
Mice in crops
again, and again, and again…….
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Mouse plagues:

An old problem, with old remedies

Mouse plagues

"*During 19 years there had been 4 visitations at intervals of 4 – 5 years…*

phosphorised wheat placed around the paddocks at sowing prevents them from doing much damage."

Arthurton 1899 (SA Journal of Ag & Industry)

An old problem that is getting worse because….

- Mice have become more common in crops due to changes in cropping practices
  - stubble retention
  - no-till
  - more frequent cropping
  - fewer livestock
  - better nutrition; more legumes and oilseeds
- A given number of mice are also more damaging due to
  - shallow sowing and better cover from predators in recently sown crops
  - new vulnerable crop types (e.g. canola)
  - reduced disturbance ➡ more persistent problems

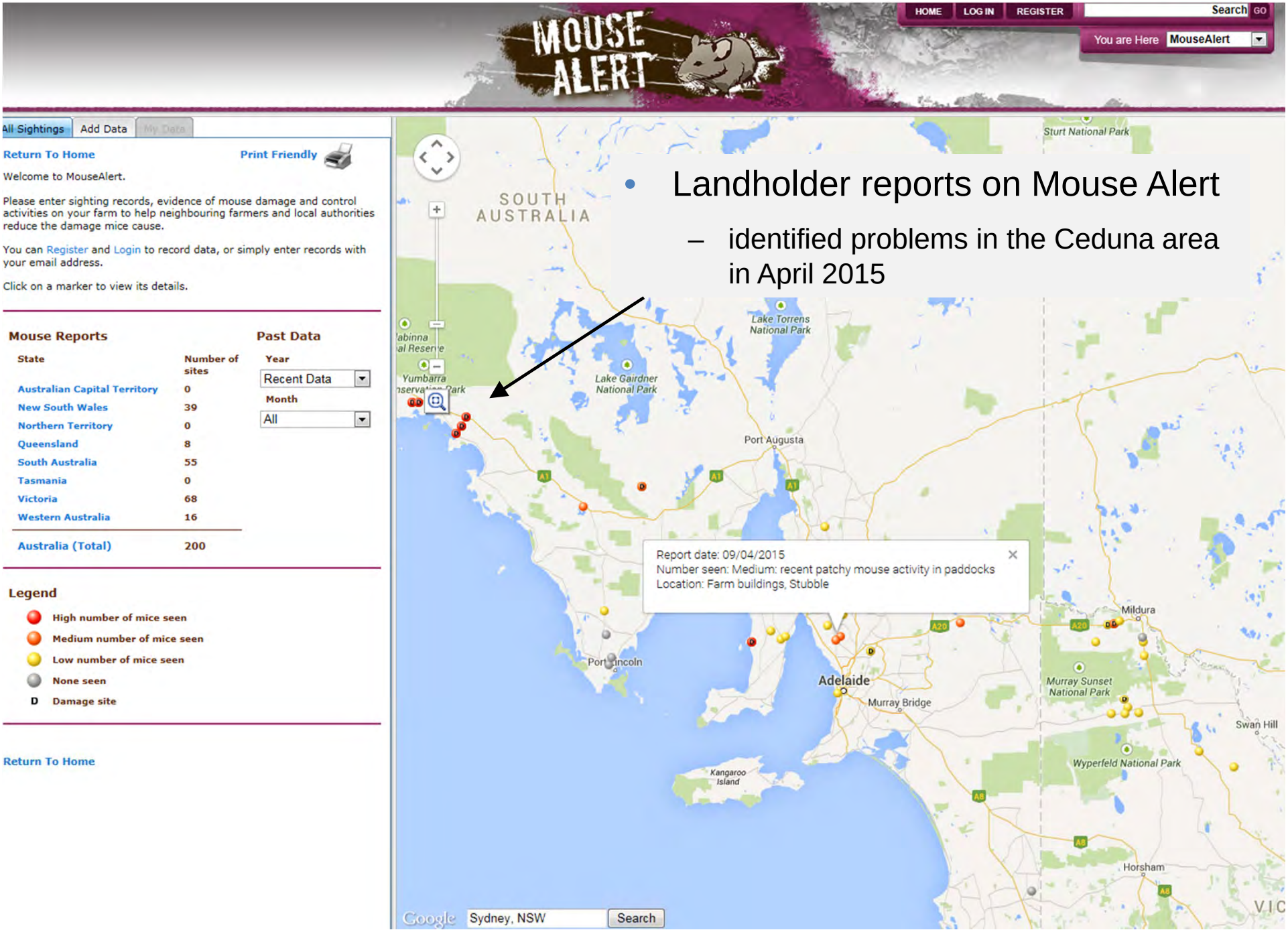
Mouse damage to wheat sown into retained stubble

Mouse damage to durum wheat tillers

Decision making for managing mice at seeding

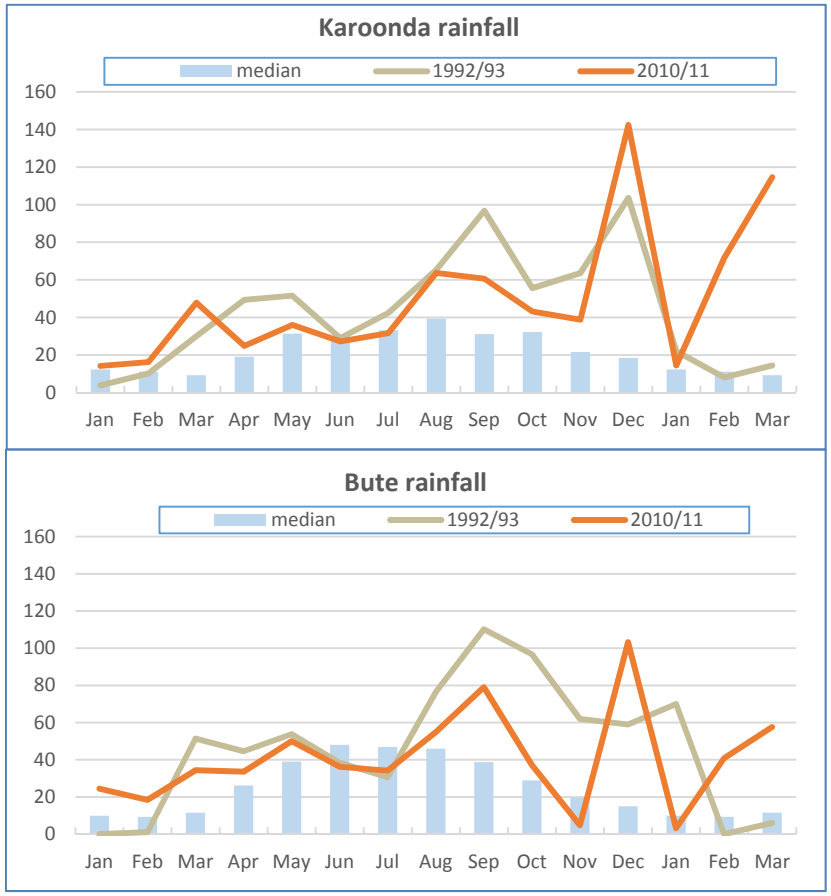
- Predicting mouse damage risk
  - Predictive plague models based on historical precedents
    - Grain yield
    - Rainfall in autumn and late-spring/summer
    - Approx. 20 - 30% failure rate of predictions
  - Regional monitoring (GRDC/Invasive Animals CRC)
    - Models that incorporate population monitoring data have greater accuracy
  - Media, grower, and adviser reports
  - MouseAlert “app” regional info from other growers

MOUSE ALERT allows growers to upload and view reports of regional mouse problems



- Landholder reports on Mouse Alert
  - identified problems in the Ceduna area in April 2015

This year's increased problems in SA were predictable from rainfall patterns alone….



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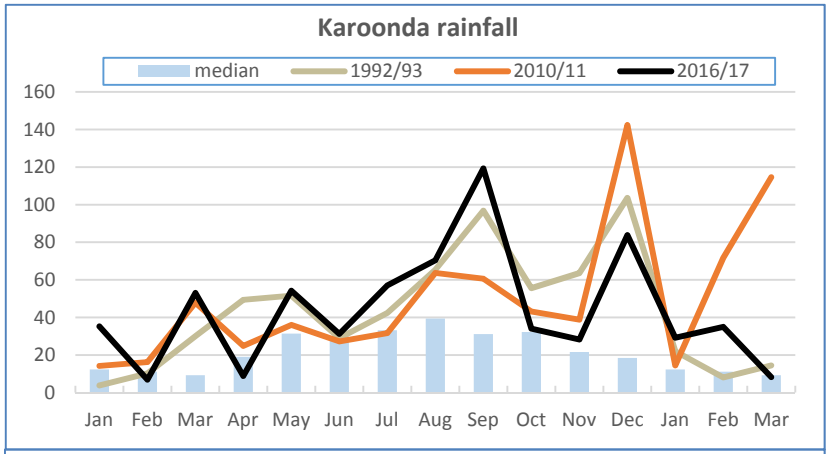
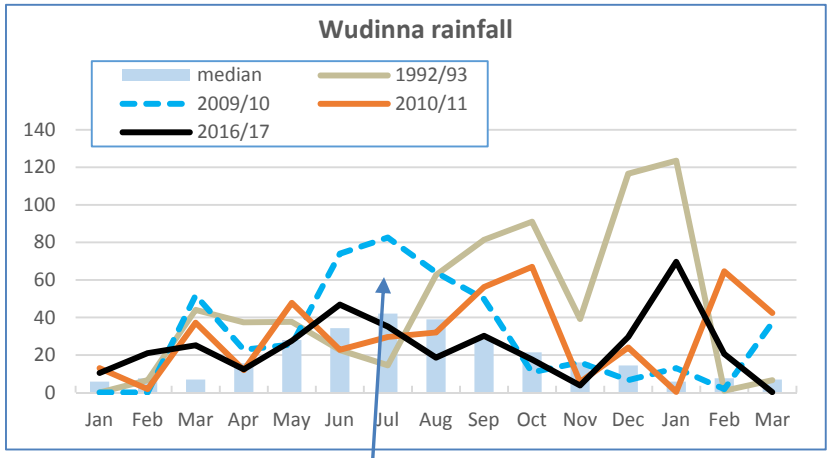
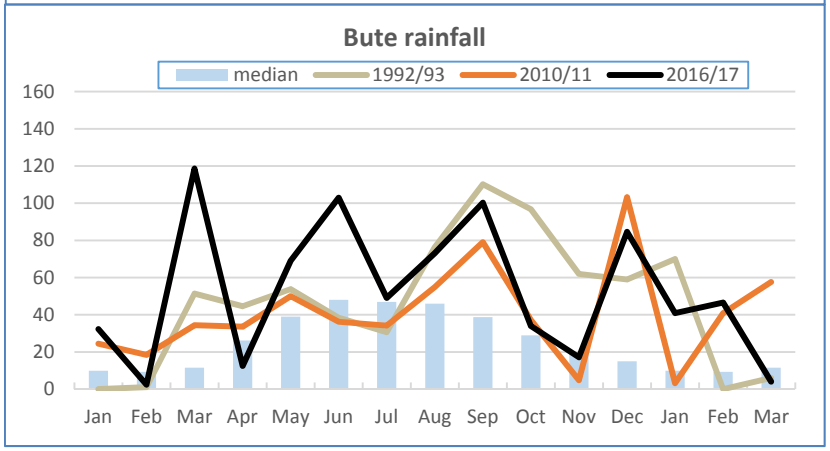
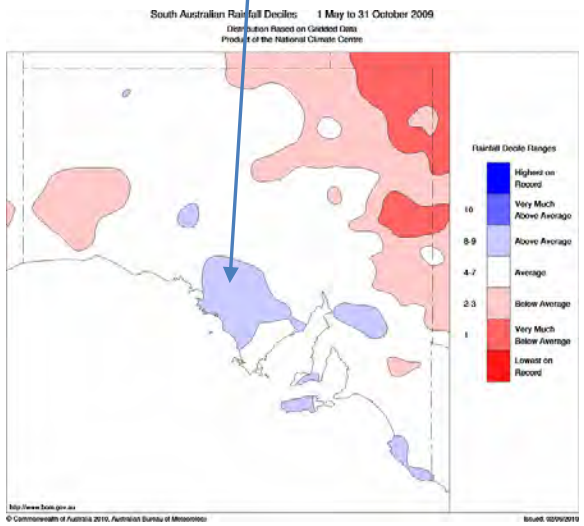








What are we in for in any given year?

Can regional predictions guide management decisions?

- The 'yes' case: problems should be fairly uniform
  - severe plagues tend to be widespread, at least at a regional level
  - mice are highly mobile (500 m per night)
  - mouse numbers build up over 6 months before seeding
- But
  - Detailed predictive models based on historical precedents may no longer be reliable
  - yield losses due to mice are highly variable within farms

Comparisons within individual farms	Yield loss at seeding Eyre Pen 2010	Yield loss at seeding SA, NSW, VIC 2011
Worst-affected crops	30%	18%
Least-affected crops	6%	2%

- Regional predictions are unreliable indicators of damage in individual crops
- Management decisions need to be made paddock by paddock

Crop stages most susceptible to damage

Decision making for managing mice at seeding

- Identifying problem paddocks
  - known risk factors
    - grain loss at last harvest
    - Mice seen at harvest
    - Weed infestation
    - Soil type
    - Mice damage history in the paddock
  - monitoring
    - Hole counts and tracks
    - Night counts
    - Bait cards
    - Snap traps
  - observed damage

Indices are site-specific to some extent

Problems are much harder to identify in spring

Head losses promote high mouse infestations

Chew rates on bait cards soaked in vegetable oil can be used to index mouse activity

Landholder perspective on mice

Factors influencing mouse infestation at the farm level: EP 2010

Grower surveys - Mouse numbers higher where:

- high grain yields
- hail or disease damage to maturing crops
- inefficient harvest
- lighter or stoney soils
- ungrazed paddocks
- tall standing stubbles vs. knocked down in summer
- summer weeds
- verge areas with heavy spear-grass or nut-grass cover
- pasture with heavy seed set
- crops that had mouse problems last year

In mouse plagues, numbers may still be high in some paddocks where all of these risk factors are low-moderate

Head losses promote high mouse infestations

Nut grass *(Moraea* or *Romulea)* corms promote higher numbers in uncropped verges

Baiting to manage crop damage

- “Mouse-off” or “Surefire” registered sterile grain baits.
- Regional bait manufacturers (unsterilized producer’s grain)
- Active ingredient Zinc phosphide
- Application rate 1 kg/ha = 10,000-20,000 lethal doses
- Cost approx $10-$12/ha sterile baits. $4-5/ha for unsterile
- Registered for aerial application or spread by a variety of small-seed applicators
- Typical control levels of >90%
- Low non-target risk if applied at specified rate, and kept away from uncultivated bare ground and native vegetation

Landholder perspective on mice

Effective mouse management : EP 2010

- Mouse damage at sowing was reduced by:
  - effective summ
  - knocking down prickle-chaining
  - incorporating st
  - baiting immedia week later)
  - early sowing, e
  - Increased sowi
- Multiple baiting was the only reliable strategy in the worst crops

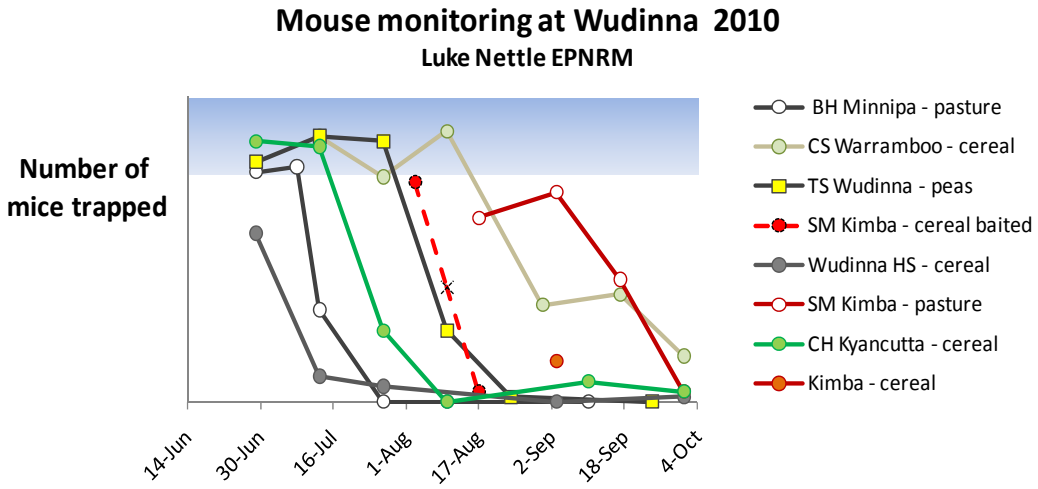
In the past 2 years, landholders have increasingly reported that ZP baiting has failed to control mouse damage

Multiple bait application has been necessary and not always effective

Melon seeds allow mice to persist in sown crops

Decision making for managing mice in maturing crops

- Some ‘mousey’ crops that are planted early get away well
- Damage declines after the seed is exhausted (2- 3-leaf)
- Should ‘mousey’ established crops be baited during winter?
  - damage before flowering is usually minor but can be severe
  - monitoring mice in developing crops is difficult
  - some problems will go away – but it is hard to predict
  - damage at flowering can start suddenly and be severe
  - baiting is usually effective

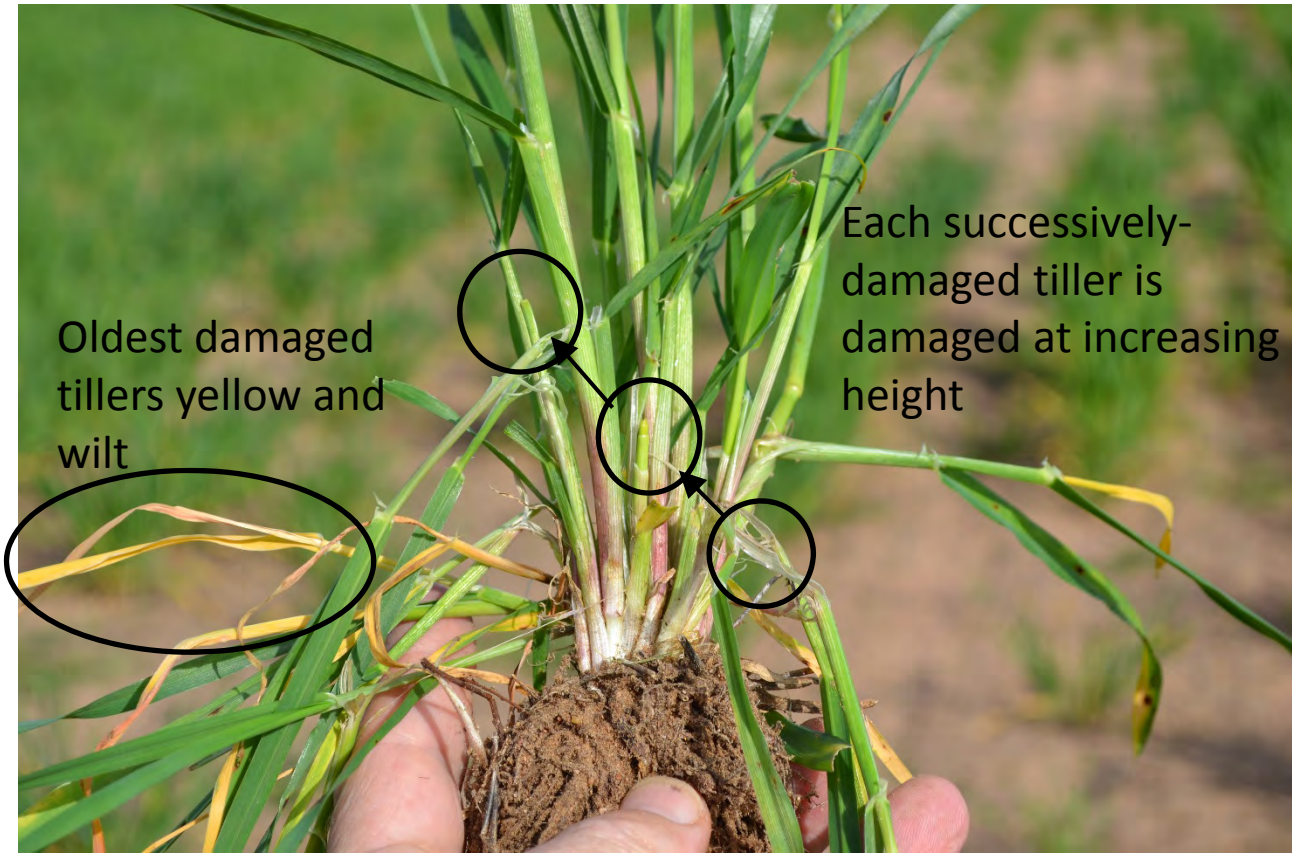


Mouse damage Yorke Pen 2014

Mouse damage M Mallee 2012

Decision making for managing mice in maturing crops

What do you look for at the early stages?

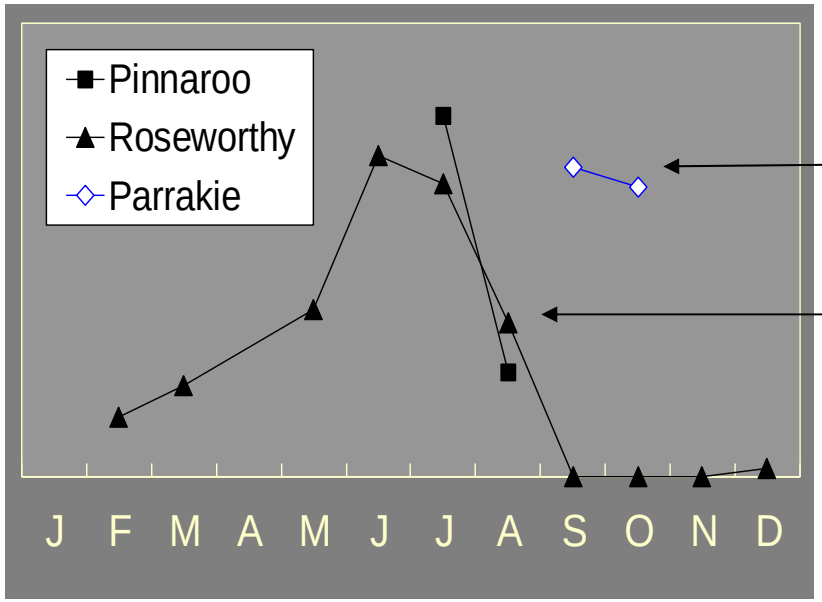


At later stages mice eat developing heads ‘in the boot’

Timing of plague decline

- Usually crash during winter, but
- high numbers sometimes persist into spring
- Has major impact on the type of damage

Mouse numbers 1993



Severe damage to maturing heads

Damage only at seeding

Conclusions

- Landholder perspective
  - stubble retention has enormous benefits but increases mouse problems
  - effective weed control and grazing reduce mouse problems but don't stop them
  - cheaper and more convenient bait, and experience with using it, initially solved most of the problems
  - ZP is no longer working reliably even with multiple applications.
  - New bait substrates or attractants are needed

Grain Producers SA

MEDIA RELEASE

Tuesday, April 15, 2014

Mouse bait stations ready for action on EP, YP

SOUTH Australian grain producers now have access to regional bait stations where they can bring their own grain and have it treated to more cost-effectively control mice.

A number of stations have been set-up by commercial companies at Wudinna, Karkoo, Lock, Cowell and Kimba on Eyre Peninsula and Cunliffe, Kadina and Minlaton on Yorke Peninsula.

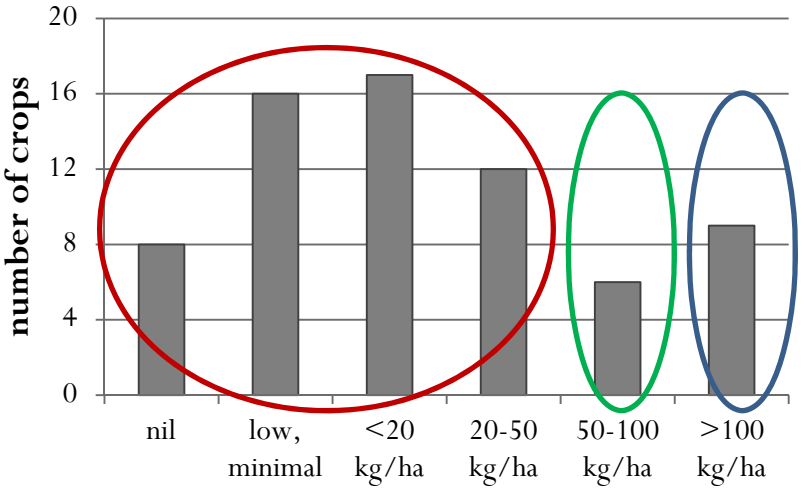
My perspective on mice

Factors influencing mouse infestation at the farm level: EP 2010

- 500 mice/ha is common in severely infested crops in early winter
- Mice eat 2-3 grams dry seed per day
- 500 mice/ha in June must have eaten ~150 kg seed/ha between Jan to end of June
- Even in the crops that were worst infested in winter 2010, grain loss at harvest in 2009 was mostly reported to have been low

Estimated 2009 harvest losses

for 68 heavily mouse infested crops on Eyre Peninsula in autumn 2010



Why has zinc phosphide baiting failed?

- Initial reports came from paddocks where alternative seed sources were abundant
- Not enough bait? - 2011 trials indicated not a problem. But in v. heavy stubble?
- Bait aversion? - pests avoid the poison and/or bait type after a sub-lethal dose

Aversion to ZP bait after single ingestion of sub-lethal quantities

Year	Rodent species	Bait-shy period
1971	Indian gerbils (2 species)	115 and 35 days
1980	*Mus platythrix*	170 days
1995	Indian mole rat	7 to 474 days

- Illegal home brews (mostly omethoate) used in 2010-11 when ZP was unavailable
  - Some growers reported effective control with ZP where application of home brews had been ineffective
  - A few reported the reverse, home brews effective after ZP failed
- GRDC recommendation "*Allow at least four to six weeks before re-application of baits to minimise the chance of bait aversion*"
- Growers can't wait 4 weeks if their crop is being eaten

Conclusions

- My own conclusions
  - Persistent, increasing mouse problems are likely in stubble retention cropping systems.
  - Better baiting strategies are useful, but increasing reliance on bait has substantial risk:
    - Overuse of zinc phosphide has probably led to bait aversion developing
    - Some risk remains that international markets may eventually ban ZP use
    - New chemical agents or bait substrates may be a short-term solution
  - New strategies to reduce grain loss at harvest are needed to protect conservation tillage