A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Mariela Soto-Berelov, Simon Jones, Andrew Mellor, Darius Culvenor, Andrew Haywood, Lola Suárez, Phillip Wilkes, William Woodgate, Glenn Newnham
TERN: Terrestrial Ecosystem Research Network

http://tern.org.au/
The Facility comprises a **portal** for data archive and access (including standard processing and validation methods for specific biophysical land cover products and basic processed time-series biophysical image maps).
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Credo, Great western woodland

Chowilla, Mallee Woodland

Robson Creek, Upland rainforest

Tumbarumba, Temperate eucalypt forest
What does an AusCover CALVAL site look like?

(from Jeff Morrissette, Bigfoot program)
CRC Spatial Information (Project 2.07)

Australian Woody Vegetation Landscape Feature Generation from Multi-Source Airborne and Space-Borne Imaging and Ranging Data

**Goal:** To develop processes to characterise woody vegetation ecosystems through automated feature generation, using a combination of ground (field), airborne and space-borne image and ranging data.
CRC Spatial Information (Project 2.07)
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Victorian reference areas

- Box-Ironbark Forest
- Mountain Ash Forest
- Central Highlands
- Mixed Species Foothills Forest
- Melbourne
Box-Iron bark forest (central Victoria)

Photo: Zbynek Malenovsky
Mountain Ash (Victorian Central Highlands)
Mixed Species foothills forest (East Gippsland)
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

- Background
- Study Area
- Research activities
- Conclusion

**Graph:**
- Y-axis: Canopy height (m)
- X-axis: Canopy complexity
- Lines:
  - Light green: Eucalypt
  - Dark green: Non-eucalypt
  - Dark green: Understory

**Legend:**
- Eucalypt
- Non-eucalypt
- Understory

**Text:**
- Phil Wilkes, 2013

**Institutions:**
- Department of Environment and Primary Industries, Victoria
- crc-si
- RMIT University
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Catalyst of forest ecosystem research across various stakeholders!
Airborne Acquisition

Hyperspectral imagery  Full Spectrum
  • 0.4-2.4um (SPECIM Eagle-Hawk)

Waveform LiDAR
  • Riegel Q560
Airborne - Calibration
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Background

Study Area

Research activities

Conclusion
Field Data Collection Processes: Atmospheric measurements
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

- General plot characterisation
- Ground cover
- Small tree characterisation
- Large tree characterisation
- Understorey species
- Fractional cover, LAI
- Coarse woody debris
- Terrestrial Laser scans
VALIDATION

Ground based structural characterisation

• Overstorey vegetation (Foliage Projective Cover)
• Understorey vegetation (Fractional Cover)

SLATS
VALIDATION

Ground based structural characterisation

- Overstorey vegetation (Foliage Projective Cover)
- Understorey vegetation (Fractional Cover)
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

- **Background**
- **Study Area**
- **Research activities**
- **Conclusion**
Ground based structural characterisation of the vegetation with terrestrial lidar
Wilkes et al. IGARSS 2013

A collaborative framework for vegetated systems research: a perspective from Victoria, Australia
Leaf sampling to monitor vegetation health

<table>
<thead>
<tr>
<th>Study site</th>
<th>Spp</th>
<th>Tree height (m)</th>
<th>Canopy cover (%)</th>
<th>Diameter at breast height (cm)</th>
<th>Water content (g/cm²)</th>
<th>Specific leaf area (g/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rushworth Reference</td>
<td><em>Eucalyptus macrocarpa</em></td>
<td>Avg: 25.69</td>
<td>Avg: 27.18</td>
<td>Avg: 41.07</td>
<td>Avg: 0.021</td>
<td>Avg: 37.64</td>
</tr>
<tr>
<td></td>
<td><em>E. macrorhyncha</em></td>
<td>Min: 6.2</td>
<td>Min: 15.4</td>
<td>Min: 14.3</td>
<td>Min: 0.014</td>
<td>Min: 30.31</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus tricarpa</em></td>
<td>Max: 65.9</td>
<td>Max: 45</td>
<td>Max: 115.4</td>
<td>Max: 0.028</td>
<td>Max: 73.70</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus polyanthemos</em></td>
<td>Std Dev: 14.73</td>
<td>Std Dev: 3.89</td>
<td>Std Dev: 21.88</td>
<td>Std Dev: 0.0023</td>
<td>Std Dev: 5.16</td>
</tr>
<tr>
<td>Watts Creek Reference Area</td>
<td><em>Eucalyptus regnans</em></td>
<td>Avg: 43.35</td>
<td>Avg: 34.75</td>
<td>Avg: 103.97</td>
<td>Avg: 0.021</td>
<td>Avg: 57.74</td>
</tr>
<tr>
<td></td>
<td><em>E. delegansensis</em></td>
<td>Min: 11.90</td>
<td>Min: 20</td>
<td>Min: 37.2</td>
<td>Min: 0.012</td>
<td>Min: 43.64</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus nitens</em></td>
<td>Max: 70.0</td>
<td>Max: 80</td>
<td>Max: 227.0</td>
<td>Max: 0.024</td>
<td>Max: 83.68</td>
</tr>
<tr>
<td></td>
<td><em>Nothofagus cunninghamii</em></td>
<td>Std Dev: 14.00</td>
<td>Std Dev: 14.28</td>
<td>Std Dev: 41.59</td>
<td>Std Dev: 0.0027</td>
<td>Std Dev: 8.52</td>
</tr>
<tr>
<td></td>
<td><em>Acacia dealbata</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ground data comparison

(Woodgate et al., ISPRS, GSR2, 2012)
MODIS 1km LAI (Rushworth)

IGARSS July 2013 – Monitoring vegetation dynamics from automated in-situ terrestrial lidar,
Darius Culvenor, Glenn Newnham, Andrew Mellor and Andrew Haywood
Monitoring vegetation dynamics from automated *in-situ* terrestrial lidar, *Culvenor et al. IGARSS 2013*
Monitoring vegetation dynamics from automated *in-situ* terrestrial lidar, *Culvenor et al. IGARSS 2013*
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Challenges
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Background

Study Area

Research activities

Conclusion
A collaborative framework for vegetated systems research: a perspective from Victoria, Australia

Background

Study Area

Research activities

Conclusion

Rowena Smith, Rebecca Trevithick, Dr. Mark Broomhall, Dr. Laurie Chisholm, Dr. Bernie-JM, Dr. Natalia Restrepo-Coupe, Dr. Kara Youngentob, Dr. Juan Pablo Guerschman, Michael Schaefer, Dr. Brendon McAtee, Dr. Kasper Johansen. Professor Alfredo Huete, Christoffer Axelsson