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Establishing and refining insect pest economic thresholds

A case study with cabbage seedpod weevil

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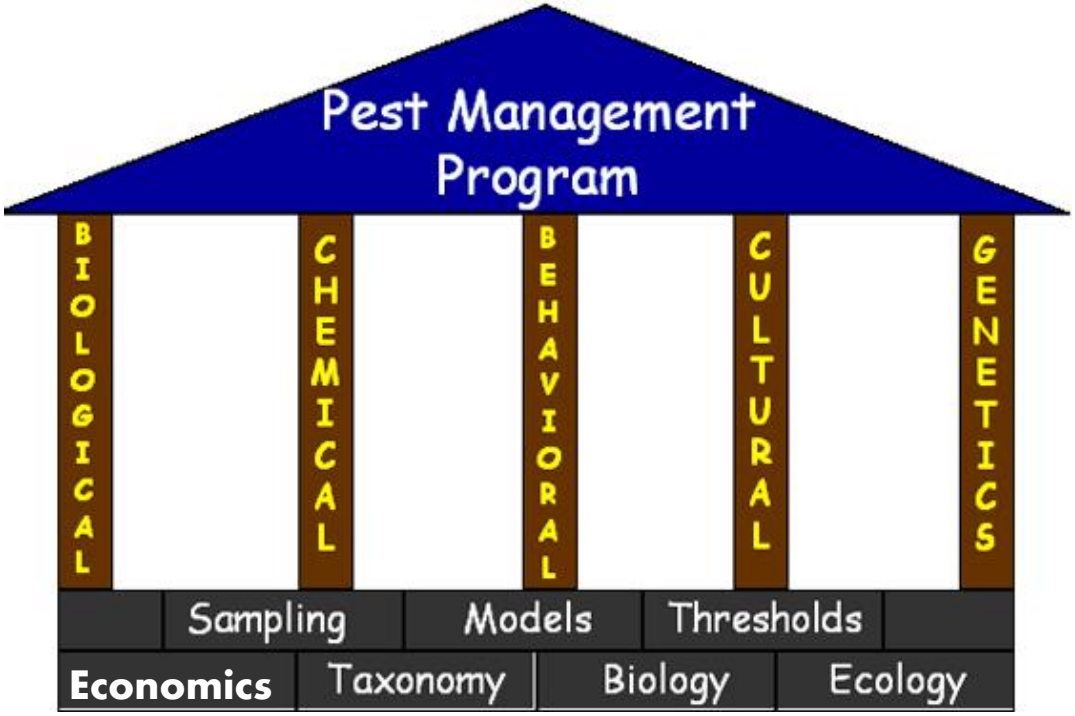
Canada

Outline

- IPM Context and history
- Some definitions of threshold concepts
  - Economic Injury Level
  - Action and Economic Threshold
- Case study: cabbage seedpod weevil

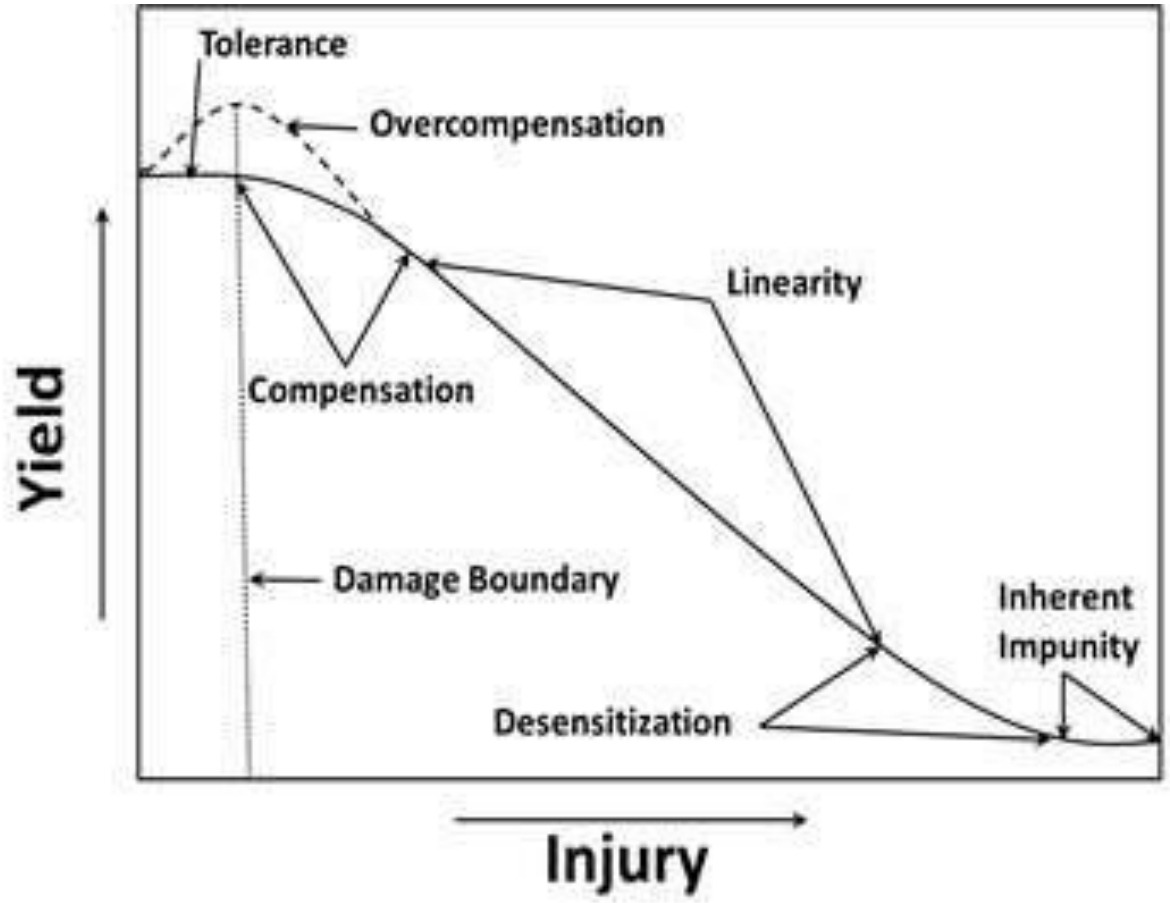
Threshold context



http://www.bestapples.com/varieties/varieties_ipm.aspx

Seminal article:
Stern, V. M., R. F. Smith, R. van den Bosch, and K. S. Hagen. 1959. The integrated control concept. Hilgardia 29:81101.

Relationship of crop injury and yield is not fully linear



Hunt et al. 2009. Univ. Nebraska

How to calculate Economic Injury Levels (EIL)

- EIL = pest abundance for break even point
  - Cost of spraying = crop value saved
  - Economic (Action) Threshold set around EIL
  - Could be lower (flea beetles, or higher depending on the biology of the pest)

  - EIL = g/b

Gain Threshold (g)

- EIL = **g**/b

- Easy to estimate:

  cost of spraying / canola price

  – $22.24/ha / $0.42771 / kg

  = 52 kg/ha

Regression Coefficient (b)

- EIL = g/**b**
  - Effect of insect on plant yield
  - Yield reduction per weevil increment (or damage for flea beetle)
  - Very difficult to get and highly variable!
    - Lots of data needed:
    - farm fields, plots, cages, lab studies

- …now the weevil example

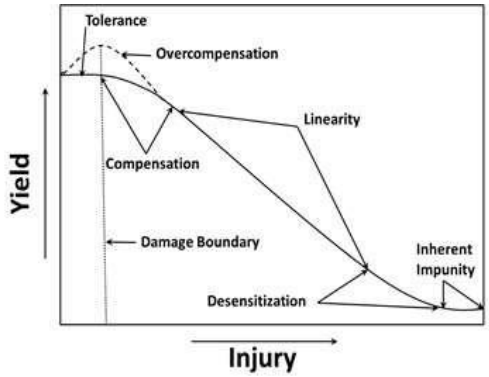


Photo by D. Johnson

Larva of cabbage seedpod weevil

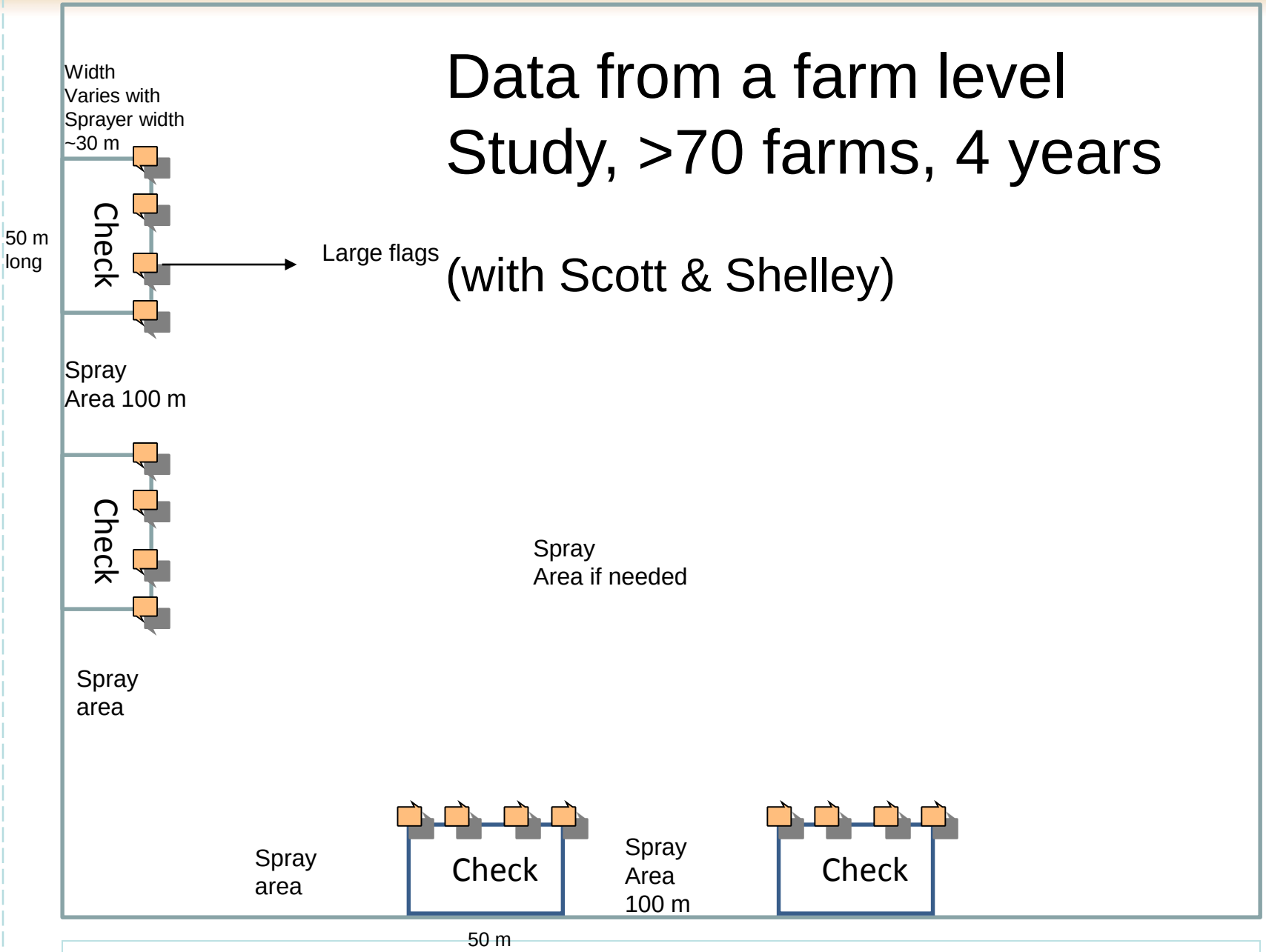
E. Kokko

L. Dosdall, AAFRD

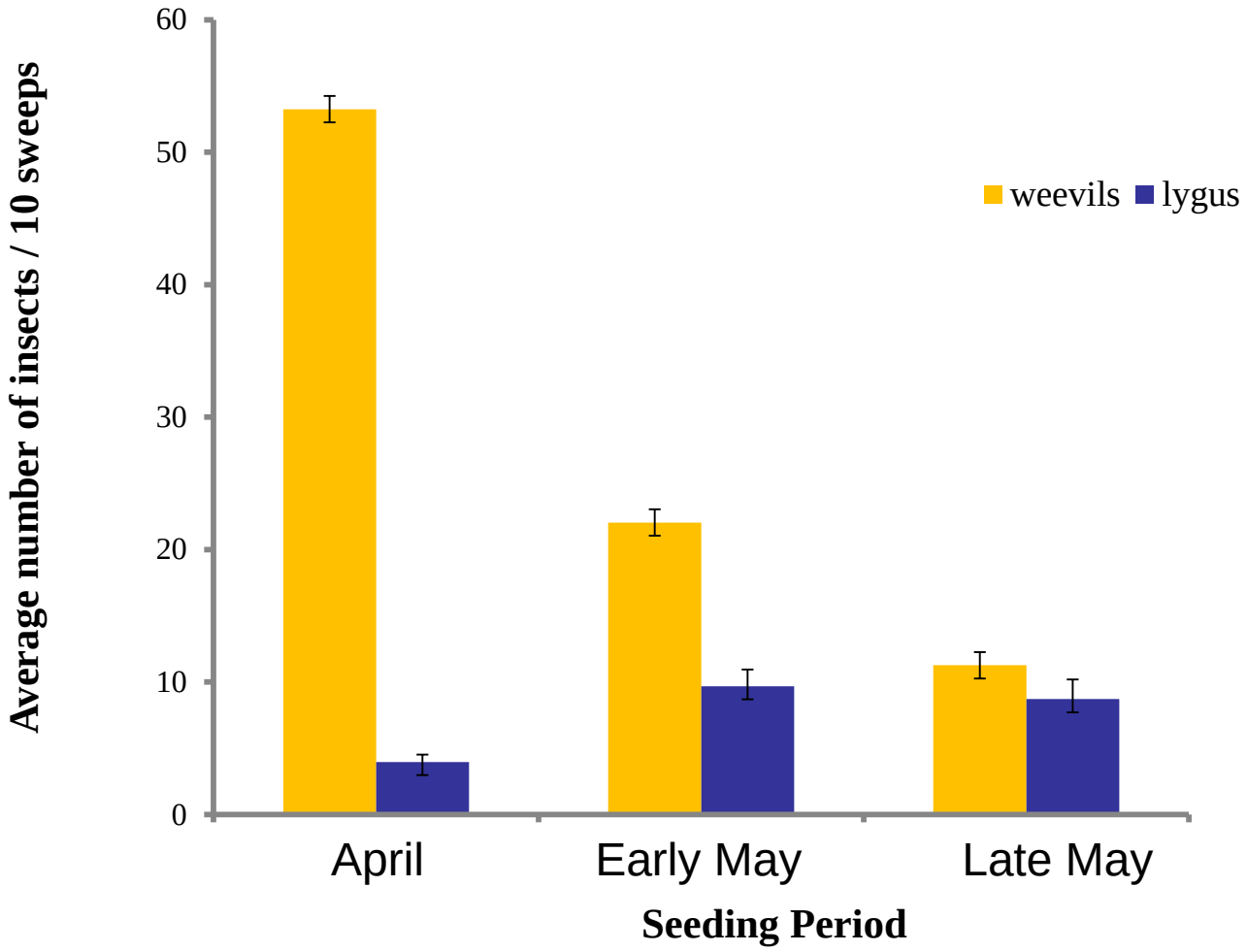
Low yield loss if less than 20% of pods with damage

Data from a farm level Study, >70 farms, 4 years

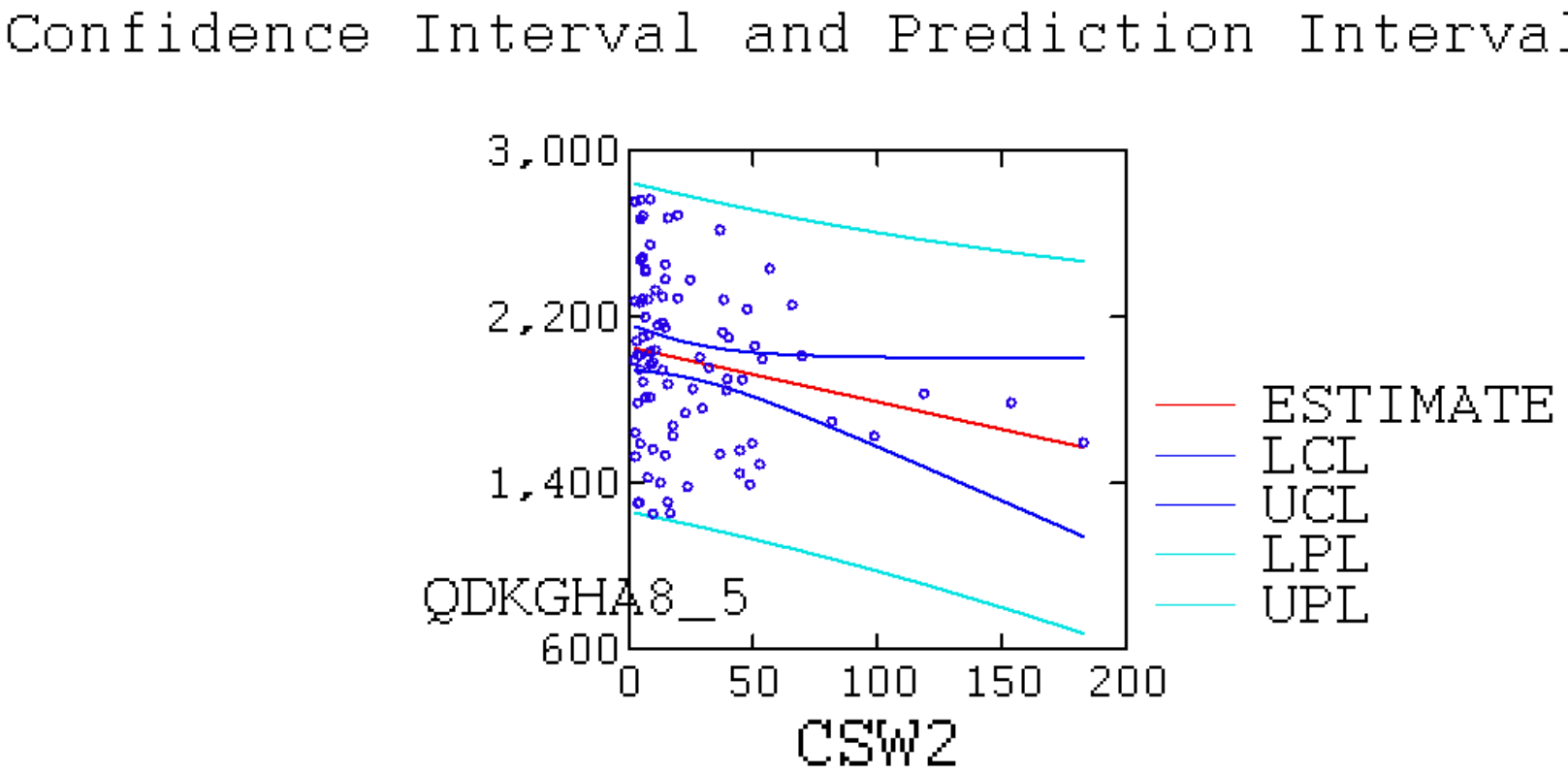
(with Scott & Shelley)



Seeding date affects abundance of weevils and lygus



Weak but significant regression of weevils and quadrat yields for early seeded fields



b = -2.64

EIL calculation for seedpod weevils

- EIL = g/b

- g (gain threshold) = 52 kg/ha
- b (insect effect) = - 2.64

- …EIL = **= 19.7** weevils/10 sweeps

- Action Threshold…?

Action Threshold for seedpod weevils

- 25-40 per 10 sweeps recommended
- Range to accommodate risk tolerances

- Why higher than EIL?
  - Old dying weevils
  - More abundant along the edges
  - Sampling…

Sampling seedpod weevils

- Sample 1 week after first flowers appear and take 10, 180 degree walking sweeps
- Ideal: 5 samples along the edge and 5 inside (spread out)
- Minimum:
  - Stop at two opposite corners
  - Take two samples 50 m apart
  - One along the edge and another inside

Current Management Recommendations

- Spray at early flower if more than 25-40 weevils / 10 sweeps
  - Do not spray JUST for lygus if under this threshold!
  - Early seeded fields are not at risk of lygus damage
- May only need to spray the borders
- Non chemical management:
  - Rotate with non host crops, pulses, cereals
    - (yellow mustard is immune)
  - Consider trap crops
  - Protect and enhance natural enemies by judicious use of insecticides (go over not under thresholds for weevils)

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