Modeling the economic impact of *Varroa destructor* on Australian beekeepers

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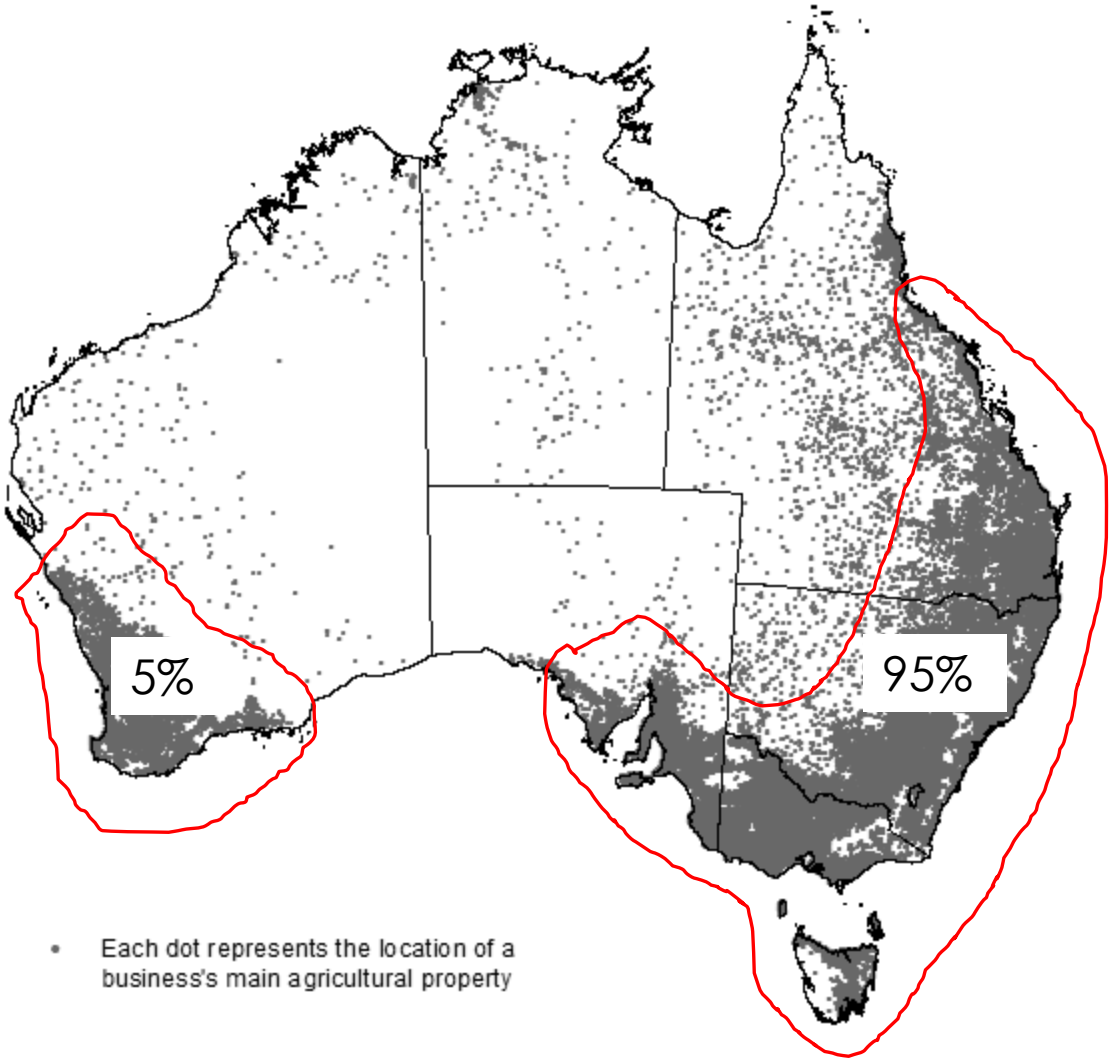
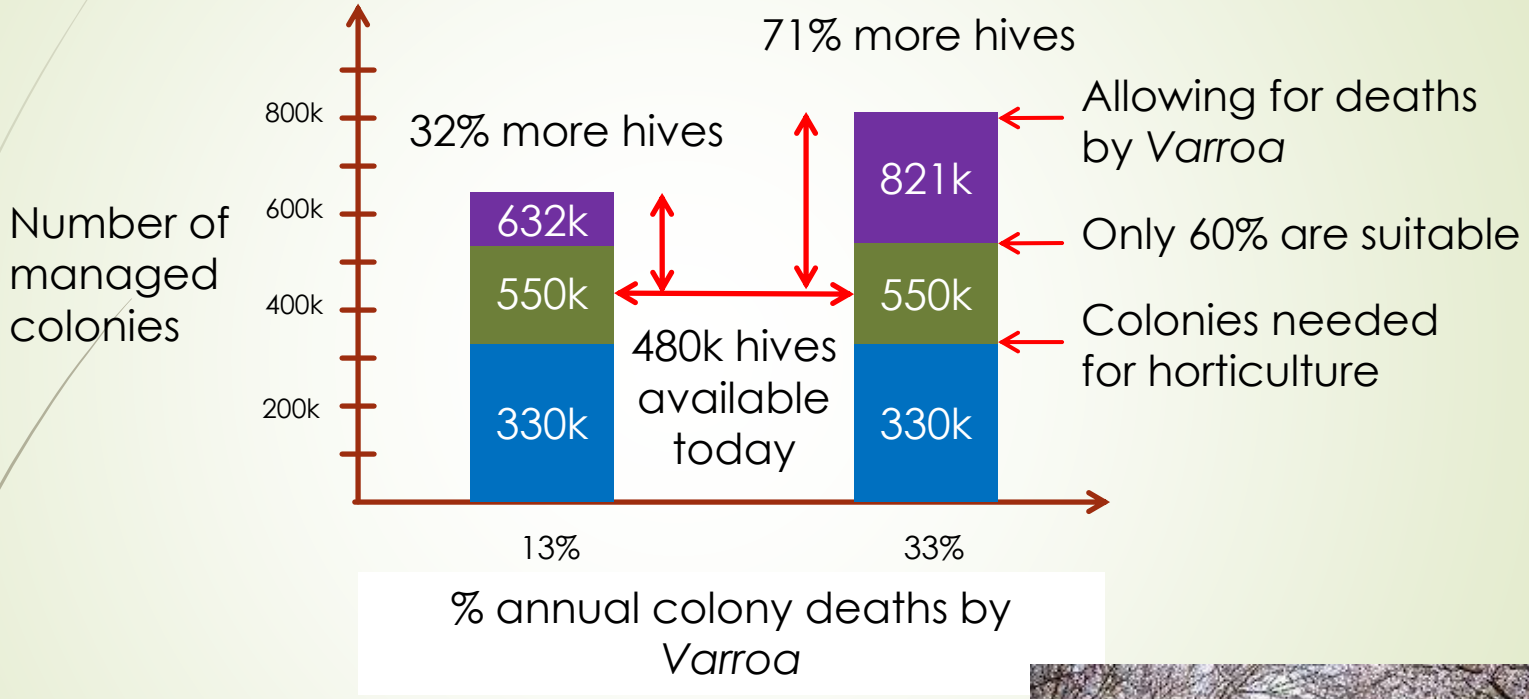
Questions to be addressed

- How many managed colonies will be required to support agriculture in **eastern Australia**?
- What is the likely economic impact of *Varroa* on commercial beekeepers?

Habitat Suitable for Bees



How many colonies are needed?



An additional 152k to 341k hives are need if pollination needs are to be met.

Economic impact of Varroa – averaged over 15 years

Number of hives

Cost, C, per apiary consisting of N colonies to manage *varroa* each year:

$$C = \frac{N}{I}\left[B + A\sum_0^P(E(P)) + \sum_0^Q\left(AG(Q) + H(Q)\right) + JK\right] + AL + M$$

Fixed cost to modify each hive

Cost of training

Driving to apiary

A: cost of labour/hour - $18USD
B: cost of an aerated base
C: total cost to manage varroa each year in an apiary of A colonies
D: number of inspections each year
E: time taken for one inspection of one hive
F: number of treatments each year
G: time taken for one treatment of one hive
H: cost of a single miticide treatment
I: efficiency of the beekeeper
J: percentage colonies that die each year
K: cost to replace a dead colony
L: time taken for training
M: cost to travel between apiaries – not included in cost calculation
N: number of hives

Economic impact of *Varroa*

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Cost of P inspections
at $A/hour

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Labour cost for Q treatments

Cost miticides

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Efficiency of beekeeper
(95% to 100%)

%

Cost to replace NJ dead colonies at $K each.

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Economic impact of *Varroa*

Colony deaths.yr^{-1}	Cost per year (AUD) per hive				
5%	6	44	81	118	155
10%	9	46	83	120	158
15%	11	49	86	123	160
20%	14	51	88	126	163
25%	17	54	91	128	165
30%	19	56	93	131	168
35%	22	59	96	133	170
40%	24	61	99	136	173
Inspections.yr^{-}	0	1	2	3	4
Treatments.yr^{-}	0	1	2	3	4

$1AUD = $0.68USD

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Assuming the cost to replace a dead colony is $50 AUD ($35USD)

Conclusions

- Approximately $60USD/hive to manage *Varroa*

- Assume 700,000 managed colonies
- 700k * $60 = $42MUSD per year!

- Assume 1 hive generates $200USD income
- Need to increase revenue by $60 USD to keep same profit
  - Almond pollination fees this year Approx. $90USD
  - 25% of eastern Australia hives went to Almonds