From random meander to stratified meander: using a quantifiable method to elucidate survey effort and detectability for threatened flora surveys

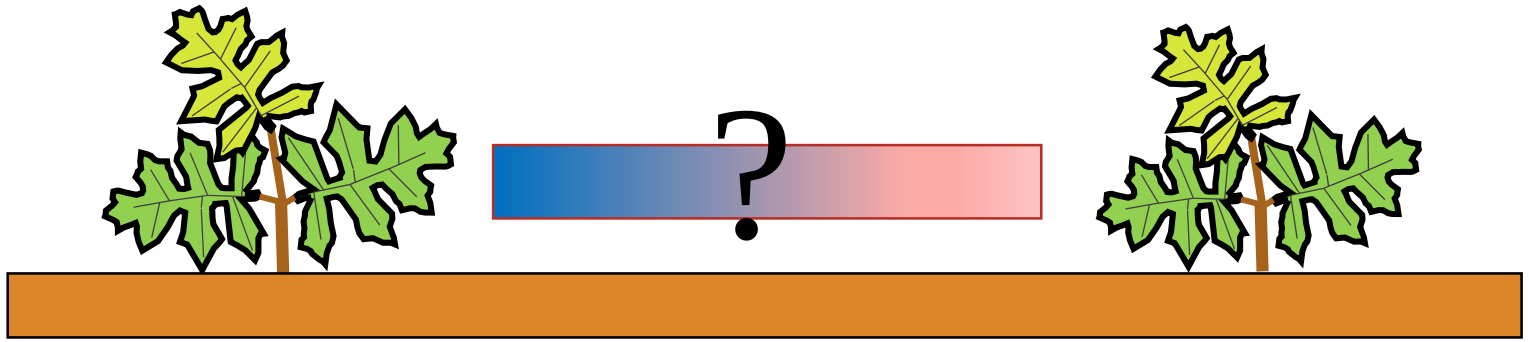
Nic McCaffrey[1,2] and Georgia Garrard[3]

[1] Principal Ecologist - WSP Australia Pty Limited
[2] The University of Queensland
[3] Senior Research Fellow - RMIT University

The Australasian Network for Ecology and Transportation (ANET) 2018
Monday 30 April 2018

Introduction

- Survey effort is intrinsically linked to the probability that a target species will be detected (its ‘detectability’) if it is present.
- Failure to acknowledge imperfect detectability can result in poor decision making
- Quantitative approaches rarely required as a part of impact assessments for proposed roads
- The key is trying to understand the unknown space between known locations

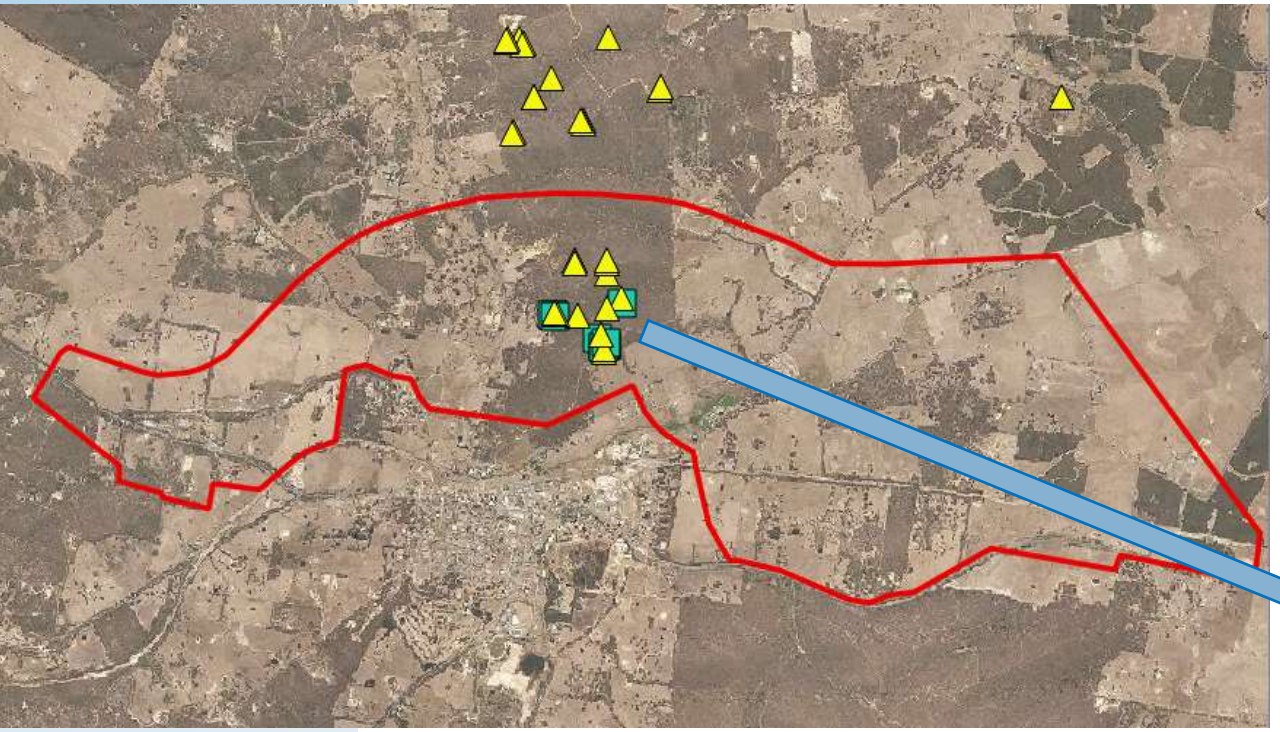


Background

- Ben Major Grevillea *Grevillea floripendula* (EPBC Act, FFG Act, vulnerable in DELWP's Advisory List) – shrub growing to 1m high
- Studies for the Beaufort Bypass Environmental Effects Statement (60km west from here) – for VicRoads
- Plants in close vicinity to proposed freeway bypass

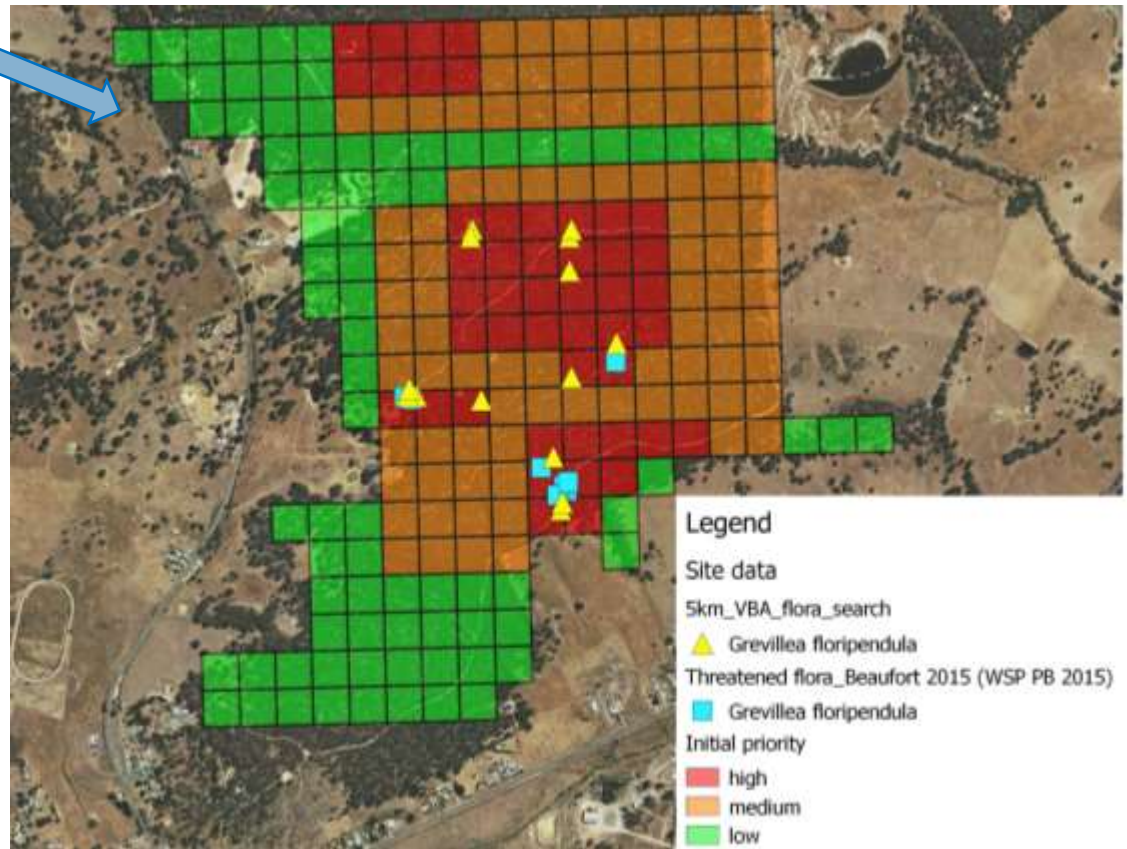
Heavily divided leaves

Green to mauve flowers



Methods

- Divided landscape into 100 x 100m (1ha) grids
- Classified a priori based on:
  - location of previous records
  - north facing ridgelines
  - species distribution model values

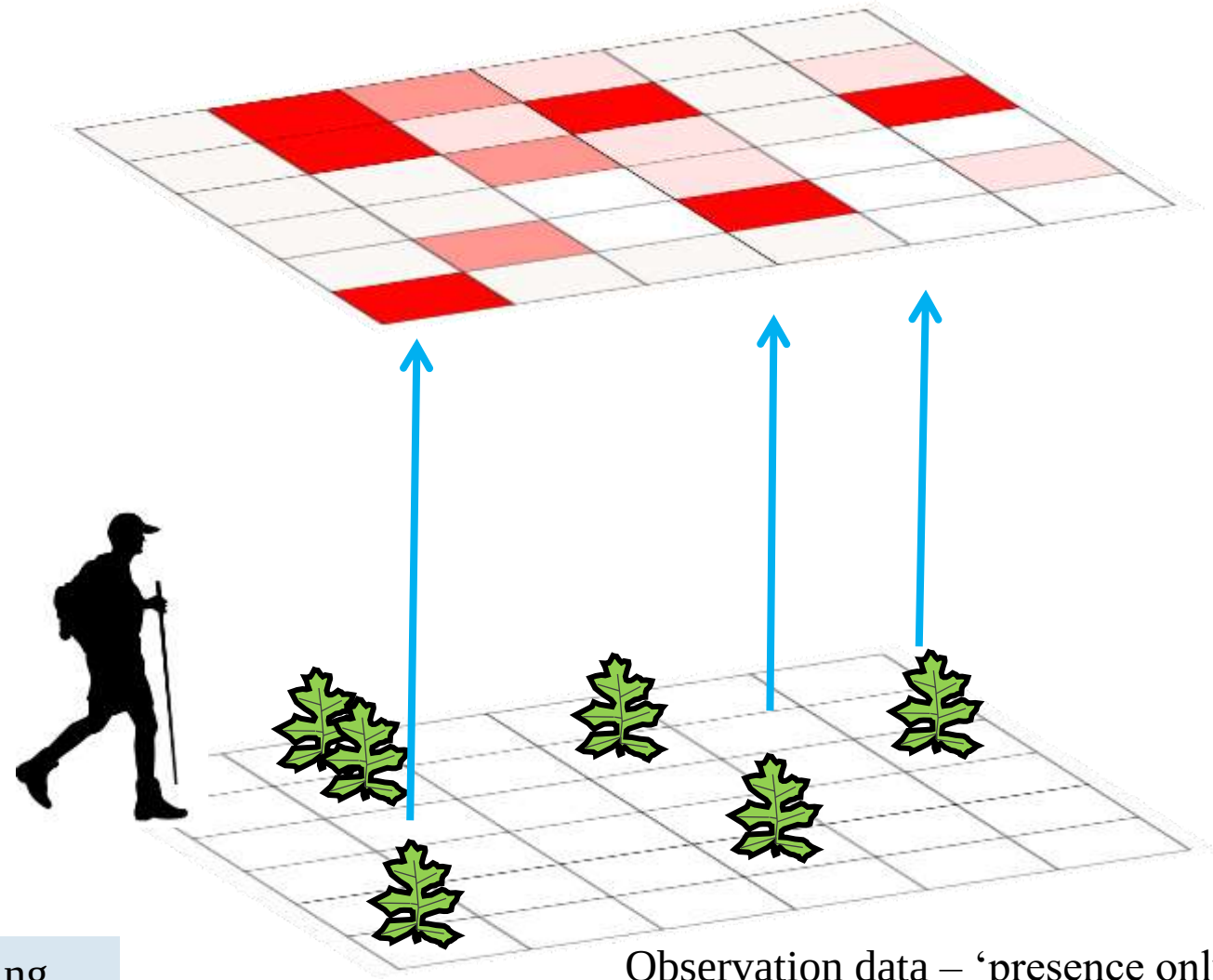


- Conduct ‘stratified meander’ as per McCaffrey *et al.* (2014)
- 3 traverses through high priority grids, 1-2 traverses through medium and low priority grids
- Collect ‘time to first plant observation’ and ‘total time in each grid’ for detection probability, as per Garrard et al. (2015)

Probability of species presence

MODEL

- Species distribution model
- Probability of detection if present
- Timed survey data



Observation data – ‘presence only’

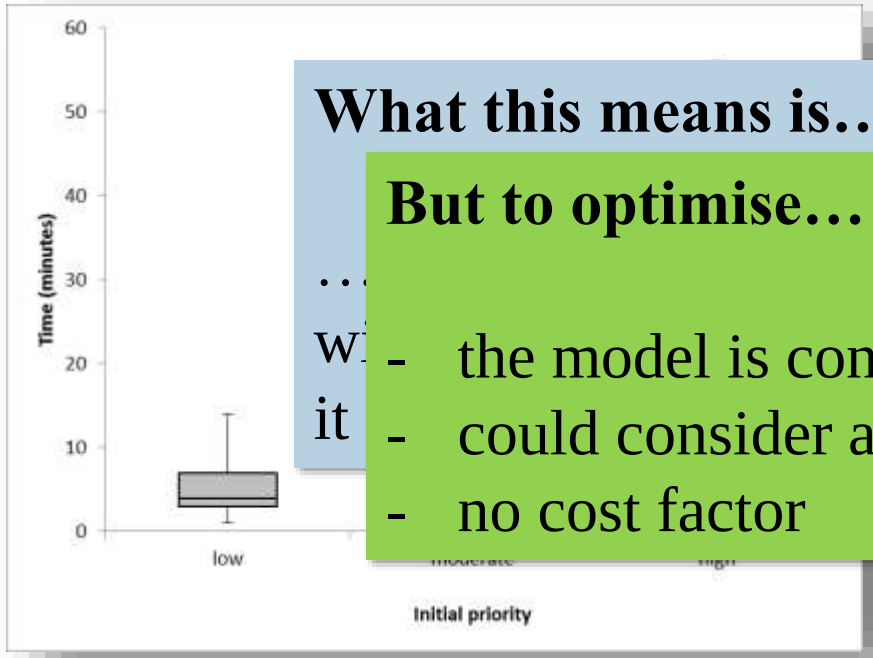
Species detectability estimated using methods in Garrard et al. (2015). Also developed for several other species.

Figure adapted from Guillera-Arroita, G (2017)

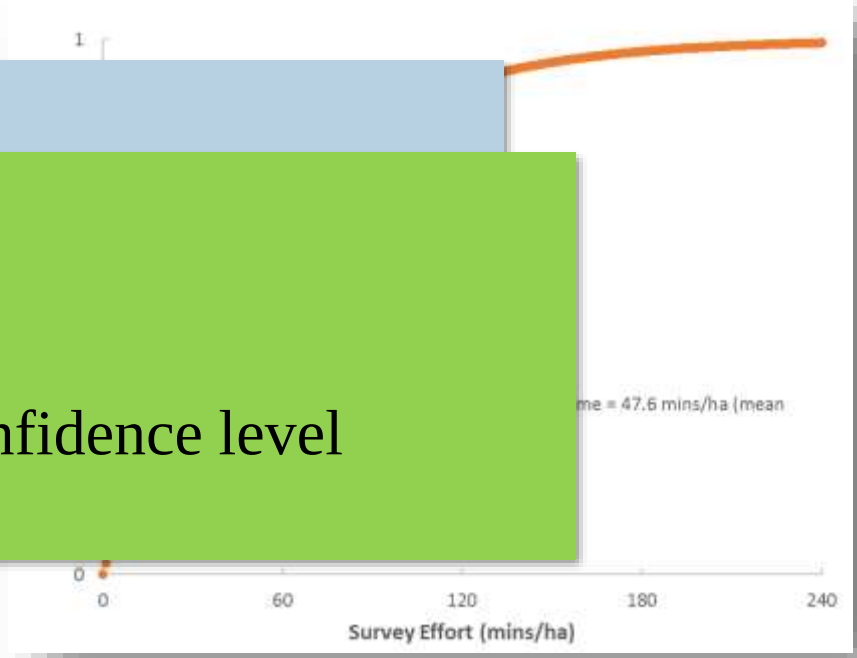
Results

- Times spent in 137 x 1ha grids (137ha coverage), based on initial search priority.
- Surveys conducted over four days x two people each day, a number of new locations found

Times surveying each 1ha grid by priority



Probability of detection



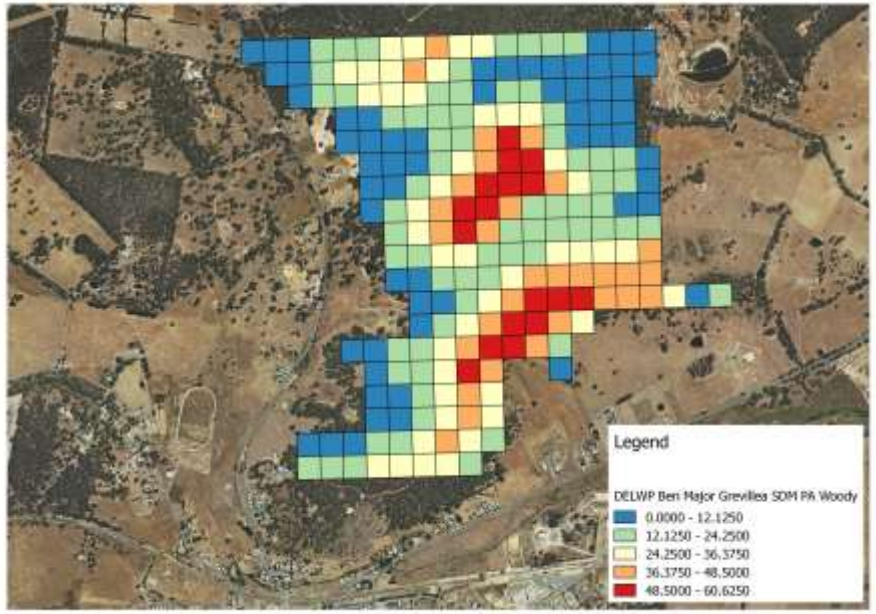
What this means is…..

…
w
it

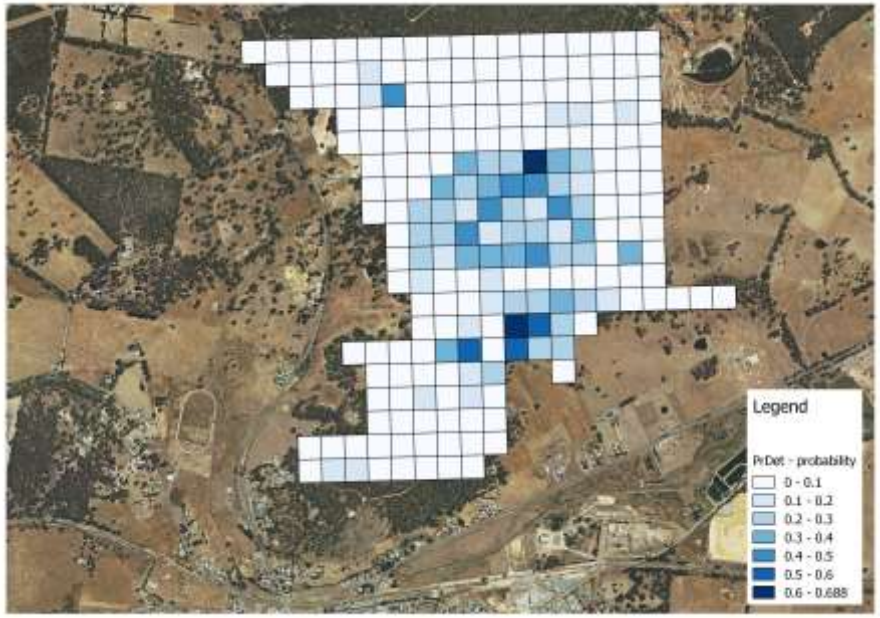
But to optimise…

- the model is conservative
- could consider a lower confidence level
- no cost factor

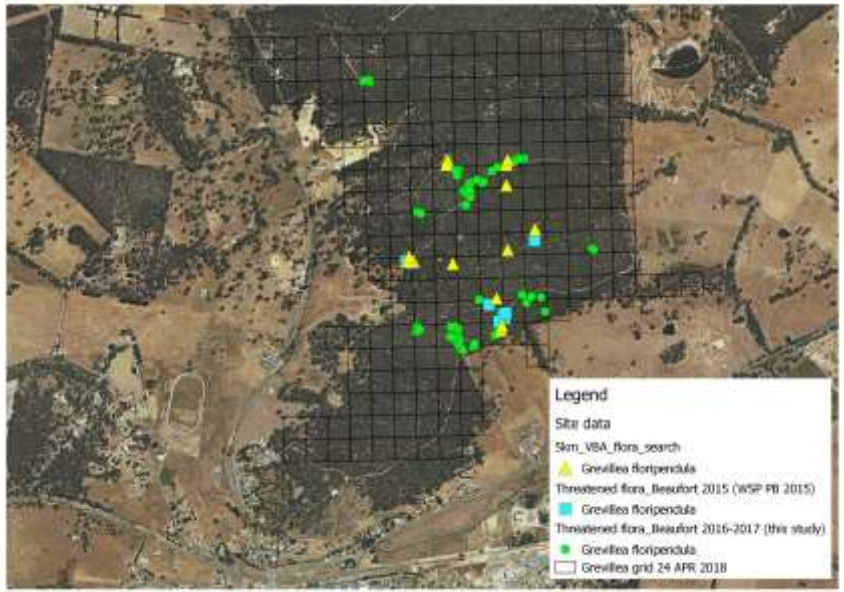
DELWP Species Distribution Model 2017



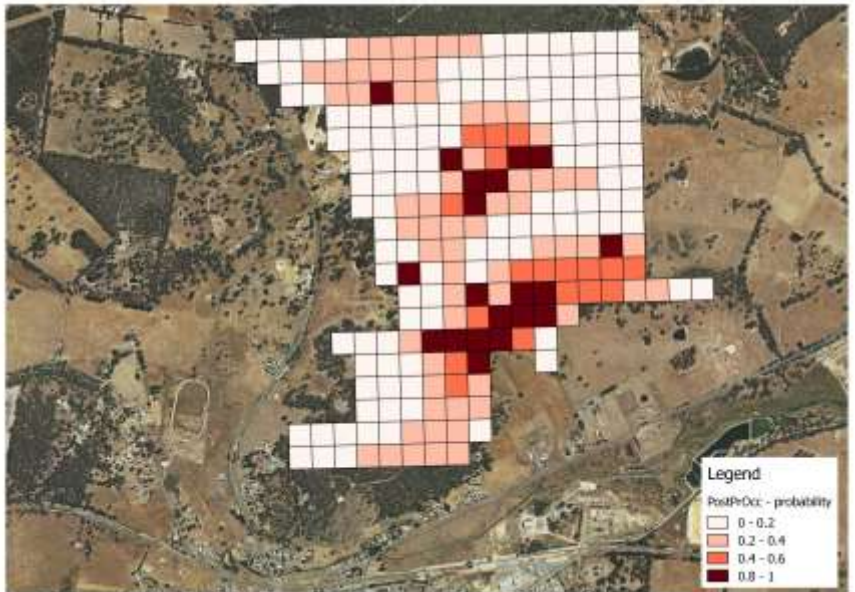
Probability of detection – based on field data



Actual data – VBA, WSP: 2015, 2016, 2017



Revised probability of detection with SDM



Conclusion

- Species detectability and prior distribution model = reduce the chance of a false absence to an acceptable level.
- Could have broader application to a number of flora species in a forest or woodland context
- Plan to develop easier-to-digest ‘rules of thumb’ in the hope of increased uptake of detectability for impact assessments

Acknowledgements

- Aaron Hui, Jonathan Harris and Scott Watson (VicRoads)
- Mark Shepherd, Zoe Steven, Sean Myers (WSP Australia Pty Limited)
- Matt White (ARI-DELWP)

References

Garrard GE et al. (2015) Incorporating detectability into environmental impact assessment for threatened species. *Conservation Biology,* **29**: 216–225.

Guillera-Arroita, G (2017), 'Modelling of species distributions, range dynamics and communities under imperfect detection: advances, challenges and opportunities', *Ecography*, vol. 40, no. 2, pp. 281-95.

McCaffrey, N et al. (2014), 'Novel ‘stratified-meander’ technique improves survey effort of the rare Pagoda Rock Daisy growing remotely on rocky cliff edges', Ecological Management & Restoration, vol. 15, no. 1, pp. 94-7.