

Sites, Modelling and Silviculture for Durable Eucalypts

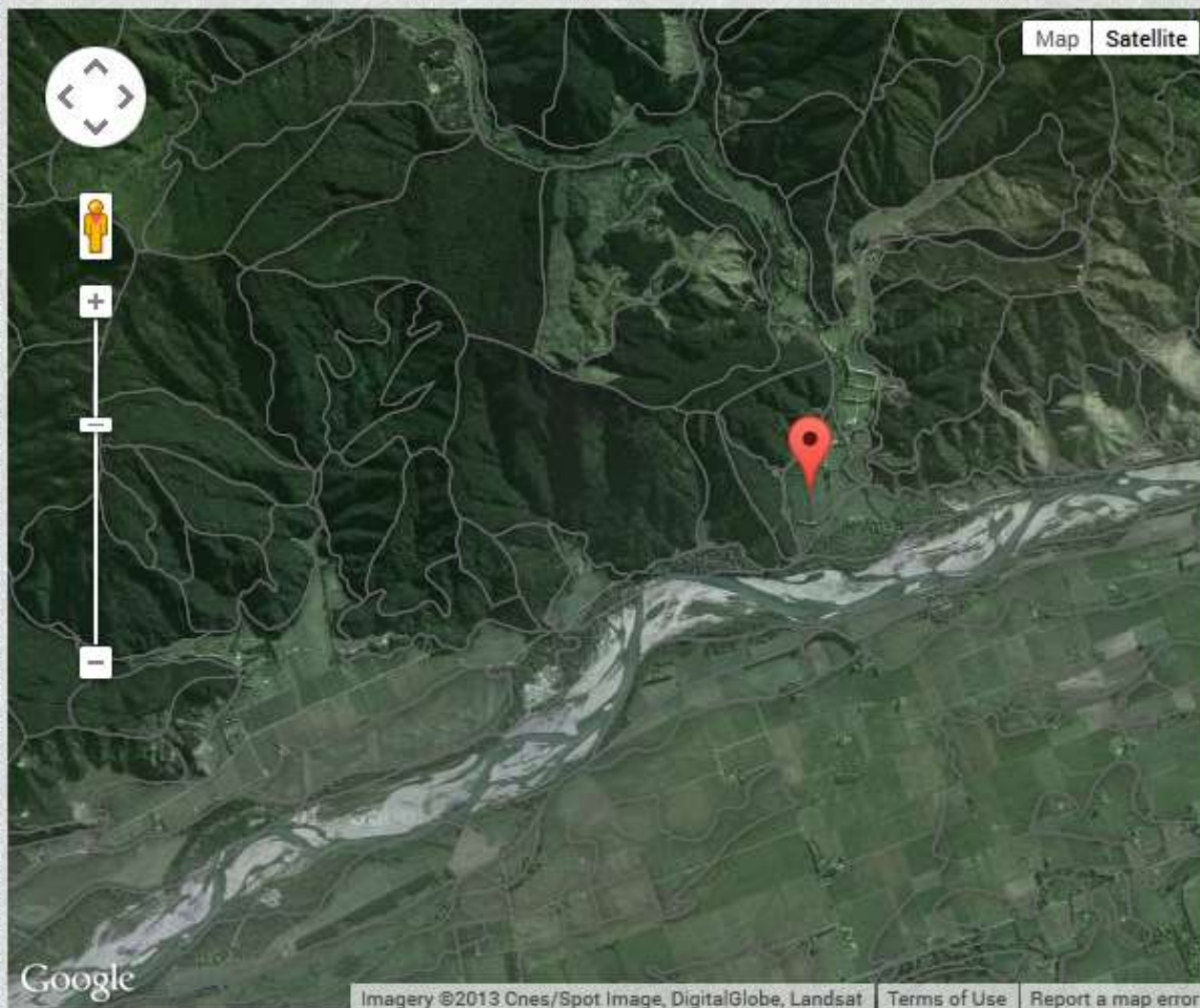
Euan Mason, Justin Morgenroth,
Serajis Salekin & Jack Burgess



Supporting decision-making

- Species & genotype choices and siting
- Tending
 - Stocking management
 - Rotation length
 - Potential for coppice
- Growth & Yield projection
 - Heartwood yields
- Funding
 - Agmardt grant
 - SWP Project
 - Forest Growers' Levy Trust





Site:

Latitude: -41.4413
 Altitude: 0
 Longitude: 173.8964
 Coast distance: 12
 Soil Drainage: OK ▾
 Plant available water: 79
 Soil texture: Silt loam ▾
 Rooting depth: 135
 Total soil water: 200
 Soil erosion risk: Low ▾
 Mean annual rainfall: 732
 Carbon:nitrogen ratio: 12
 Soil pH: 5.7
 Soil acid-soluble P rating: Moderate ▾

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<https://www.treesandstars.com/euan/sppchc/>

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District:

Marlborough

Objective weights:

Production 50

Carbon 50

Shelter 0

Soil conserv. 0

Altitude (m): 0

Distance to sea (km): 12

Rainfall (mm): 732

Aspect S

Slope (deg): 20

Soil type:

Silt loam

Soil pH: 5.7

Acid-soluble P:

Moderate

C:N ratio: 12

Potential root depth (cm): 135

Soil water retention: OK

Drainage: OK

Go

Help

Google Maps

Harvest costs

Why?

Wildings

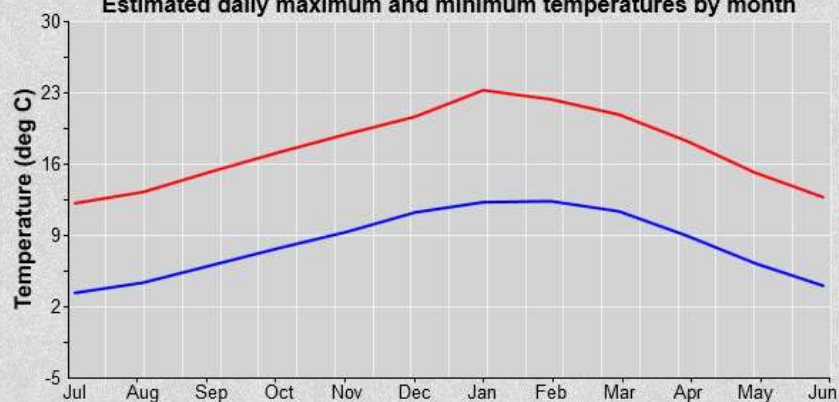
Species	Overall score	Productivity	Cold limitation	Water limitation	Carbon sequestration
Radiata pine	33	Medium	Minimal	Medium	High
E. globoidea	20	Medium	Medium	Medium	High
Corsican pine	10	Low	Minimal	Medium	Low
E. fastigata	9	Medium	Low	High	High
Ponderosa pine	3	Low	Minimal	High	Low

Estimated potential productivity (assuming good nutrition) = **Medium**Estimated nutritional status (from C:N ratio) = **High**Estimated response to P fertilisation = **High**

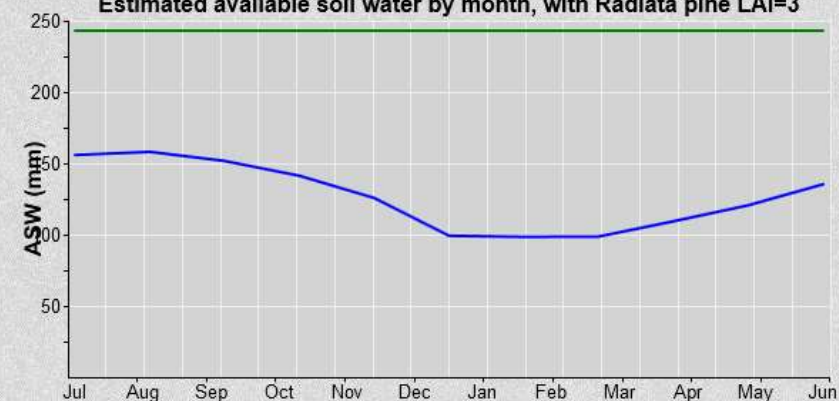
Estimated mean annual temperature = 12.7 degrees C.

Estimated erosion susceptibility = **Low**

Estimated daily maximum and minimum temperatures by month

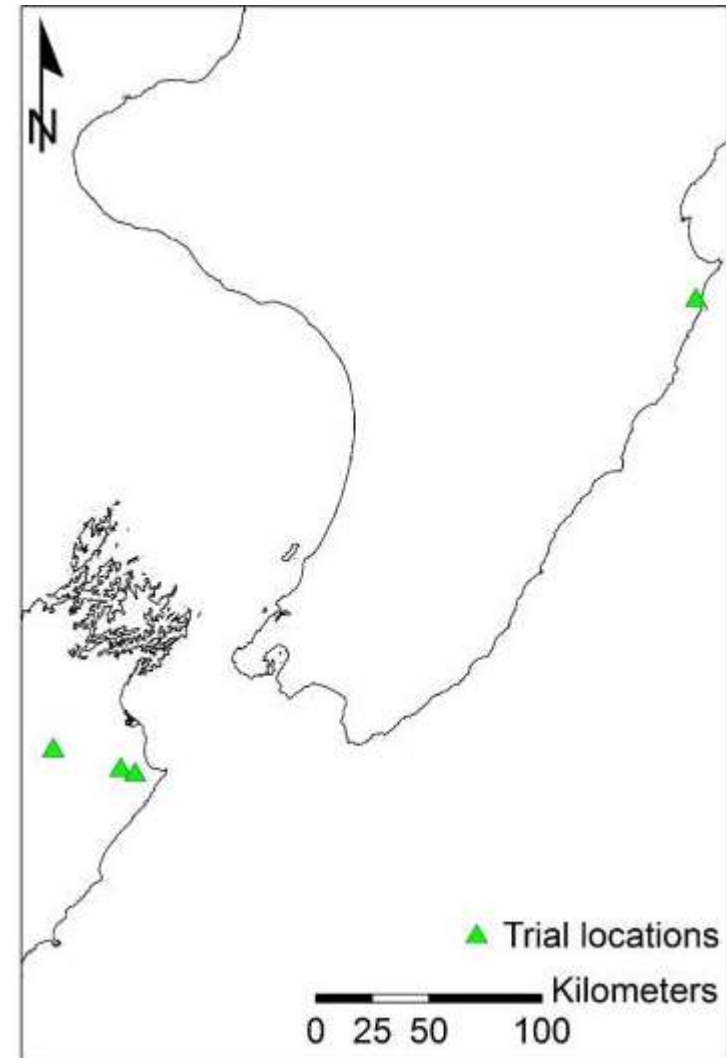


Estimated available soil water by month, with Radiata pine LAI=3



Serajis Salekin's PhD project

- Micro-site and between site variation
- Complete growth and yield model for *E. globoidea*
- Initial yield models for *E. globoidea* & *E. bosistoana*
- Eco-physiological models for both species
- Deliver models in DSS framework







Micro-site variation



Image: Serajis
Salekin

Micro-site variation – Soil

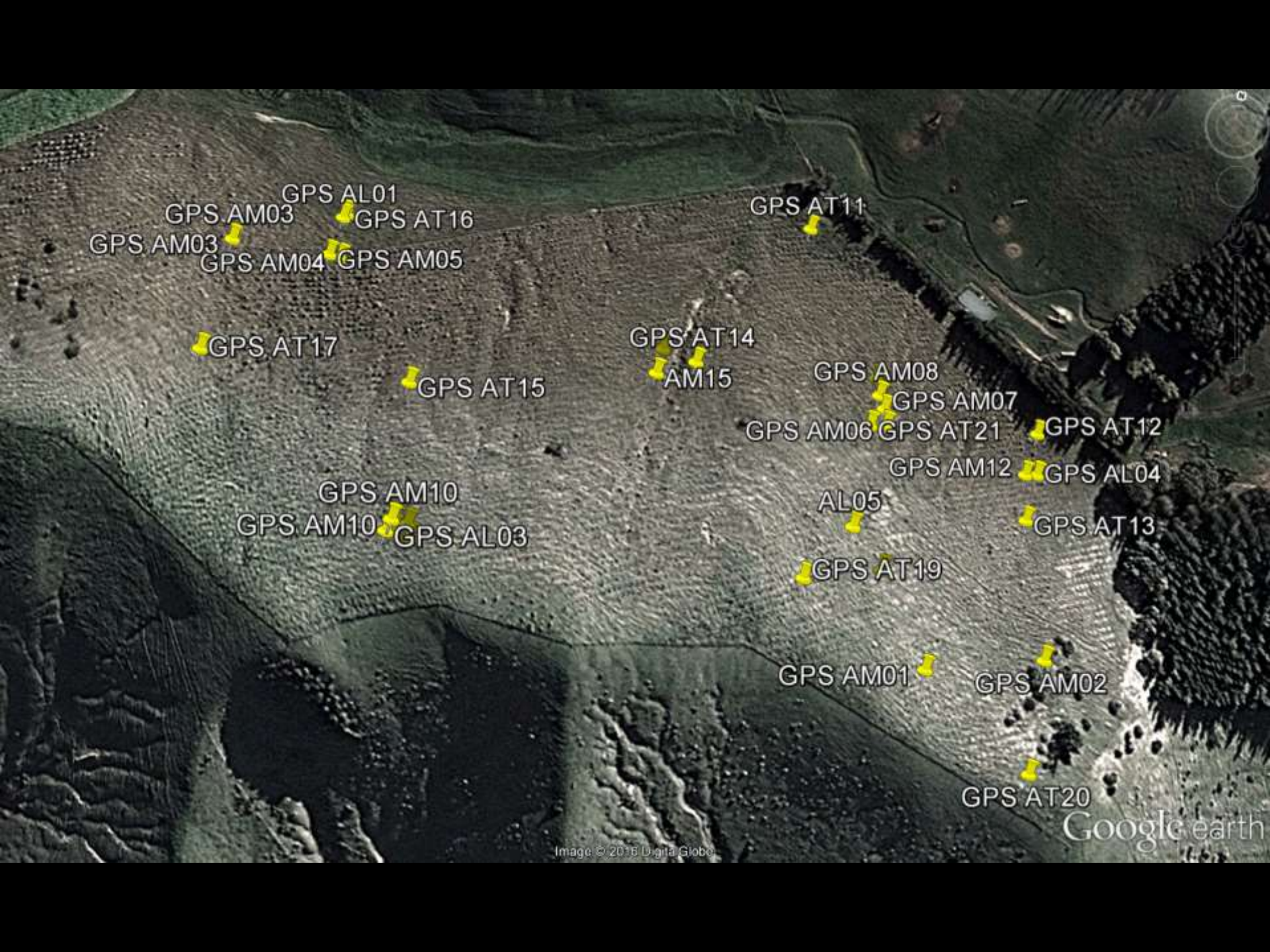


- Soil pits
 - 1 m deep
 - 4 horizons
 - Texture, bulk density, soil moisture retention, C, N, P, B, CEC, pH
- Soil moisture sensors
 - Volumetric soil moisture at 30 min. intervals
 - 10 sensors at Lawson, 12 sensors at Avery, 0 at McNeill

Micro-site variation – Climate

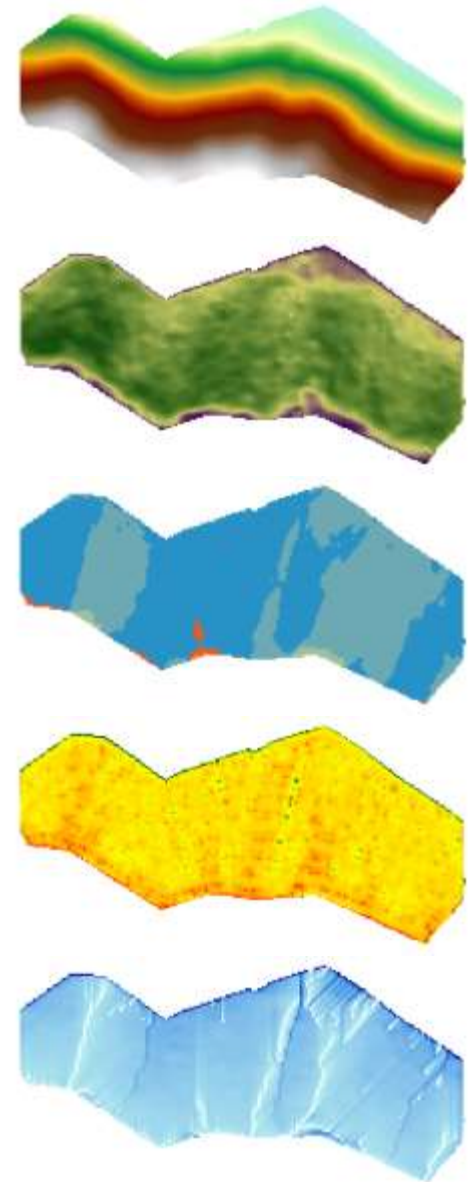
- Measuring:
 - Wind, precipitation, radiation
 - 1 climate station at each site
 - Air temperature
 - > 10 sensors at each of Avery and Lawson, 3 at McNeill, and 4 at Dillon
 - Data captured at 30 min. intervals for > one year



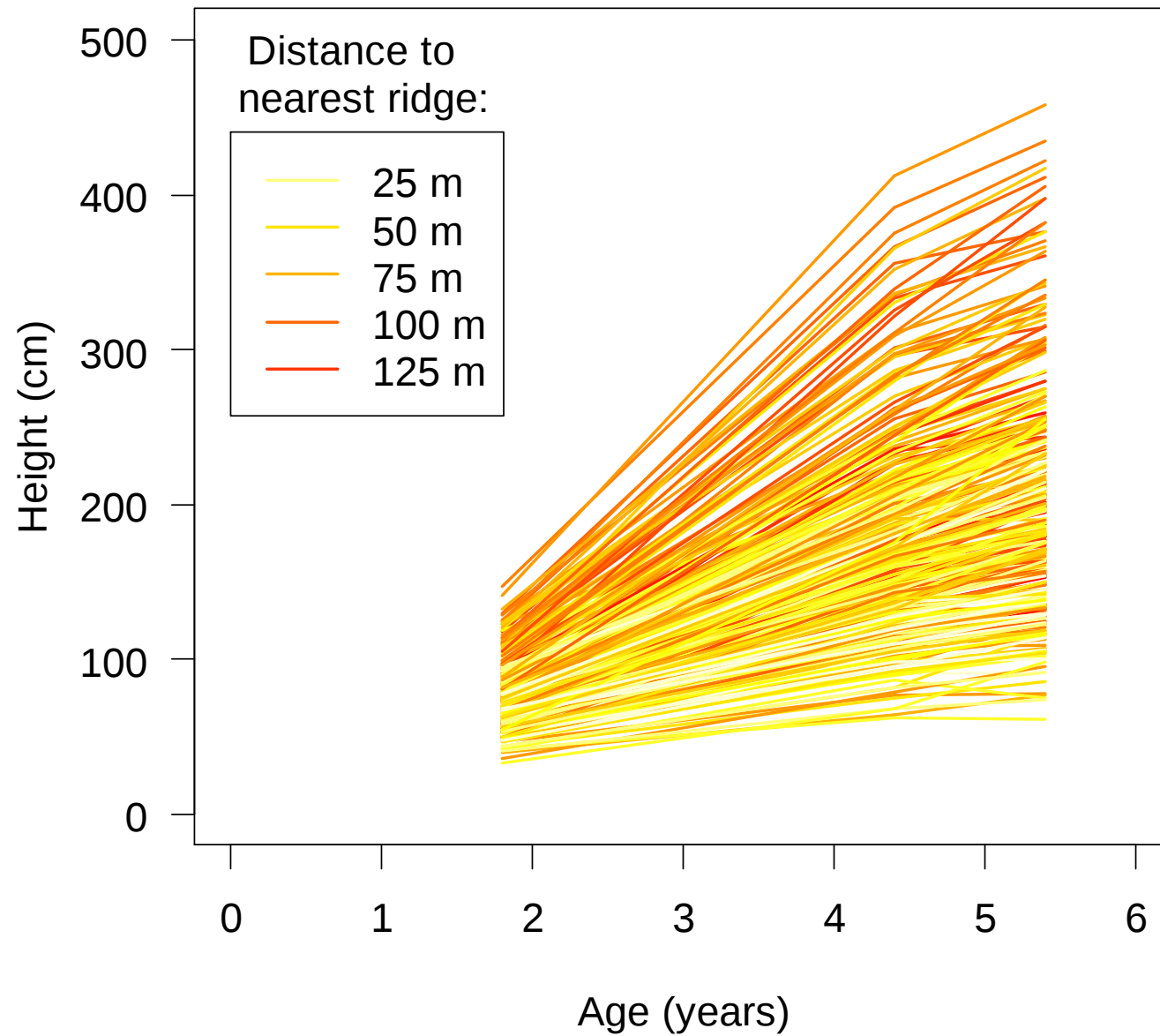


Micro-site variation - Topography

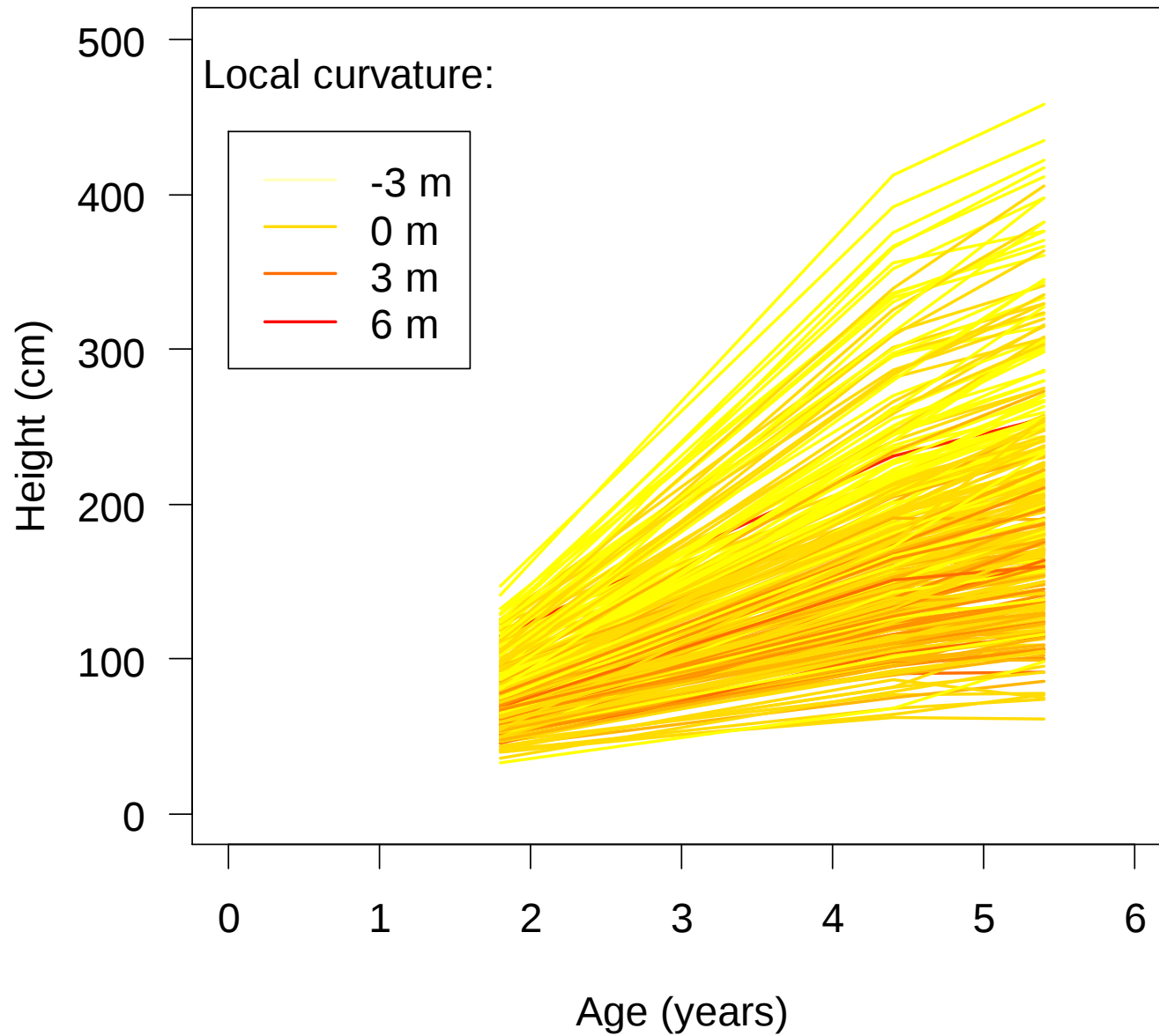
- GPS-derived digital elevation model
- Various surfaces are derived from DEM
 - Slope
 - Aspect
 - Curvature index
 - Wetness index
 - Cumulative radiation
 - Roughness index



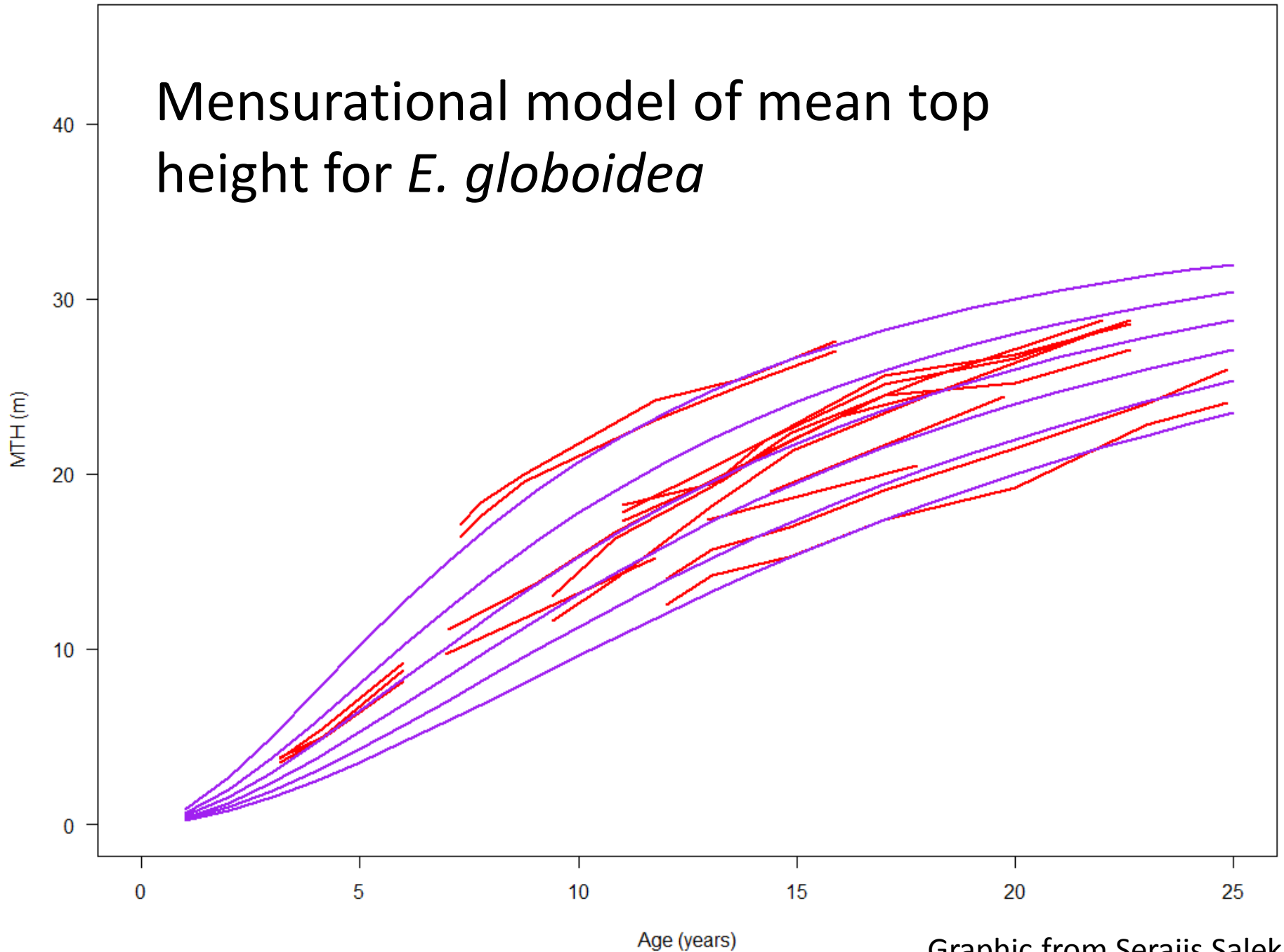
***E. globoidea* at Avery's site**



***E. globoidea* at Avery's site**



Mensurational model of mean top height for *E. globoidea*

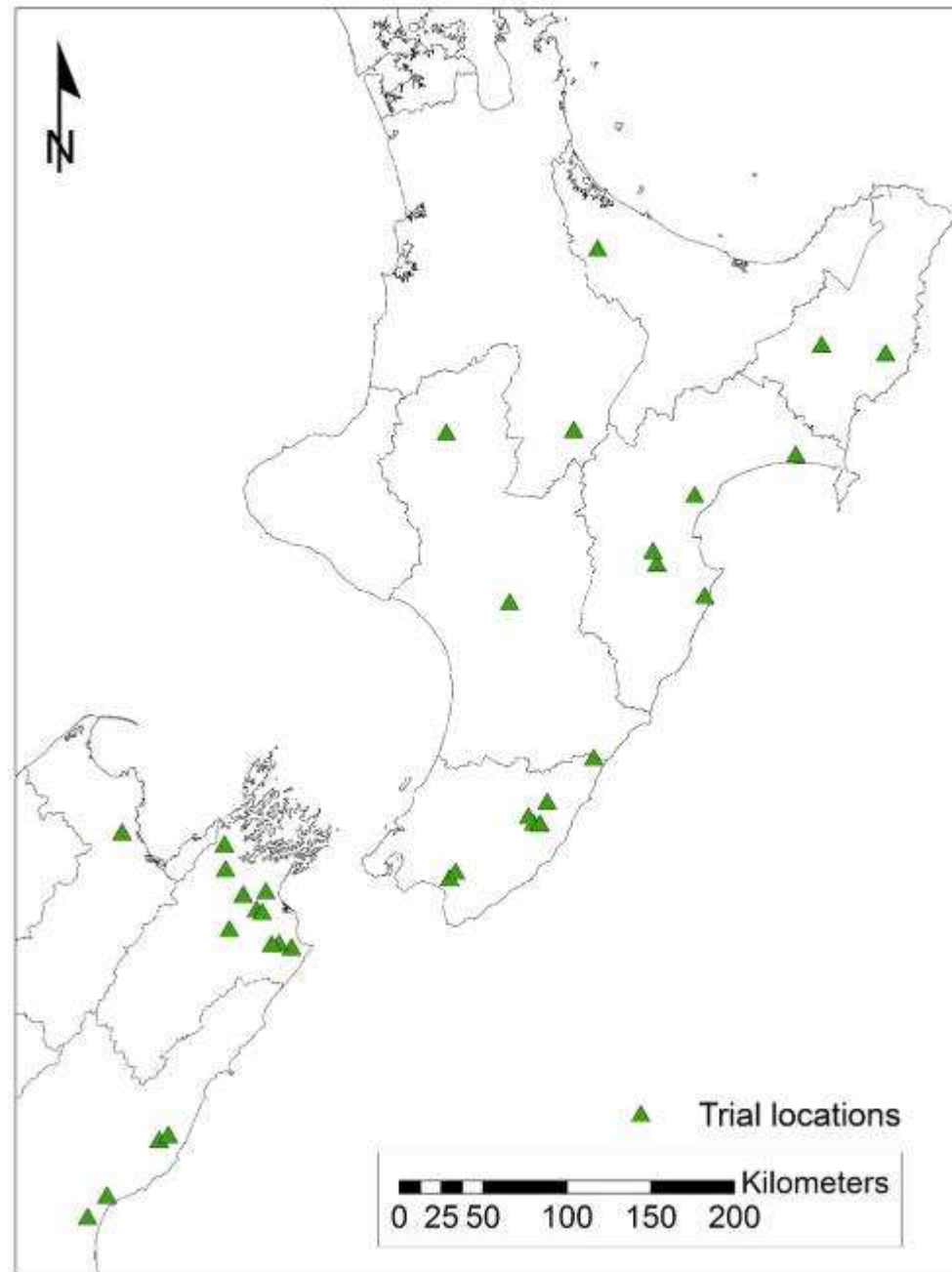


Jack Burgess' MForSc project

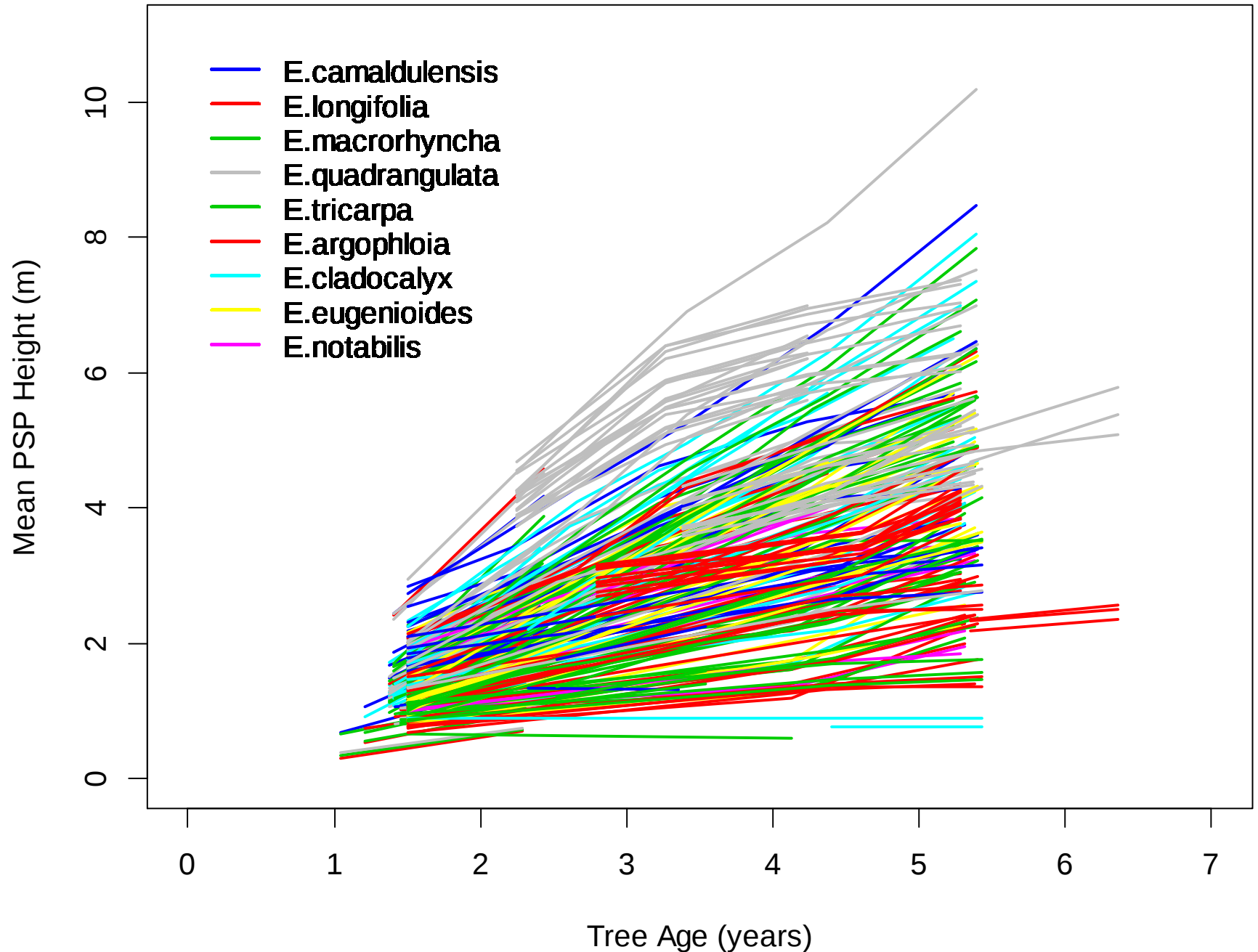
- Work with species not covered by Serajis
 - *E. camaldulensis*, *E. longifolia*, *E. macrorhyncha*, *E. quadrangulata*, *E. tricarpa*, *E. argophloia*, *E. cladocalyx*, *E. eugenoides*, *E. notabilis*
- Objectives
 - Models of mortality
 - Site tolerances
 - Initial yield models
 - Only initial tree stem data available
 - Deliver DSS implementations

Data from 28 sites

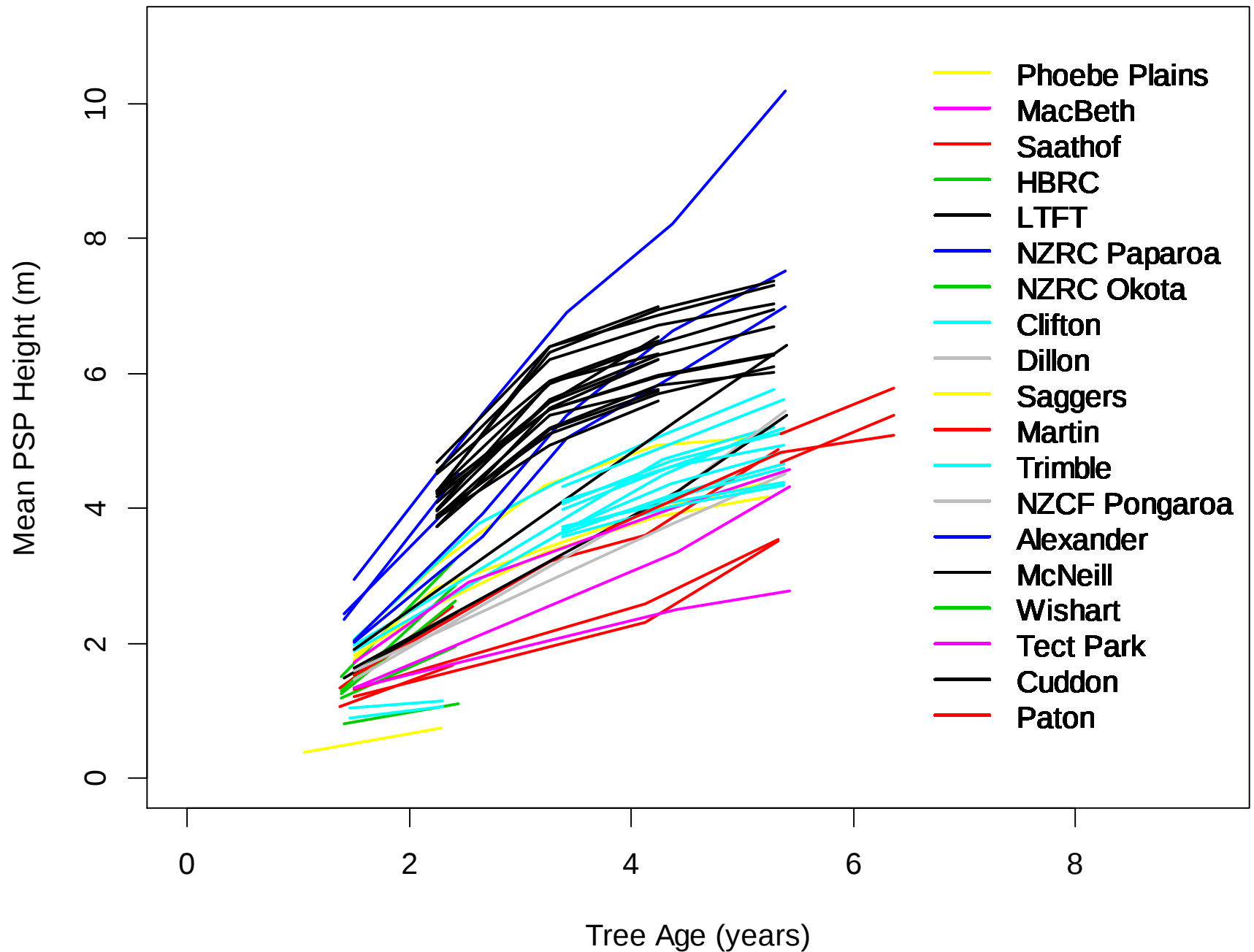
- Height, DBH
- Best available site characterisation data
 - LiDAR or GPS-derived DEM and other surfaces
 - On-site climate stations or VCSN
 - On-site soil data collection or S-map



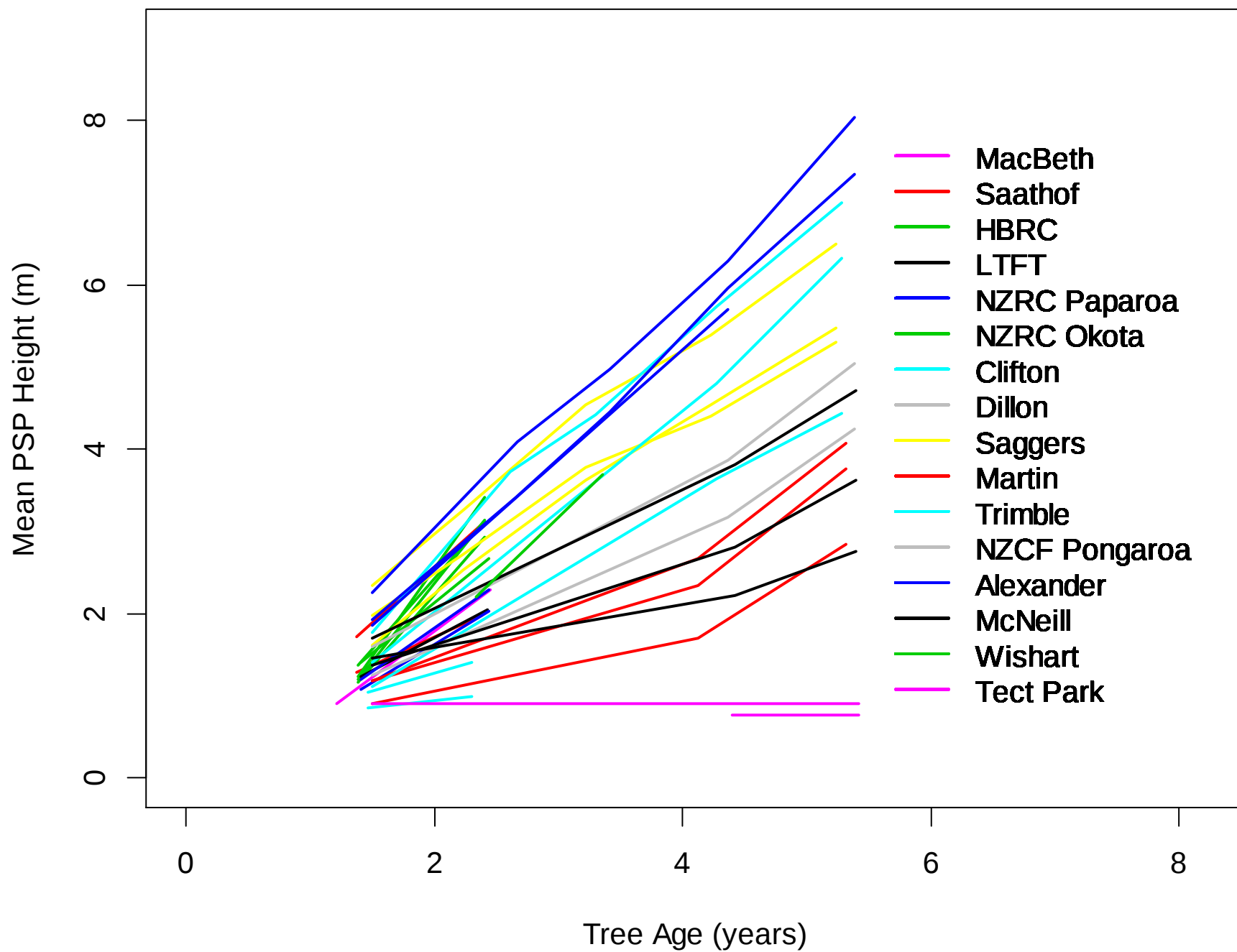
Mean height trajectories of NZDFI PSPs by Species



Mean height trajectories of *E. quadrangulata* PSPs by Landowner

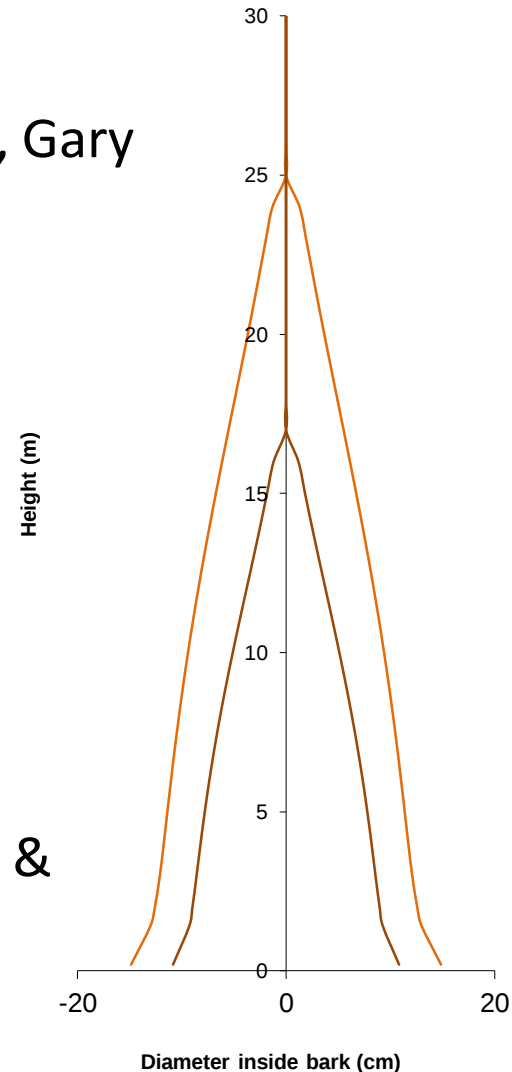


Mean height trajectories of *E. cladocalyx* PSPs by Landowner



Further work

- Knowledge elicitation for the DSS
 - Paul Millen, Ruth McConnochie, Angus Gordon, Gary Fleming, Denis Hocking
 - SFF bid?
- Biomass and leaf area index assessments
- Taper and volume
 - Incorporating heartwood
 - New PhD project?
- Impacts of tending, genotype & pathogens
 - Nelder & block spacing/thinning experiments
 - Incorporation of genotype in models
 - Influences of pathogens on LAI, photosynthesis & heartwood



In summary

- We wish to provide information for potential investors in, and planters of durable Eucalypts
- Site selection via an on-line decision support system
- Growth and yield models
 - Site sensitive
 - Includes heartwood
- Two postgraduate student projects
- More projects required