographical and climatic influences on photosynthesis.

Researchers and companies from New Zealand, Sweden, Chile and Uruguay are collaborating. New Zealand company participants include Nelson Forest Management Ltd, Kaingaroa Timberlands Ltd, Port Blakely Ltd, Global Forest Partners Ltd, Rayonier (NZ) Ltd and Wenita Forest Products Ltd. Companies use productivity layers for a variety of purposes, including allocation of silvicultural regimes and prioritising spending on productivity improvement. Hybrid growth and yield models can be used for all traditional purposes, but also for identifying potential impacts of climate change during a rotation, as well as updating inventory estimates of growing stock, taking account of the weather since the time of the inventory.

Very early screening of radiata pine wood properties (by Luis Apiolaza)

Wood produced in the first 10 years of radiata pine (corewood) is often downgraded to low-value products, as their wood properties do not meet market requirements. The NZ Radiata Pine Breeding Company has been working with the School of Forestry on very early screening methods to remove families and clones with poor wood quality.

In 2013, we assessed wood properties for 3,000 two-year-old trees, representing 90 families and 10 clones used by the New Zealand forest industry. We identified candidates for removal from the commercial deployment based on acoustic velocity, density and shrinkage properties.

Right now we are processing six-year-old samples to test how stable the selection decisions were made at age two in 2011. This time we are using 1,200 increment cores, and evaluating their acoustic velocity, density and shrinkage properties, including trends with age. By the end of this project we will have identified the worst corewood quality genotypes, so they can be removed from future commercial use, improving the profitability of commercial plantations.

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