CRC for Forestry

Researching sustainable forest landscapes

Project 1.3 Modelling and information integration newsletter

Introduction

Firstly I'd like to wish all our project partners a happy and productive new year and introduce you to a new communication initiative within Project 1.3.

Some criticism has emerged within CRC project steering committees and program coordinating committees of a general lack of knowledge transfer from project-based activities to CRC partners. Over the last few years and while I was involved in the ARC Cellular Automata (CA) project, I produced a six-monthly newsletter informing partners of project activities and some of the recent science highlights and outcomes. I plan to continue this approach to address some of the concerns around industry engagement and technology transfer.

I had positive, although limited, feedback on the CA newsletter, but I would hope that this newsletter is not just a one-way transfer of information. Please contact me if you would like to comment on the project and its directions or if you would like to contribute to this newsletter.

Given that we are all extremely busy, and I'm sure that many of these communications get filed and quickly forgotten in our ever-expanding email inboxes, I've decided to try a novel form of communication—snail mail—so you can easily take the message on your travels. Let me know what you think.

Tony O'Grady

Meet the team

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Focus: Florentine Valley—forest water use studies

Water balance matters

In 2007, Sandra Roberts of Forestry Tasmania (FT) started investigating aspects of the water balance in a chronosequence of *Eucalyptus nitens* trees in the Florentine Valley, Tasmania. It is important that FT and other forest management organisations develop tools to enable estate-level planning that incorporates an understanding of the role that plantations play in catchment water balance. FT have established water balance studies in the Florentine Valley to explore the relationships among stand age, basal area and leaf area index, and stand transpiration.

Monitoring sapflow in six year old E. nitens *trees in the Florentine valley (photo: Maria Ottenschlaeger)*

Understorey transpiration is an important and often-overlooked component of the site water balance and can in some circumstances dominate evapotranspiration. Quantifying this component of the water balance is complicated as understoreys are often structurally and floristically complex.

Digital photography is being used to track monthly changes in leaf area index of the forest canopy (photo: Maria Ottenschlaeger)

In Project1.3, we're working with Sandra and her team to develop methods to estimate and model how understorey transpiration contributes to evapotranspiration. We are monitoring understorey water use in a number of the key woody shrubs using sapflow gauges to quantify understorey water use. We are also monitoring the growth and leaf area index of the overstorey and understorey vegetation and measuring understorey microclimate to understand the controls on understorey transpiration.

In combination with the water balance studies being conducted by FT, we will develop a more complete picture of forest water balance and also start to understand some of the competitive interactions between the overstorey and understorey.

For more detail, contact Tony O'Grady (CRC, UTas) or Sandra Roberts (Forestry Tasmania)

From the data book

As part of the Florentine forest water use studies, we are conducting ecophysiological studies into the functioning of three common Tasmanian understorey shrubs. These studies aim to help us understand how these woody shrubs are influenced by changes in climate and soil water availability and will help us to better to understand processes driving the water use and productivity in understorey environments.

A common measurement in ecophysiology is pre-dawn leaf water potential (Ψ_{pd}). Measurements are made 'pre-dawn', which in the Tasmanian summer is very early. This ensures that the measured leaf water potential is representative of plant water status when there is no transpiration taking place, as transpiration will result in a reduction in leaf water potential that is related to the plants' resistance to water movement. Under these 'no flow' conditions, it is assumed that the plants have equilibrated with soil availability.

Thus, pre-dawn water potential is an indication of the water status of plants and is commonly used as a surrogate of soil water availability in plant communities. This relatively simple measurement can provide a considerable amount of information relating to a plant's water status, including the degree of stress the plant is experiencing, relative rooting depth and how plant water status may change seasonally or as a function of other factors such as competition from the overstorey.

Figure 1 shows data collected in February 2009 in thinned and unthinned *Eucalyptus nitens* plantations in the Florentine Valley (Tasmania). There are two important points:

- Ψ_{pd} is lower in the *A. dealbata* compared to the *P. apetela* or *Z. aborescens,* potentially indicating differences in the effective rooting depth of each species.

- Ψ_{pd} is generally lower in plants in the unthinned plantation compared to plants in the thinned plantation, indicating reduced water availability to understorey plants in the unthinned plantation.

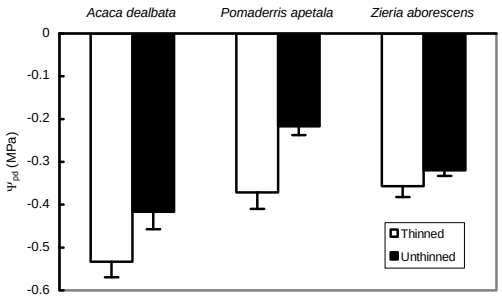

***Fig. 1**: Pre-dawn leaf water potential of three dominant understorey species in* Eucalyptus nitens *plantations in the Florentine valley (Tas.). Data: February 2009*

Current activities

Current activities within Project 1.3 focus on four major fronts:

- extending and developing the Cellular Automata model
- maintaining and monitoring the paired plots network
- developing a functional classification of understorey communities
- conducting Florentine Valley water use studies.

Please call Tony O'Grady if you'd like more information regarding these activities.

Recent publications

Drew DM, Downes GM, O'Grady AP, Read J (2009 *in press*) High resolution temporal variation in wood density, microfibril angle and wood anatomical properties in irrigated and non-irrigated *Eucalyptus globulus*. *Annals of Forest Science*

O'Grady AP et al. (submitted) Convergence in water use within an arid woodland. *Oecologia*

Eyles A, Pinkard E, O'Grady AP et al. (submitted) Role of corticular photosynthesis in recovery following defoliation in *Eucalyptus globulus*. *Plant Cell and Environment*

Quentin A, Pinkard EA, Beadle CL, O'Grady AP, Paterson S, Mohammed CL (submitted) Do artificial and natural defoliations have similar effects on physiology of *Eucalyptus globulus* Labill. seedlings? *Tree Physiology*