

Growth & Form of 10 y.o. *Casuarina obesa* Provenances on Saline Avon Farmland (WA)

Bob Hingston

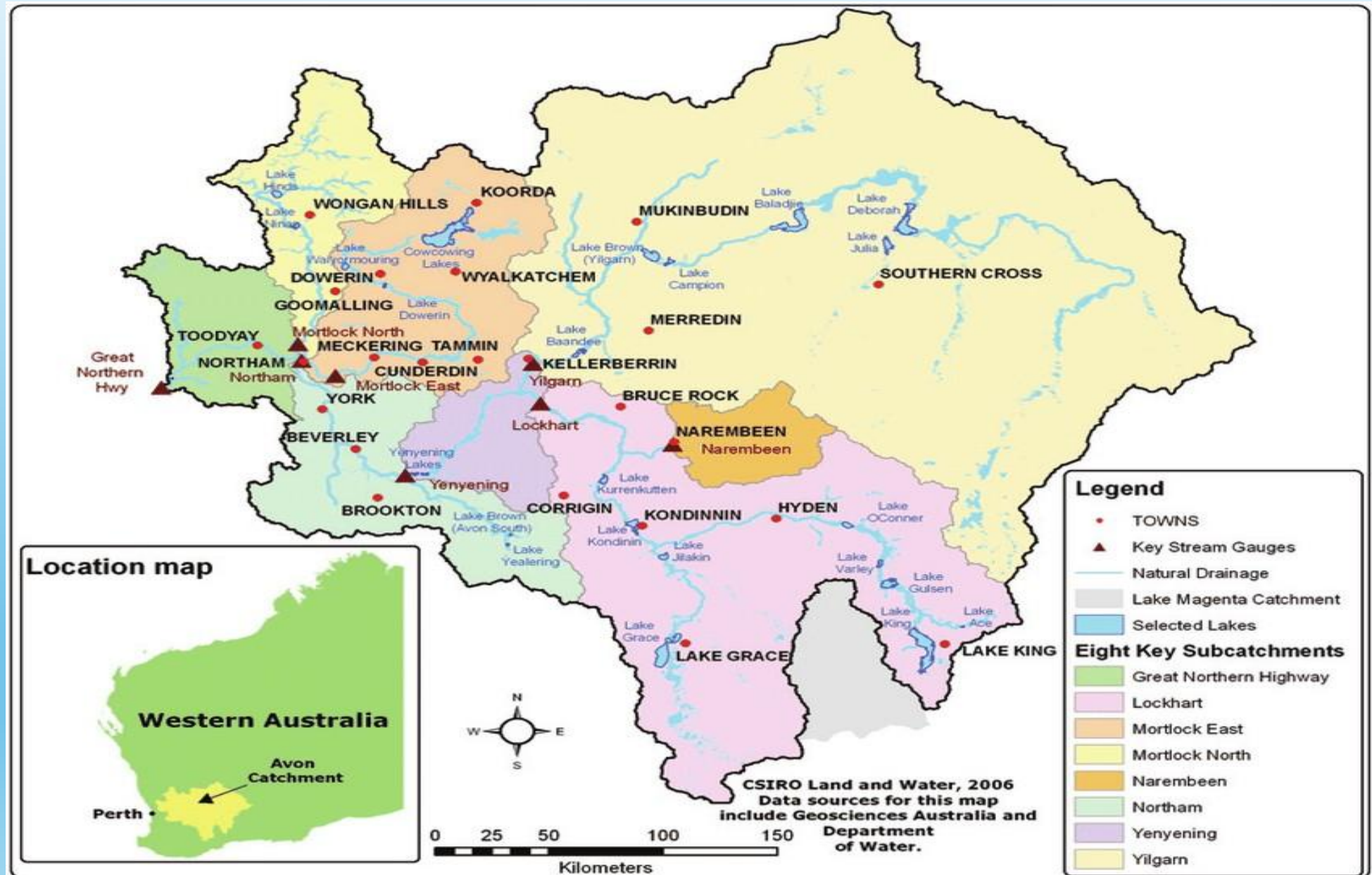


Introduction & context

- ~300 k ha privately owned land affected by salinity in the Avon Valley region:
- >1 m ha of salinity across SW of WA.
- increasing at ~10 k ha/year.
- Wheatbelt NRM manage ~ 12 M ha of the Avon Valley Basin



Location of Avon Valley Basin – W.A. (12 M ha)



Introduction & context

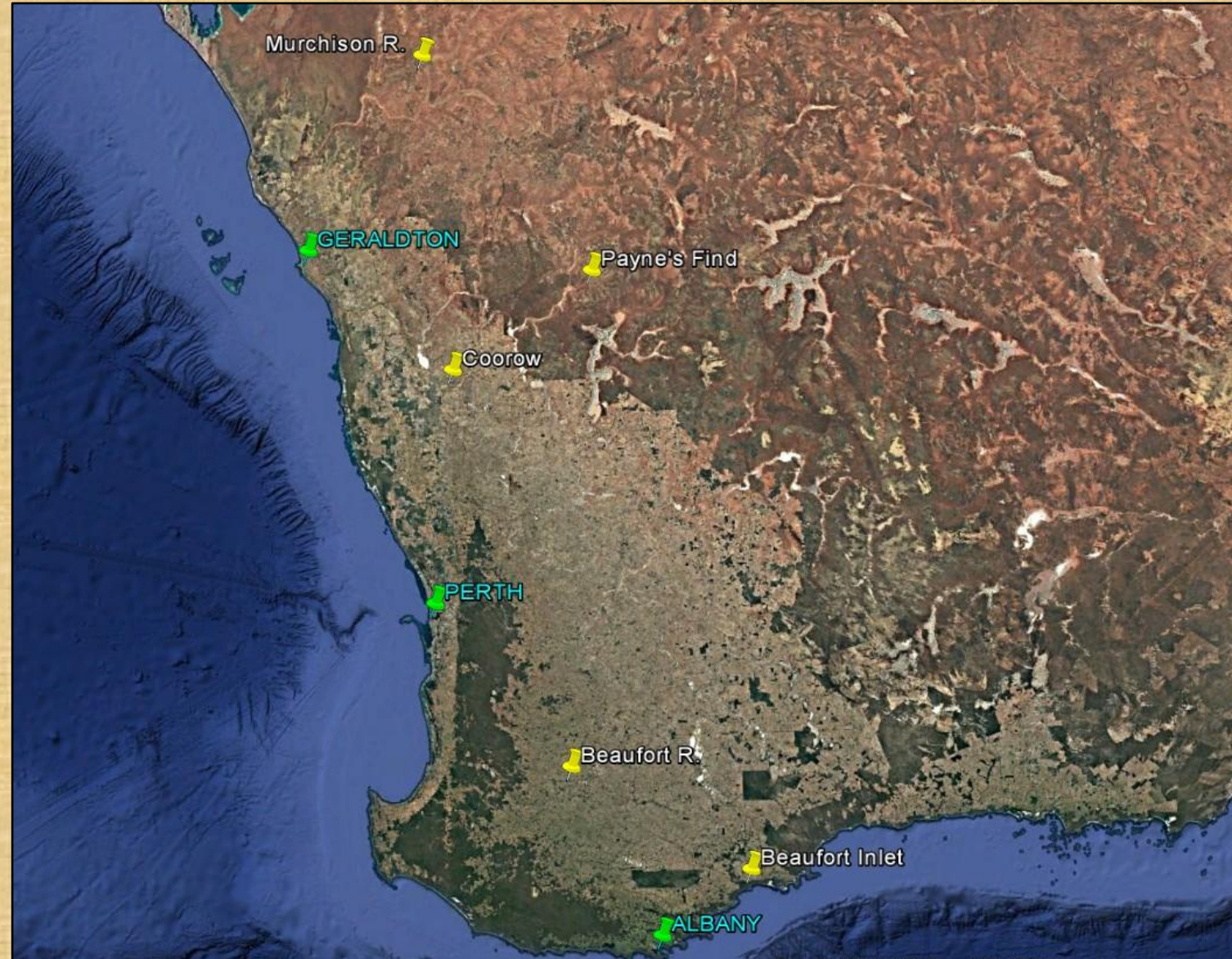
A role for *Casuarina obesa* (Swamp sheoak):

- a key Landcare species for ameliorative revegetation.
- salinity mitigation.
- renewed interest in the spp or a carbon sequestration opportunity ??
- a long-term tree crop option (i.e. timber, biomass/bioenergy).
- ‘green’ canopy cover – min. reflection of broad Wheatbelt saline valley floors.



Casuarina obesa

- Grows naturally around margins of saline creeks, salt lakes & rivers.
- Widespread natural distribution
 - From South Coast to Rangelands
 - Rainfall zones <270 – 700 mm/yr
- Soils – saline loams to red earthy sands or calcareous sands.
- Tolerates shallow duplex water logged sites, frost & high salinity.
- Palatable to stock, roos, rabbits, and '28' parrots.
- Broad range in tree form or provenance variation.



Casuarina obesa

- Useful timber species – sawing, planing, etc
- Air dried density $\sim 820 \text{ kg/m}^3$
- Useful for CCA posts, firewood (bioenergy), carbon sequestration on marginal land.
- Poor form – harvesting and utilisation issues
- Long-term timber option (>30 years)



Key attributes of *Casuarina obesa*:

- One of the few reveget options for saline land on marginal or low opportunity cost farmland.
- Is able to grow on a variety of soil types, with soil salinity of >250 mS/m but generally <200 mS/m
- An excellent agroforestry spp
 - light crown allows pasture growth
 - excellent shade & shelter
 - foliage is palatable (useful drought fodder – met. energy 9.1 mj/kg or DDM 41.1% (coppice)
 - nitrogen fixer (*Frankia* spp.)



Frankia

- A nitrogen-fixing actinomycete bacteria associated with higher plants.
- Can improve plant performance in inhospitable, nutrient poor environments.
- Benefits of artificial inoculation e.g. 1.8 – 4.2 times for height or increased biomass
- Collected from 2 x native stands & propagated before inoculation
- May benefit farmland if inoculated?



2015 *Casuarina obesa* provenance trial objectives

1. To test five W.A. *Casuarina obesa* (swamp sheoak) provenances $\pm$ *Frankia* on saline Avon Valley farmland (ie, unsuitable for cropping).
2. Improve biodiversity, soil health & commercial opportunities on Avon farmland.
3. To revegetate a degraded, saline site with a long-term commercial option.
4. Promote & demonstrate agroforestry for Wheatbelt farming systems.

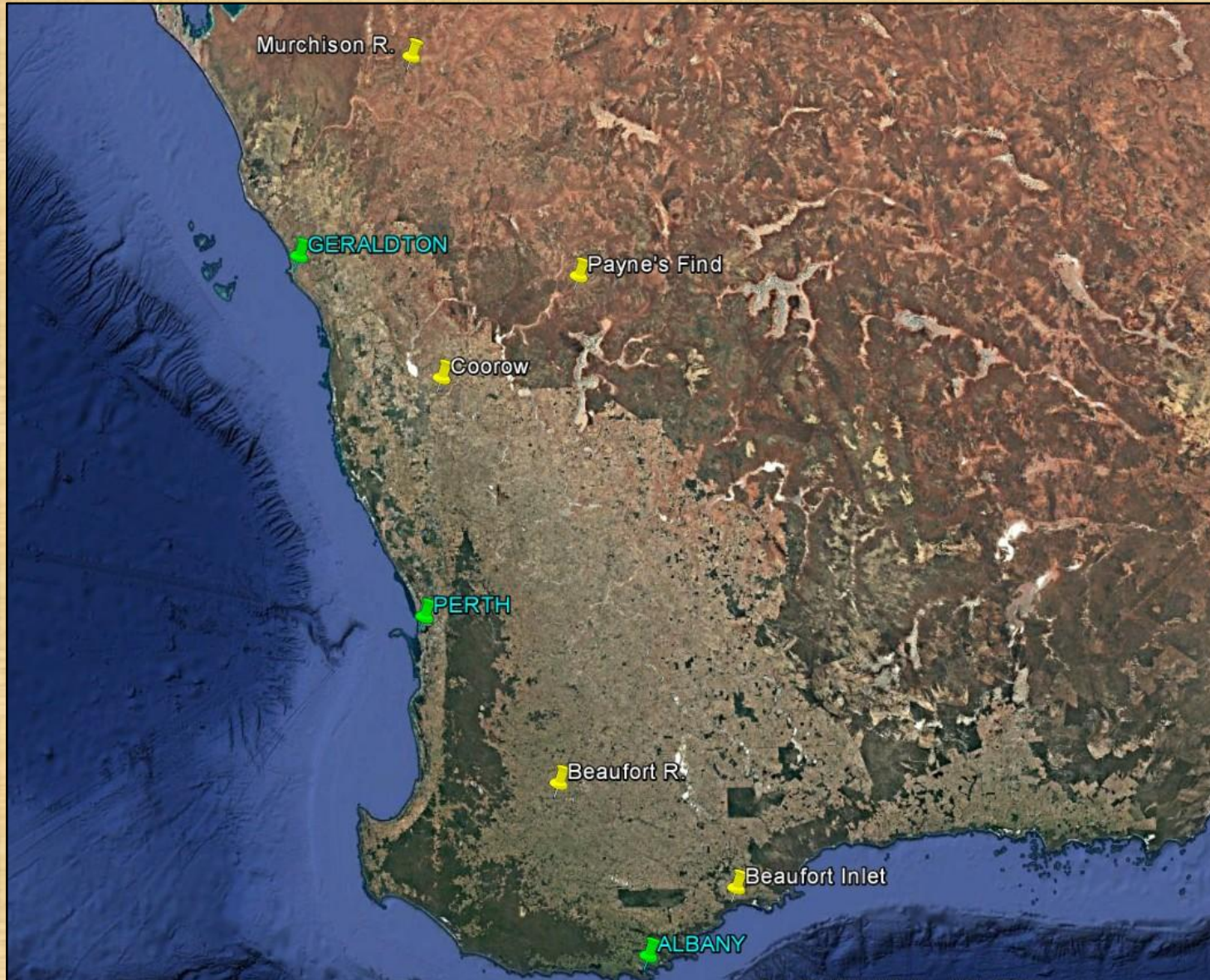


2015 *Casuarina obesa* provenance trial

- Goomalling ~ 135 km E of Perth
 - 1,560 ha cropping farm
 - Annual rainfall ~363 mm (226 to 515 mm)
- Randomised block – 5 x Provenances x 4 Reps x plus & minus *Frankia*
- Planted at 3 x 3 m or 1,111 trees/ha
plot size 6 trees x 6 rows = 36 trees
- Soils – loamy sand to loamy clay at 145 cm & sandy loam over clay sand at 175cm; (i.e. 2 x site types).
- Soil salinity (EM38)
 - ‘dry’ site mean:147 mS/m (vert. dip.)
 - ‘wet’ site mean:183 mS/m (vert. dip.)
- Soil nutrient status – poor.



Casuarina obesa provenance seed source



Assessment of tree form criteria

Rating	Tree form description	End-use *
1	Straight tree (butt log and crown)	A
2	Straight butt log of 1.8m – crown ok or us	A
3.1	Forked - pruning can turn it to Ranking No 1	A
3.2	Forked – pruning can turn it to Ranking No 2	A
4	Forked – cannot be fixed with pruning	B
5.1	Malformed – bent or crooked stem	B
5.2	Multi-forked	B
6	Stunted or poor growth and or multi-forked	C

*Potential end-use

A - agroforestry - timber, posts or biomass

B - biomass

C - low value biomass or Landcare/amenity

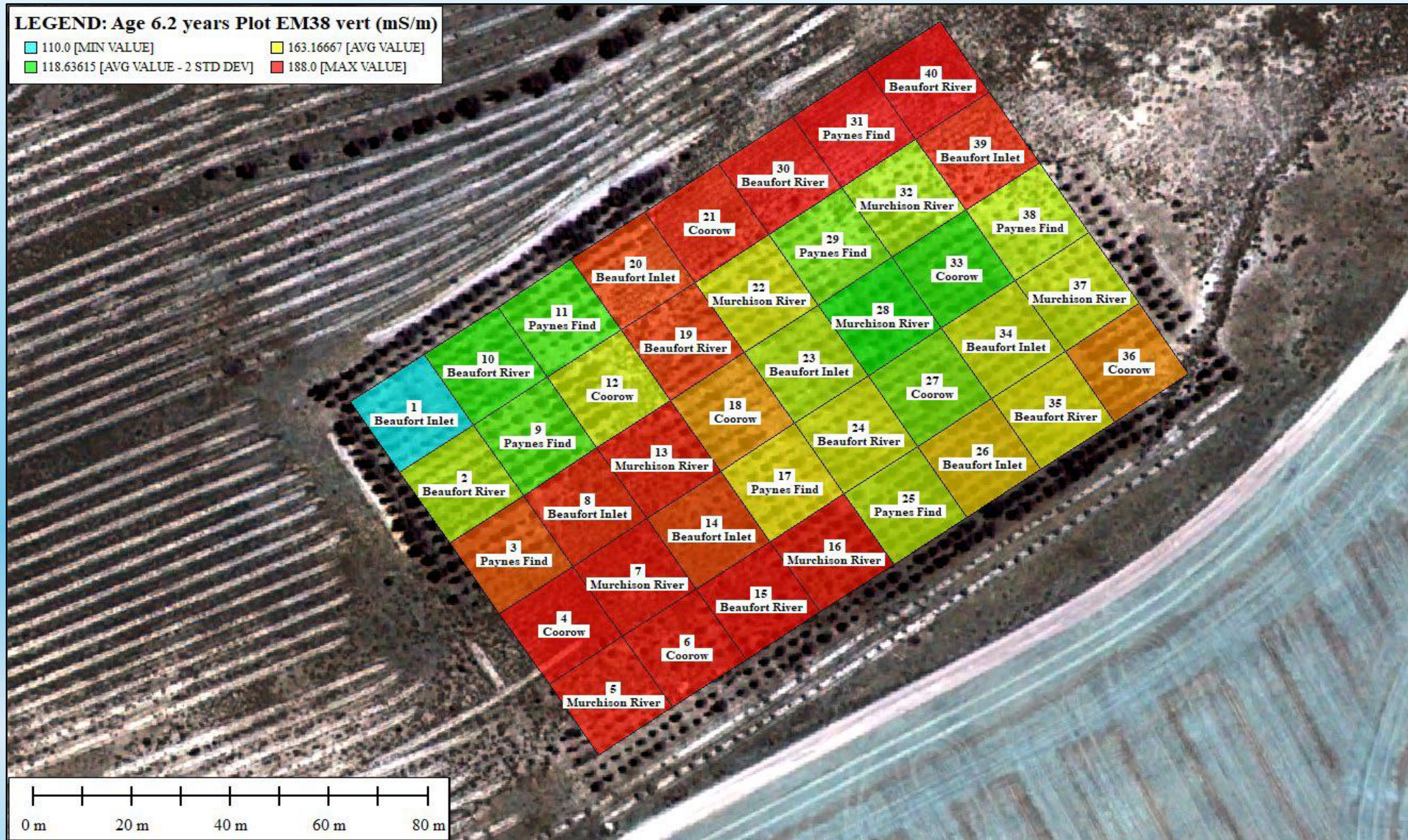
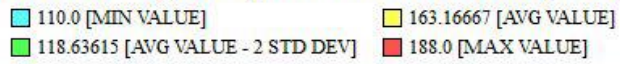


Geonics EM38 soil salinity meter



EM38 (V) salinity levels -2015

LEGEND: Age 6.2 years Plot EM38 vert (mS/m)



Results – Tree growth

****NSS differences between + and – Frankia****

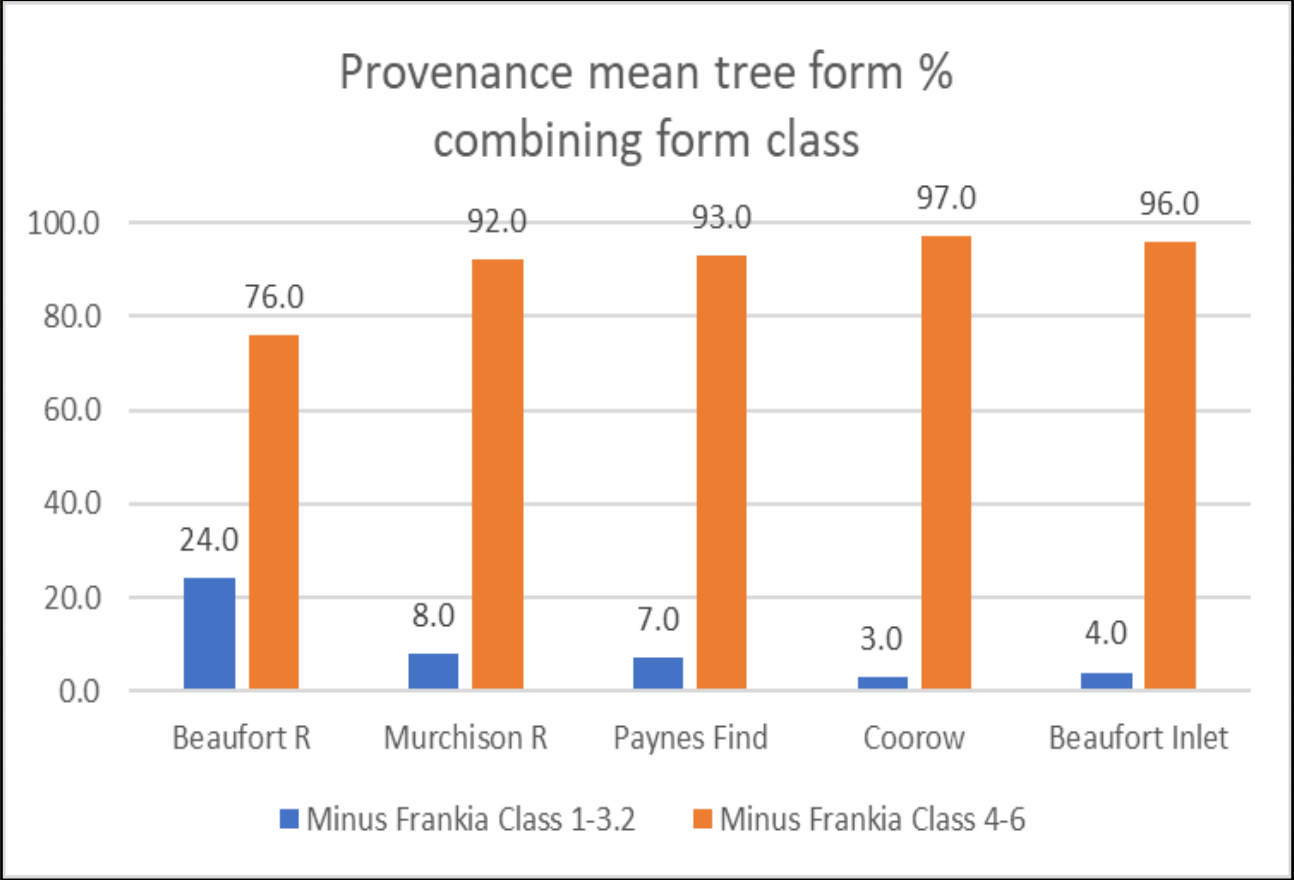
Provenance	Mean Diameter at Breast Height Outside Bark (cm)*	Mean Height (m)*
Beaufort River	5.28 a	4.95 a
Coorow	4.06 b	4.46 b
Beaufort Inlet	3.96 bc	4.20 b
Paynes Find	3.59 cd	3.92 c
Murchison River	3.31 d	3.72 c

* Common letters indicate significant differences at $P > 0.001$ level (Tukey's HSD pairwise comparisons)

Note: Growth rates very low for age 10 – cf other sites (pastured)



Results – Tree form



Summary

1. Growth rates were disappointing
 - poor nutrition, high soil salinity, residual stocking
2. Site was suitable for testing thresholds of salinity tolerance for different provenances
3. Tree form variable & not promising for sites like this (agroforestry future)
4. Future funding – *Frankia* nodules & foliar nutrition sampling



Beaufort Inlet prov. 44% ok for agroforestry

Summary – future adoption

Consider this:

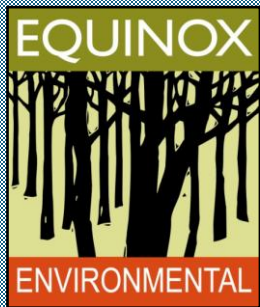
1. Property size – 1,560 ha cropping
2. 344 ha salinity or 22%
3. Shire rates 2024 = \$16,000
4. L/owners paying rates on saline land or here ~\$3,520/yr

Here lies opportunities for:

- Carbon offset projects
- Landowners (offset rates)
- Wheatbelt – greening valley floors
- Industry development (biomass)??



Acknowledgements



Equinox Environmental Pty Ltd
(*Dan Huxtable*)



Thank you



Beaufort Inlet prov – 44% ok for agroforestry