Operational Silviculture Technologies in the Green Triangle - An overview of Forestry Centre of Excellence (FCoE)

Presenter: Di Patzel

07/10/2026

Adelaide University

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*Photo source: D.Patzel unless otherwise stated

Content

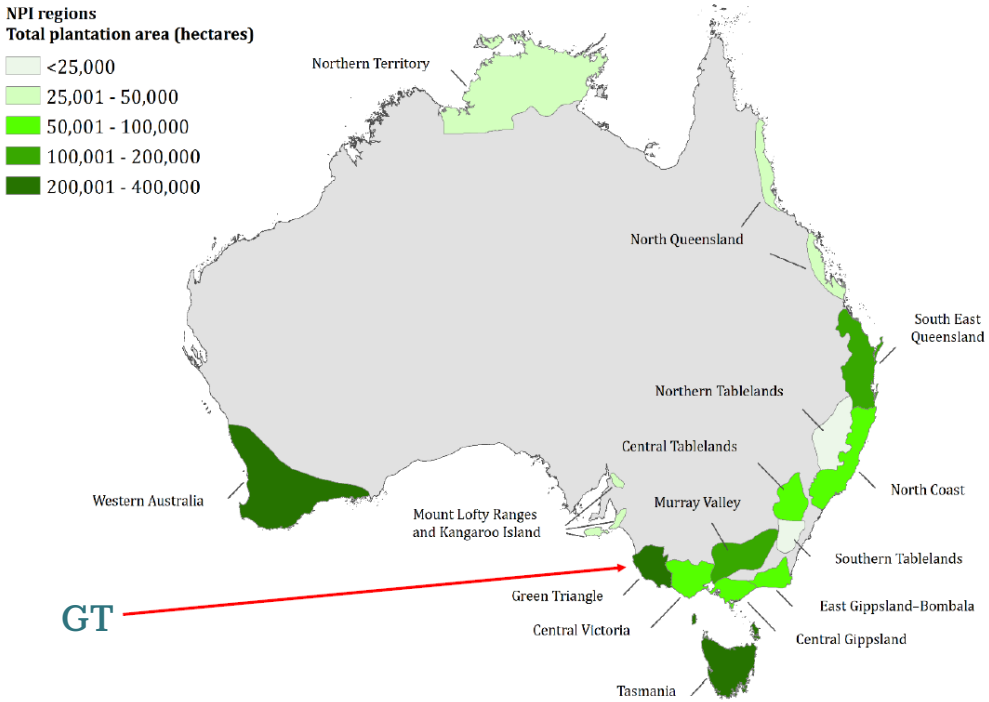
- Overview of Australian Plantation Forestry
- GT context
- Forestry Centre of Excellence (FCoE)

- Overview with a focus on technology trends, digitalisation and adoption of AI
- - Silviculture (Mechanised planting, Drone Technology)
- - Forest Health
- - Water

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Australian Forestry Regions



Source: *ABARES 2025*

Total forest cover

- 133.6 million hectares (ha)
  - Native forest 131.5 million ha
  - Commercial plantations 1.82 million ha
  - Other forest 0.24 million ha

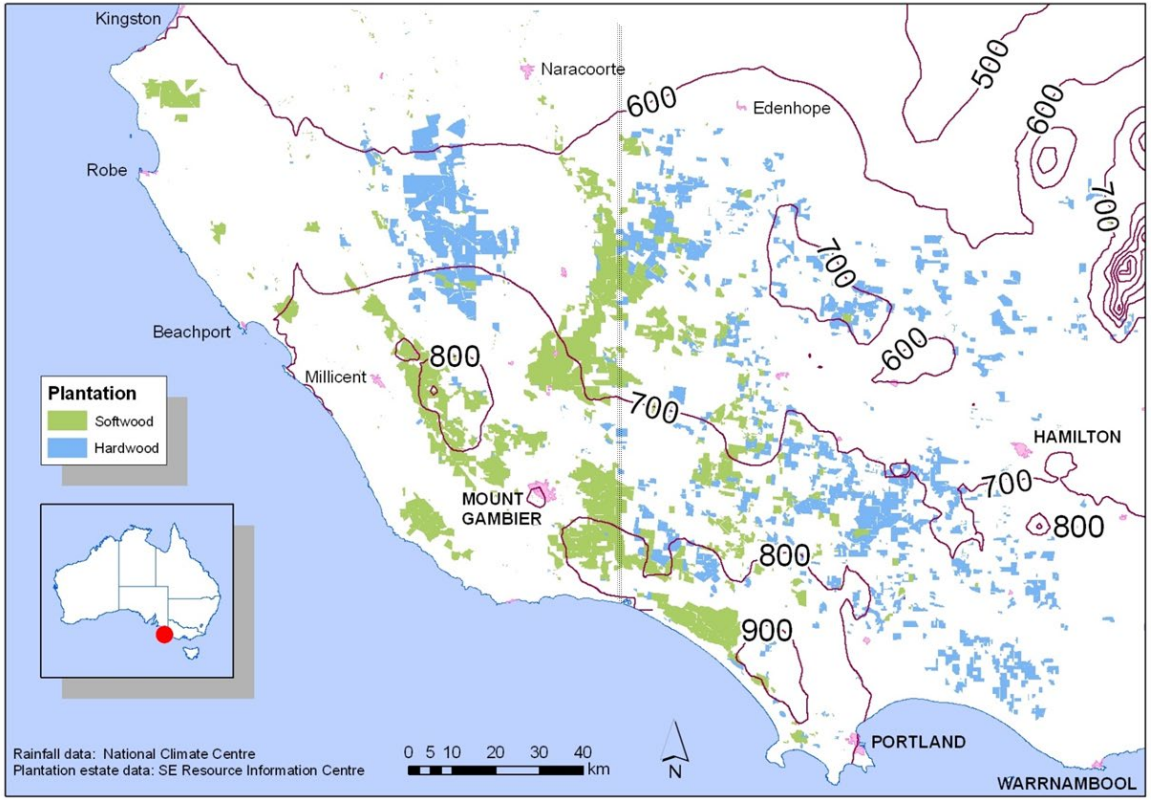
Commercial plantations

- 1.06 million ha (*Pinus radiata*)
- 0.74 million ha (*E. globulus and E. nitens*

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Green Triangle Forestry – Plantation Extent



Source: *ABARES 2025*

Green Triangle total (315,000 ha)

- Approximately 180,000 ha *Pinus Radiata*
- -Av. MAI 21m^3

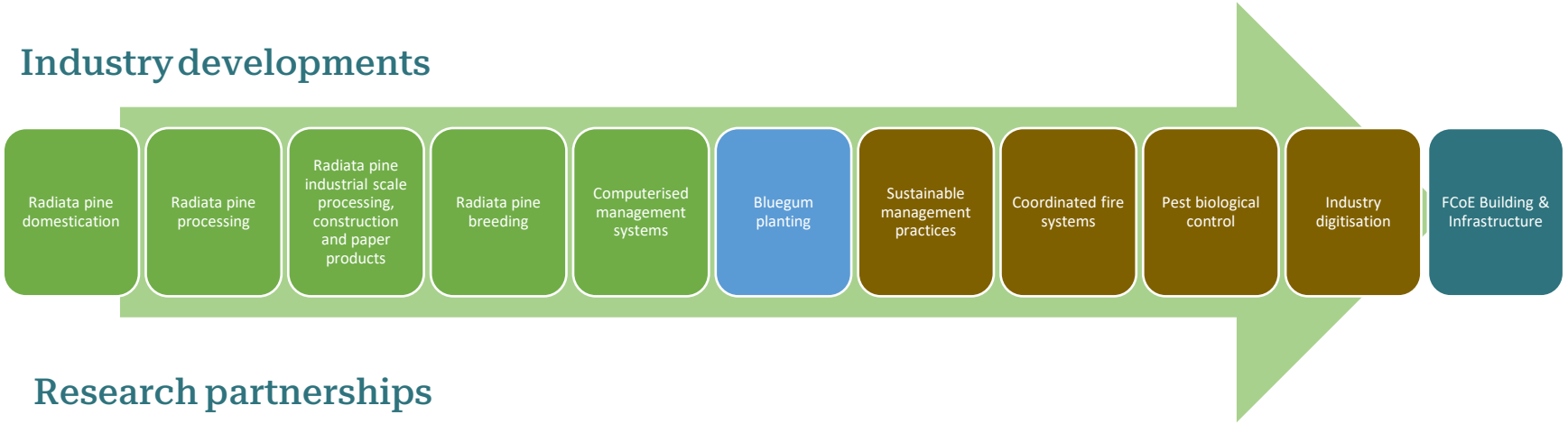
- Approximately 133,000 ha of *Eucalyptus globulus*
- -Av MAI 17m^3

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1875-2026 - Industry Developments, Research Partnerships, & South Australia State & Commonwealth

Industry developments



Research partnerships



Source: *J.Ohehir*

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Government of South Australia
Department of Primary Industries and Regions

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https://www.forestrycoe.com.au/

Silviculture projects @ FCoE

- FWPA - Getting the best plant in the right place to maximise tree survival, productivity and resource quality

- SilVR – VR Silviculture training tool

- Drone NIFPI - Clean-strip establishment systems for improved plantation outcomes
- Drone FWPA - Weed Identification Using Remote Sensing
- Drone NIFPI - Future Proofing SA Blue Gum Plantations through improved detection of koalas in early planning and forestry operations.
- Drone FWPA - Koala Detection using Biologically Inspired Vision

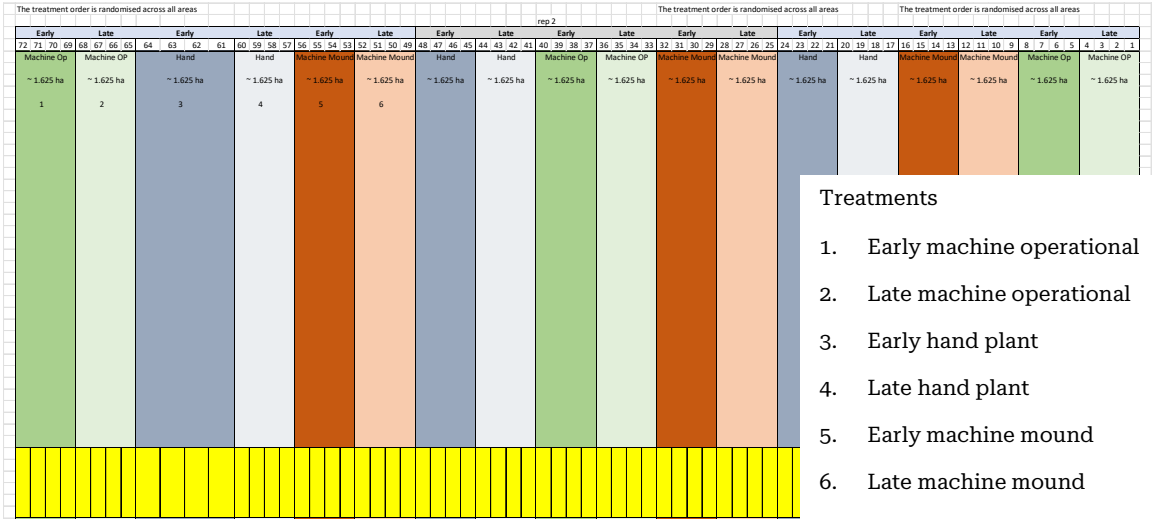
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Trial - Mechanical planting

Di Patzel dianne.patzel@adelaide.edu.au

Objective:

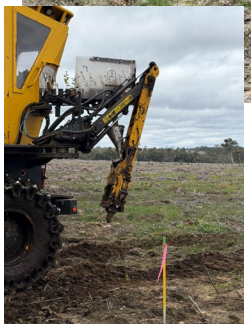
1. Determine the impact on survival and early growth of extending the planting window. Early planting (early May) vs late planting (late August) on the same site.
2. Determine the impact of seedling placement on survival and early growth. Machine based mound vs gutter planting vs hand planting on the mound.



Treatments

1. Early machine operational
2. Late machine operational
3. Early hand plant
4. Late hand plant
5. Early machine mound
6. Late machine mound





Trial established: 2026 (no results available yet)

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VR – SilVR

Dr Spencer O'keeffe: spencer.okeeffe@adelaide.edu.au



- SilVR allows users explore different management regimes in VR environment. Attributes such as stand density, thinning intensity and forest health can be explored to view their effects on plantation outcomes.

- Used as a training tool for industry and students in plantation silviculture

O'Keeffe, S., B.H. Thomas, J. O'Hehir, J. Rombouts, D. Patzel, D. Weber, J. Baumeister, A. Cunningham. 2026. SilVR: Comparing Diegetic and Non-Diegetic Interfaces in an Immersive VR Simulation for Silviculture Education. Journal - Simulation & Gaming. https://www.webofscience.com/wos/woscc/full-record/WOS:001685328000001

Source: Dr Spencer O'Keeffe

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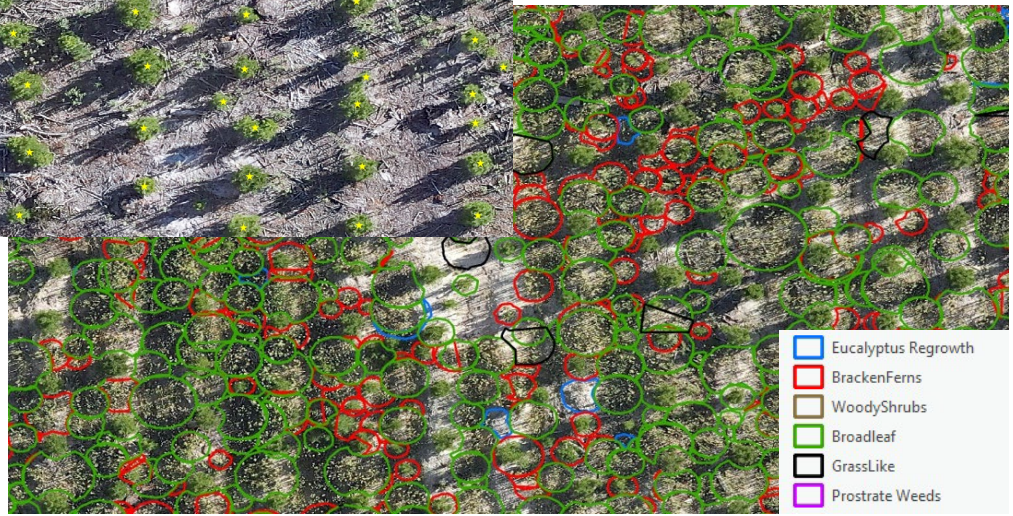
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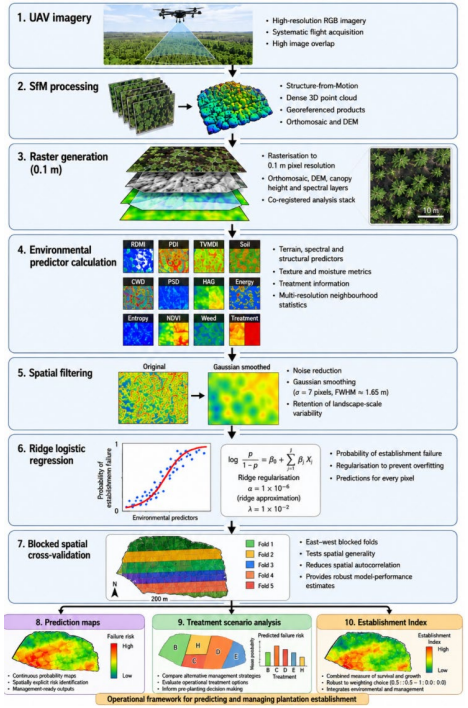
Drone

Professor Anthony Finn : Anthony.finn@adelaide.edu.au



- PINT Tree Survival
- PINT Weed Coverage
- PINT Weed Identification
- PINT Site Productivity Prediction





Source: Adapted from material by Anthony Finn and Neil Winkley

Finn, A., Kumar, P., Peters, S., & O'Hehir, J. (2022). Unsupervised spectral-spatial processing of drone imagery for identification of pine seedlings. ISPRS Journal of Photogrammetry and Remote Sensing, 183, 363-388.

Finn, A., Skelton, P. S. M., O'Hehir, J., Schebella, D., Winkley, N., & Jenkin, B. (2026). Predicting Future Forest Plantation Establishment Outcomes from UAV-Derived Pre-Planting Environmental Conditions. *Remote Sensing*, *18*(16), 33 pages.

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Koala detection

Professor Anthony Finn : Anthony.finn@adelaide.edu.au

Automation technology to detect Koalas in Bluegum plantations.

Workflow
1. The thermal camera detects candidate objects (regions of interest)
2. The Biologically Inspired Vision (BIV) processing enhances these detections
3. The RGB camera images of these regions are analysed by a deep learning classifier
4. The classifier determines if the object is a koala



Weber, D., A. Finn, L. Al-Shimaysawee, R. Brinkworth, M. Schebella, D. Whisson. 2025. Future Proofing SA Blue Gum Plantations through improved detection of koalas in early planning and forestry operations. National Institute for Forest Products Innovation – Document# NS021

Al-Shimaysawee, Laith A. H., Anthony Finn, Delene Weber, Morgan F. Schebella, and Russell S. A. Brinkworth. 2024. "Evaluation of Automated Object-Detection Algorithms for Koala Detection in Infrared Aerial Imagery." *Sensors* 24(21): 7048. doi:10.3390/s24217048.

Source: Adapted from material by project NS021

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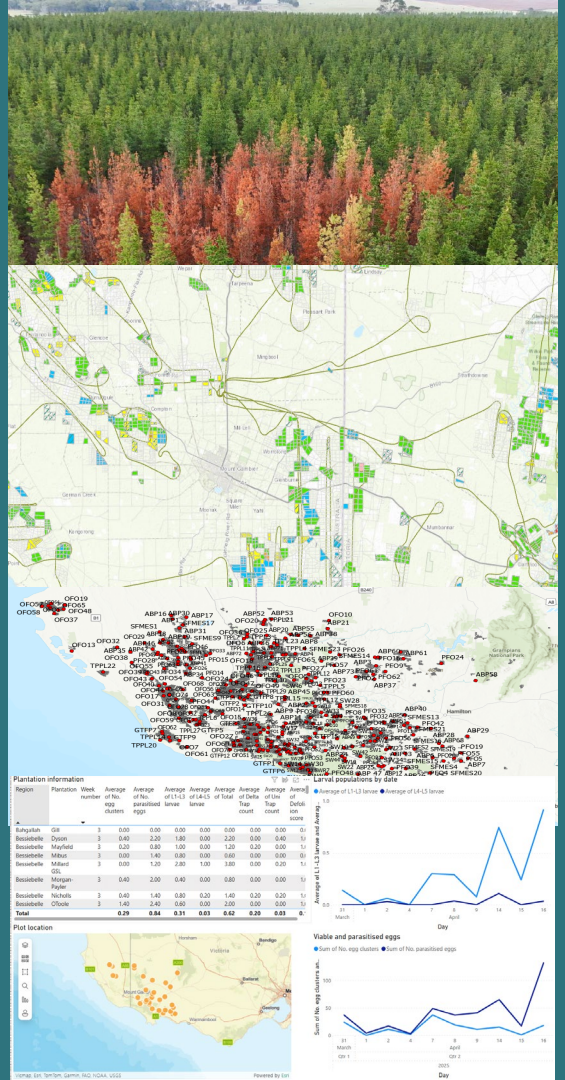
Forest Health projects @ FCoE

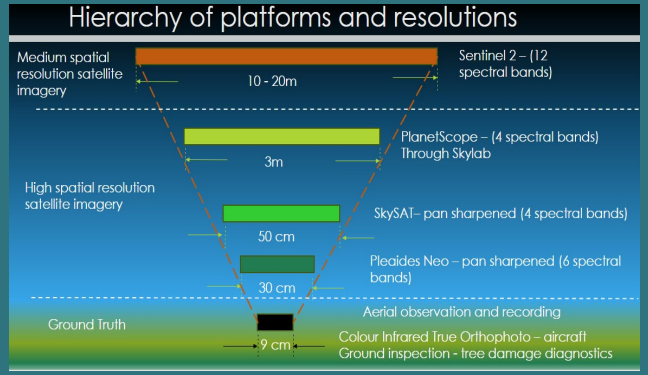
- NIFPI - Development and implementation of forest health and biosecurity systems and protocols based on quantitative pest risk and economic impact assessment.
- FWPA- Evaluation of remote sensing techniques for plantation health surveillance.
- Industry contract - Forest Health and biosecurity program
- FWPA - Remote Sensing for forest pests and change detection
- AFWI - Sustainable management of plantation forest pests under changing climates

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Forest Health Surveillance and Remote Sensing

- Active collaborative surveillance program across all major plantation growers in the region
- Location, extent and severity of Pest and Pathogens impacting plantation health





Source: C.Stone and D.Bruce by project NIFPI - NS089

Bruce, D., Hillman, M., Wang, M., Stone, C., Patzel D., Carnegie, A., Pearse., G Evaluation of remote sensing technologies for plantation health surveillance. National Institute for Forest Products Innovation – Document# NS089

Wang, Mingzhu, Christine Stone, and Angus J. Carnegie. 2026. "Application of CNN and Vision Transformer Models for Classifying Crowns in Pine Plantations Affected by Diplodia Shoot Blight." *Forests* 17(1): 108. doi:10.3390/f17010108.

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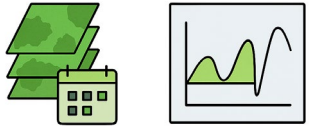
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Timely detection of tree disturbance in Green Triangle Pine Plantations using Cloud-based remote sensing

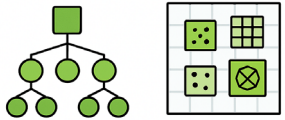
METHODS:



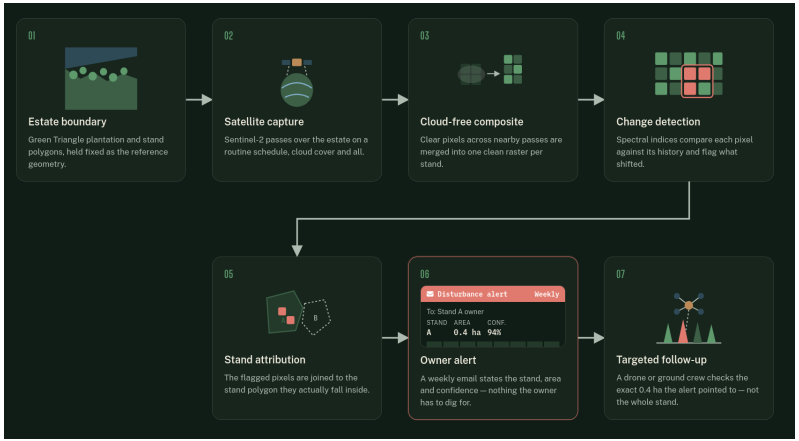
Spectral Indices



Temporal Methods



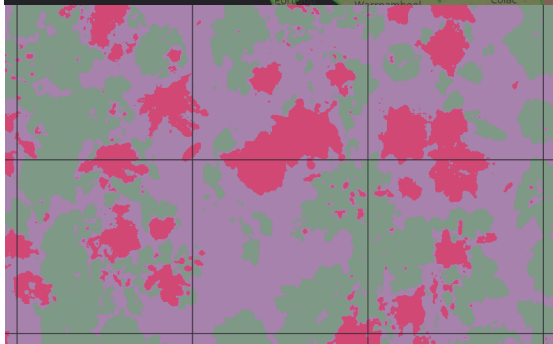
Machine & Deep Learning



Source: Adapted from material supplied by Evan Boutsalis







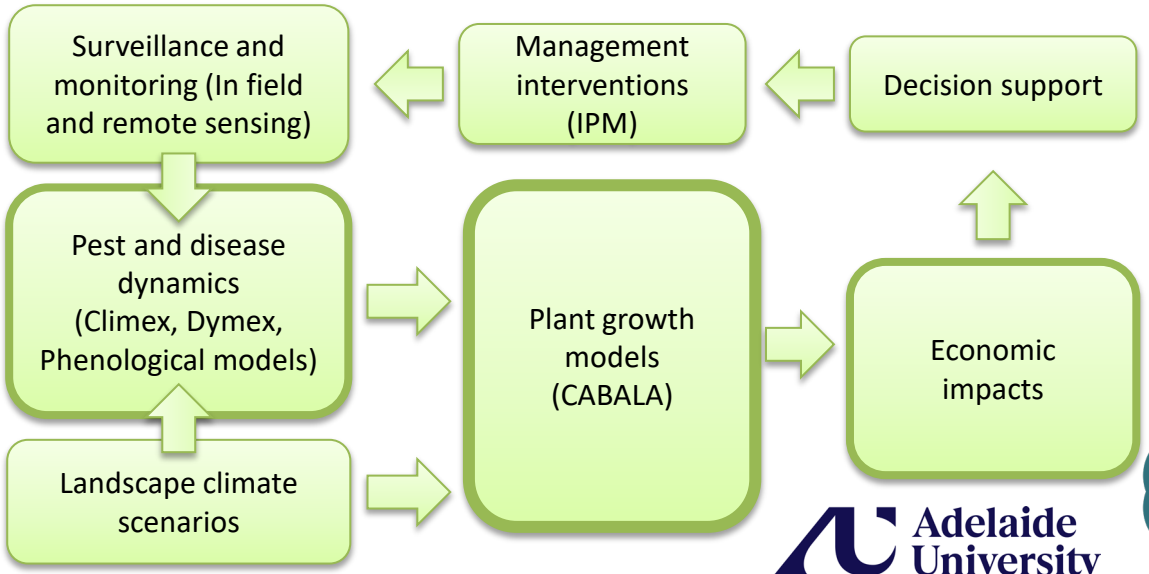
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AFWI: Sustainable management of plantation forest pests under changing climates

New Forest Health Specialist Dr Nari Williams
nari.williams@adelaide.edu.au

Aim 1 – Risk, Economics and Investment
To quantify forest health risks and economic impacts under current and future climates, and guide strategic investment in pest and disease management, monitoring and research.

Aim 2 – Forest Health Decision-Support Platform
To develop an integrated forest health dashboard that combines monitoring data, climate and pest models to provide timely forecasts, support management decisions, and strengthen knowledge sharing across industry.



Source: Adapted from material by Nari Williams and project

Water

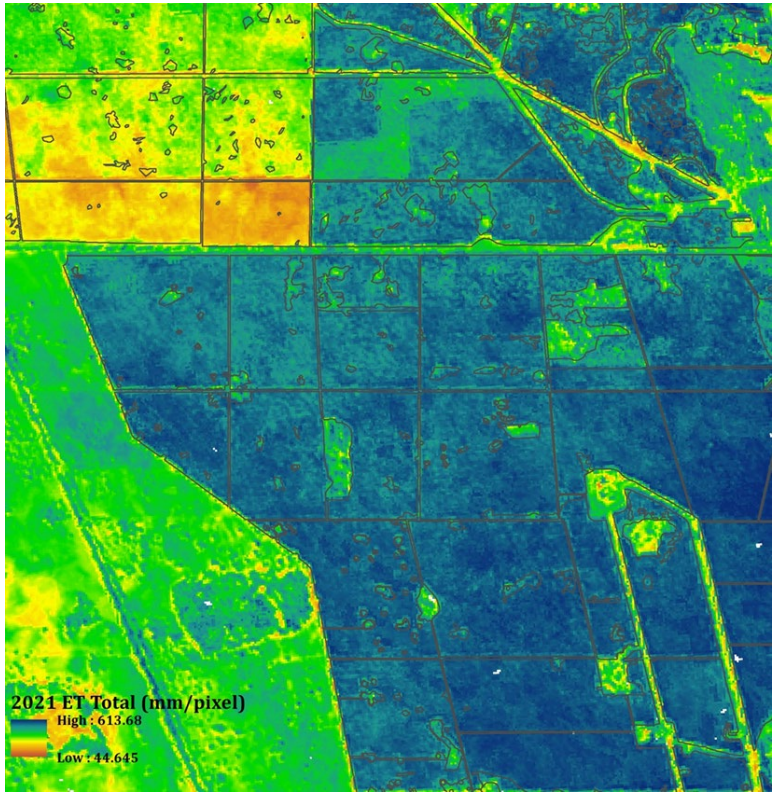
- NIFPI – Plantation water use and environmental asset management in plantation forests.
- Optimising the management of plantation, water and environmental assets.

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Water

Dr Baden Meyers

- We are also developing a remote sensing tool - **FOR**est **E**vapo**T**ransopiration at **HI**gh **R**esolutuion (FORETHIR)
- The tool is currently functional in Google Earth Engine and we will be making in publicly available soon
- If you are interested to calibrate the tool to local data please get in touch!



The FORETHIR tool determines landscape ET calibrated only to plantation forests in the Green Triangle at this time.

Source: Baden Meyers

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Water

Dr Baden Meyers: baden.meyers@adelaide.edu.au

- We measure each parameter to determine total site water balance and estimate groundwater extraction to compare with policy
- Transpiration – sap flow sensors
- Rainfall - rain gauges
- Interception - throughfall troughs
- Evaporation – mini-lysimeters
- Soil water – soil core excavation, with logging moisture sensors being installed soon!

Myers, B., O. Batelaan, R. Benyon, G. Hewa Alankarage, E. Jones, J. Lawson, J. O'Hehir, D. Partington, S. Peters. 2025. Optimising the management of plantation, water and environmental assets. National Institute for Forest Products Innovation (NIFPI) – Document # NS024.

Karunatilaka, P. D., B.R. Myers, T.M. Doody, R.G. Benyon, G.A. Hewa, B.P. Umali, J.F. O'Hehir. 2026. Assessing the Impact of Subsurface Clay Layers on Water Use Dynamics in Plantations. Journal - Hydrological Processes. https://www.webofscience.com/wos/woscc/full-record/WOS:001703853800001









Source: Baden Meyers

Thankyou!

Contact:
dianne.patzel@adelaide.edu.au

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