



Queensland Alliance for Agriculture and Food Innovation

Timing of Preventive Flystrike Treatment

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Flystrike Treatments

Resistance management – Rotations

Early season treatments

Timing non routine treatments

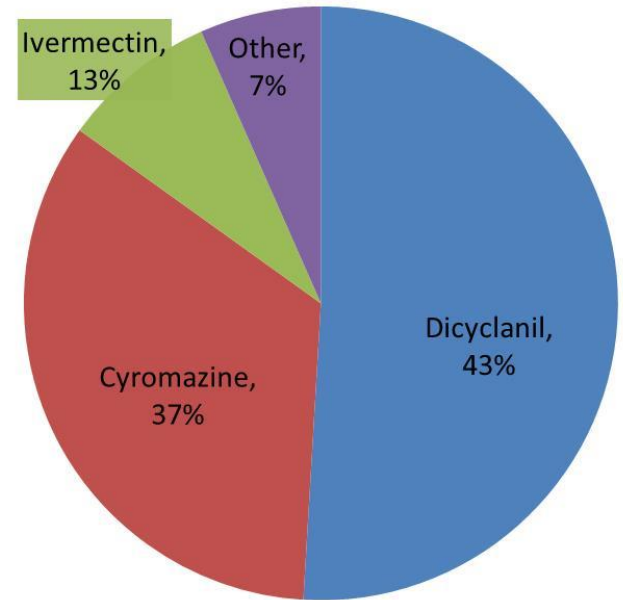
Often best resistance management option is not the best practical or economic option



Resistance in *L. cuprina*?

History of resistance – OC's, OPs, Carbamates, Diflubenzuron, Cyromazine/dicyclanil

Early low level resistance has historically been followed by much higher resistance



Industry use, preventive treatments

Chemicals available	Dicyclanil	Cyromazine	Ivermectin	Spinosad	SP	OP	(Dfb)
Protection	X	X	X	X	X		(X)
Treatment		X	X	X		X	
Resistance (field)	X	X				X	X
Resistance (Lab)	X	X			X	X	X

Resistance to cyromazine and dicyclanil

(Levot *et al.*)

- Nimmitabel strain emergence associated with underdosing and a wet summer 2010-11
- Resistance low level but, cross resistance between cyromazine and dicyclanil
- Strain overwintered suggesting little fitness penalty
- Collected from 4 of 5 surrounding farms

- Resistance Ratio: cyromazine – 8x; dicyclanil – 3x

- Reduction in protection (larval implants)

Cyromazine 14w reduced to < 8w

Dicyclanil 18-24w reduced to <11w

- New Zealand – dicyclanil

L. cuprina - up to 5x

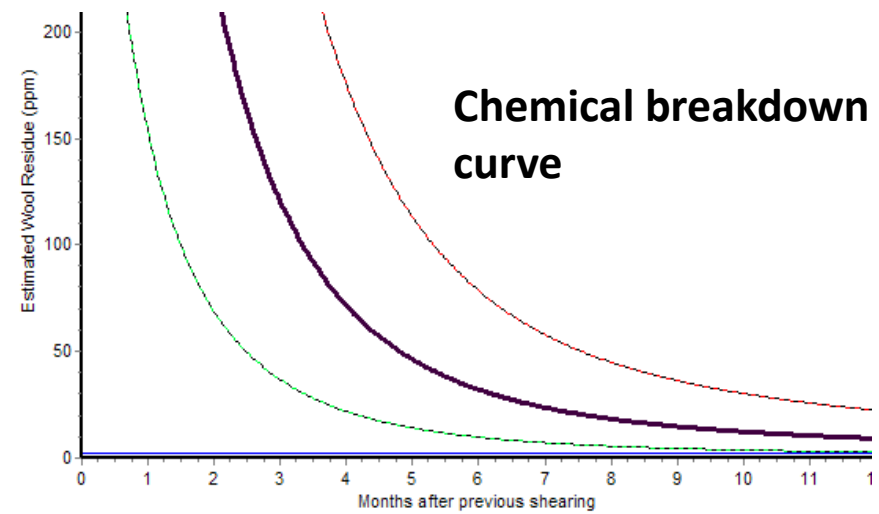
L. sericata - up to 28x

(Waghorn *et al.* 2013)



Factors contributing to resistance

- Ongoing selection conferring survival advantage to more resistant genotypes
- Sub-lethal dosing of the most resistant portion of the population
 - Poor application, underdosing
 - Breakdown tail – selective concentrations in fleece as treatment ‘wears off’
- Repeated applications with same chemical
- Persistent formulations
- Widespread industry usage (temporal and spatial)
- Exposure to chemicals used for control of other parasites
- Survival of more resistant larvae following treatment of struck sheep



Treatment of struck sheep

- Sublethal dosing of larvae escaping strikes can contribute to resistance
- Some products don't kill larger larvae and some just get under-dosed
 - selection for resistance
- Collect and kill larvae/struck wool clipped from strikes
- Avoid chemicals used for recent preventative treatments



Resistance management – some factors to consider

Moderation

- Reduce chemical use – IPM, increase reliance on non-chemical methods
- ‘Threshold’ treatments v routine treatments?
- Less persistent chemicals (Dicyc 18-24 w; Cyro 10-14 w; Iver 12 w; Spin 4-6 w; SP 10w)

Rotation

- Chemical GROUPS with different modes of action
- Timing of treatments
 - Early season treatment or treatment when flystrike risk?
 - Sub-lethal breakdown tails in times of low fly pressure?
- Strategic rotation? (End, beginning of season)
- Treatments for other parasites (lice, internal parasites)
- What level of persistence is required?
- Timing with regard to crutching and shearing to avoid chemical tails?
- Treating struck sheep



Rotation

If?

What chemicals?

When?

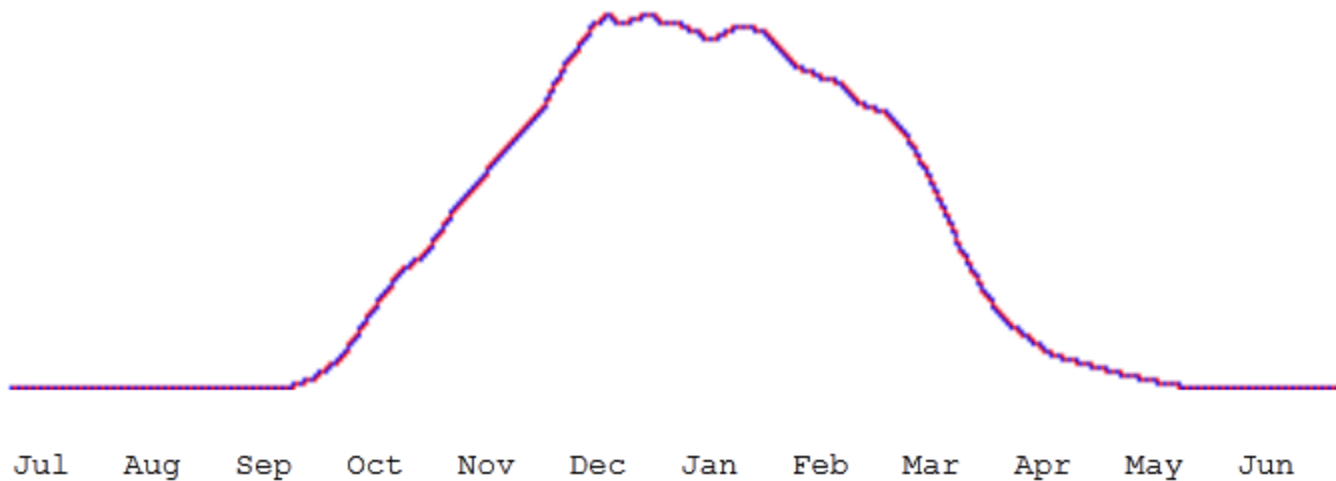
Balancing short term efficiency with long term sustainability

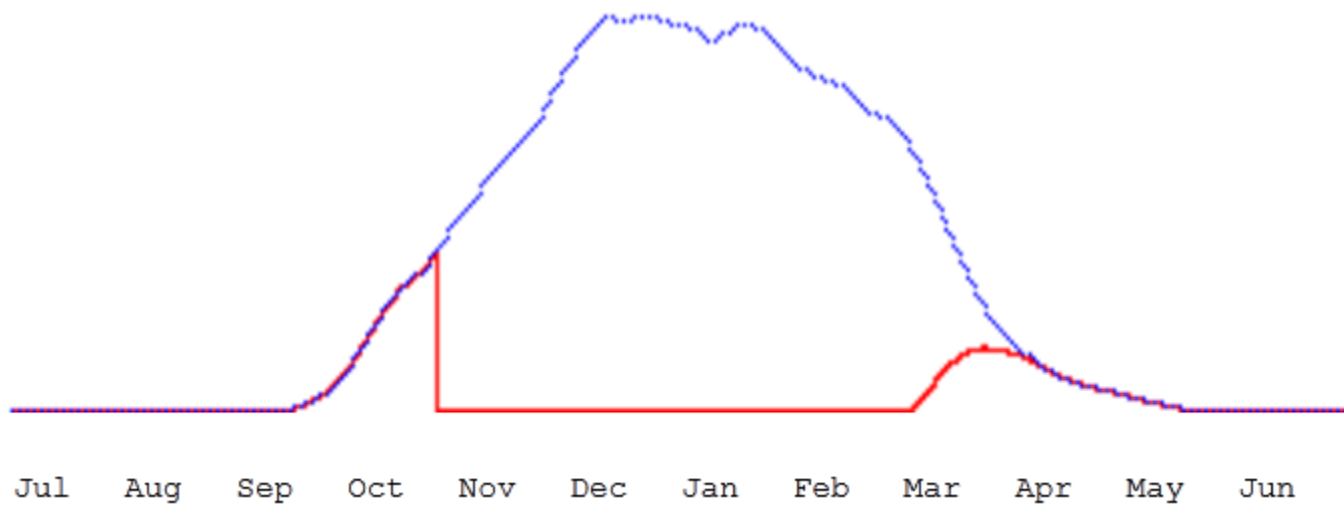
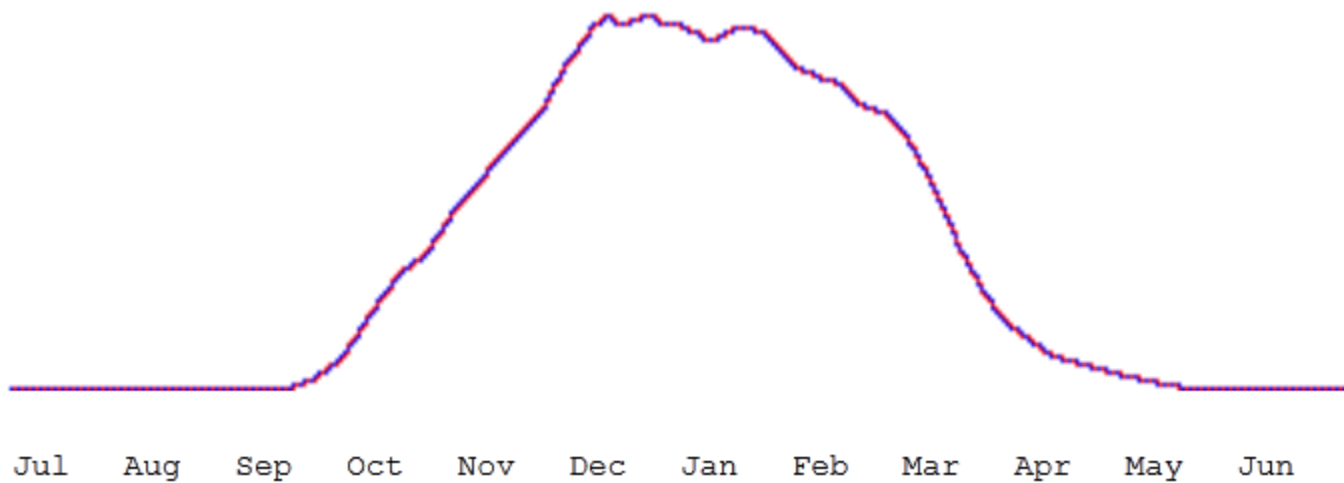




Set time each year

- FlyBoss can help decide the optimum time taking into account shearing and crutching





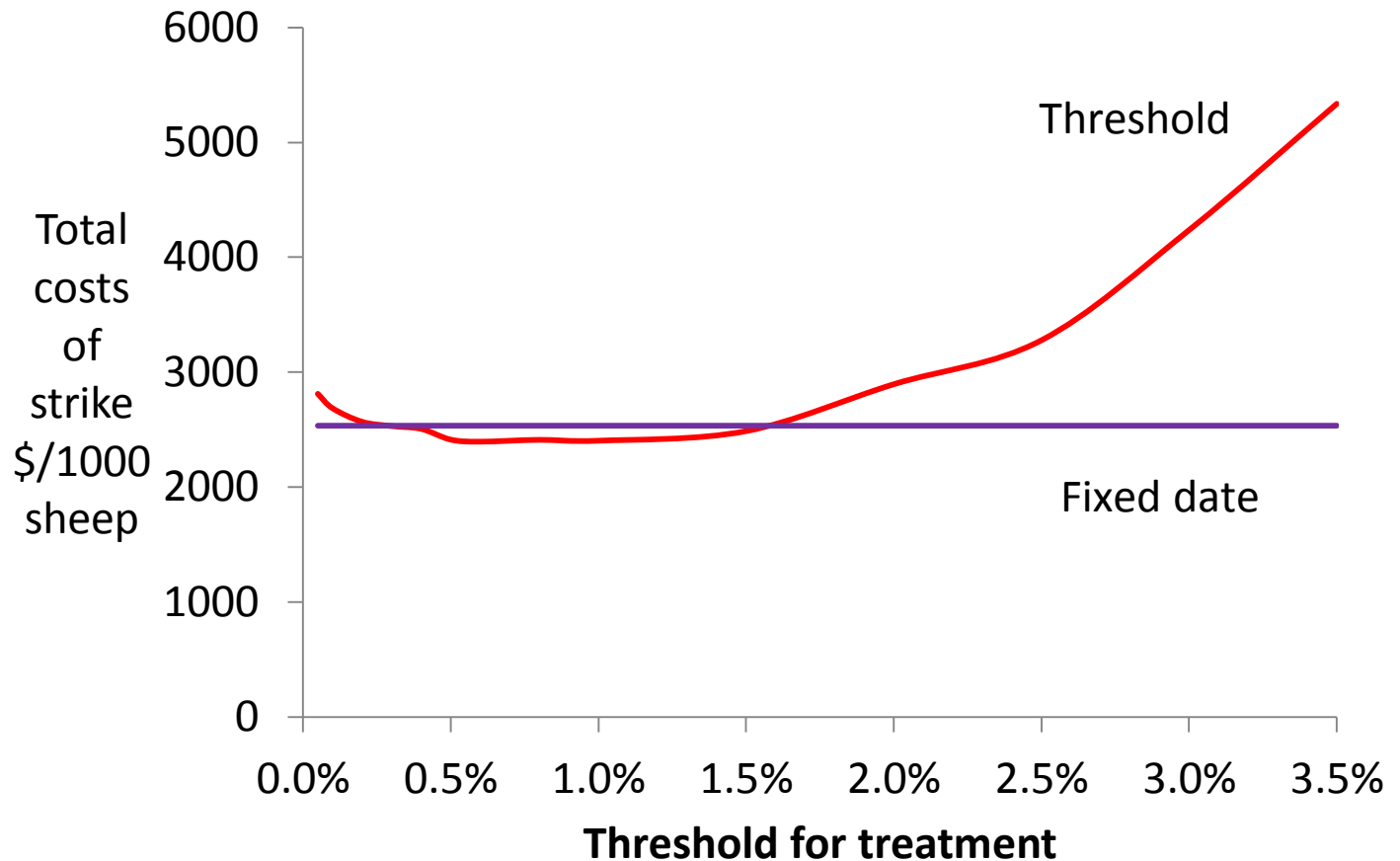
Set time each year

- FlyBoss uses past weather records
Weather patterns may be changing
- Previous experience may be better
Unless climate is changing
- Need to fit in with other farm management
Models don't allow for non-sheep management
- If the season is highly variable then fixed time is not ideal

When a set number of sheep struck

- How many struck per mob to intervene

One
500
5 to 15



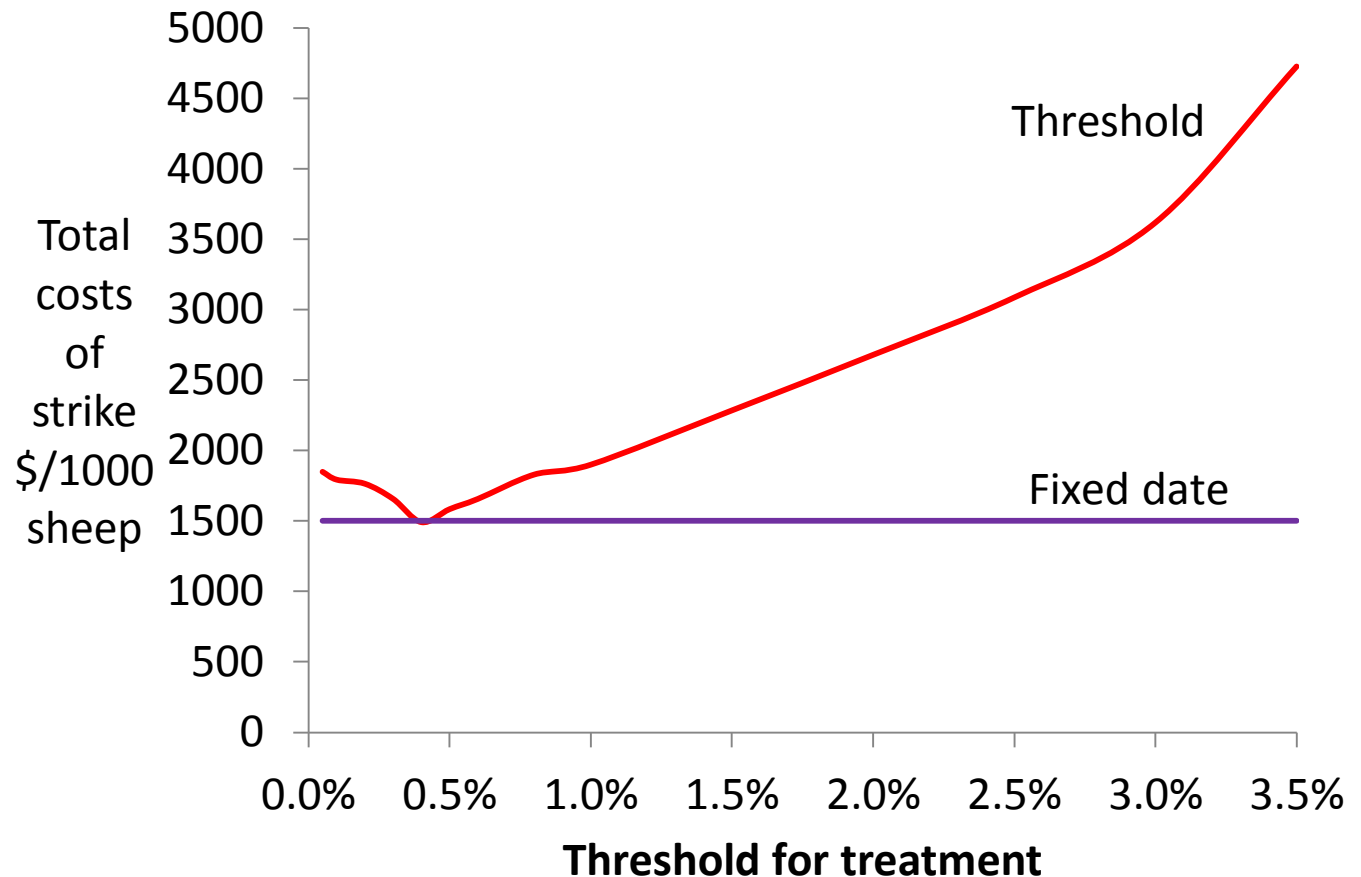
When a set number of sheep struck

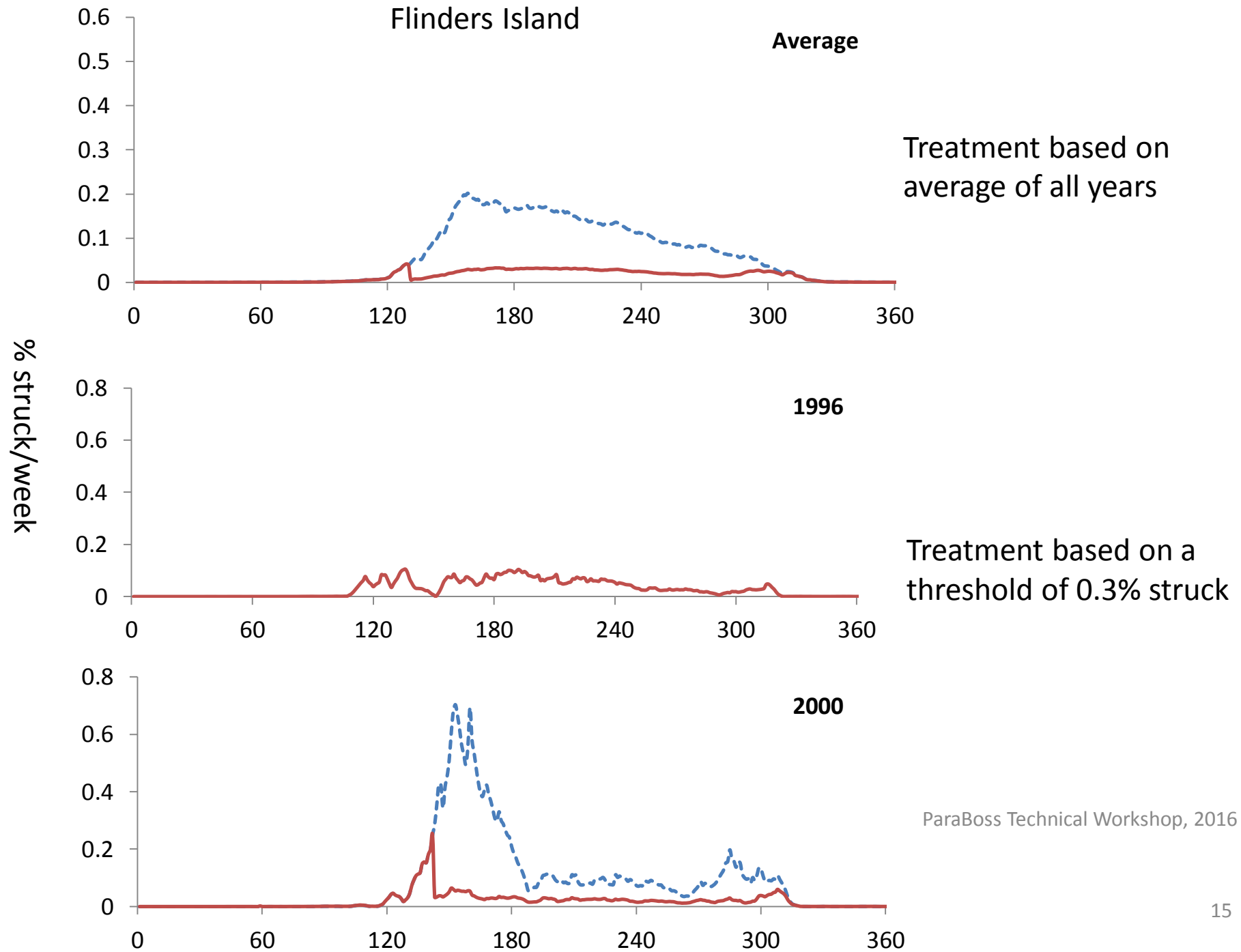
- How many struck per mob to intervene

One

500

5 to 15





Preventative Treatment

- Standard advice is plan treatment (fixed date)
 - Rarely a bad option
 - Makes planning easier
- Variable date better in some cases
 - Requires frequent monitoring and experience
- Animal welfare important
 - Waiting does not always increase number struck
- Intervention point not easy to decide



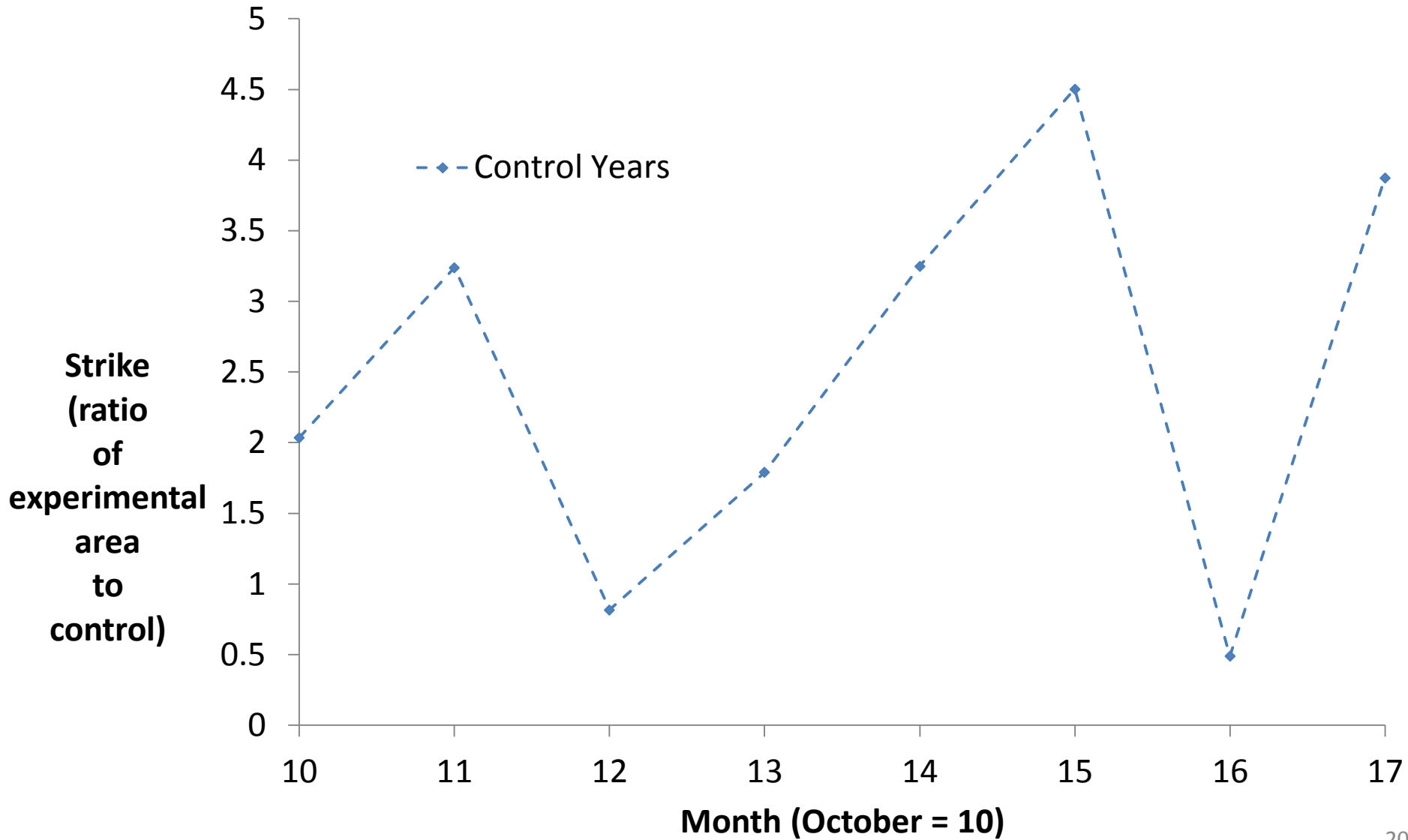
Treat Early

- Treat **before** any sheep struck
- Use dicyclanil on **all** sheep on the property
- Flies have nowhere to reproduce
- Fly population is much lower than if flies have had a chance to strike and reproduce
- May reduce risk for the whole season
- May reduce total chemical applied over season

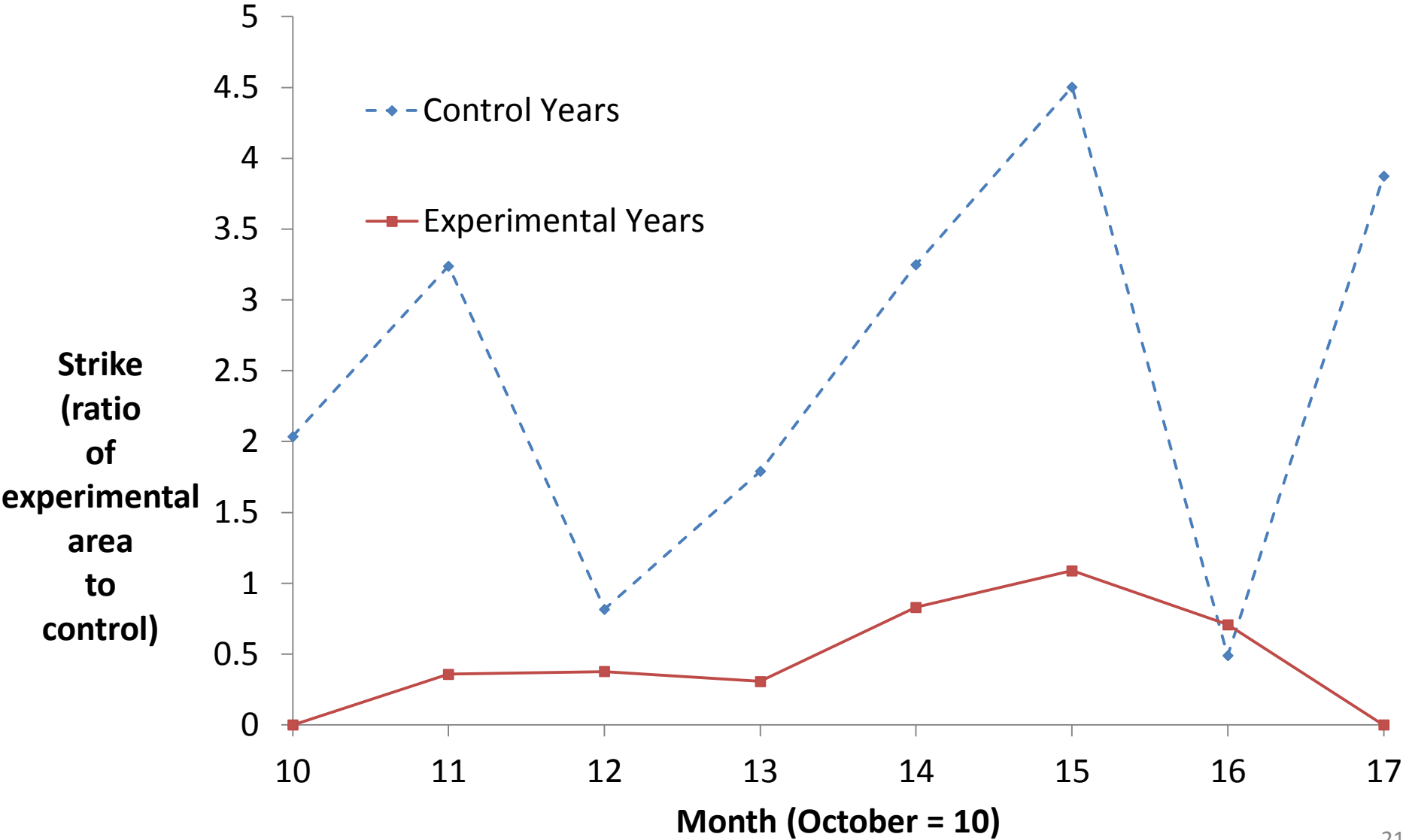
Assumptions for Early Treatment

- Flies reproduce only on live sheep
 - Very low reproduction rate on carcasses
 - Flies living in rubbish dumps may not strike sheep
- Flies do not travel far
 - *L. cuprina* do not fly in windy conditions
 - Rarely travel more than a few km
 - May travel 10km if no sheep nearby
- Cannot leave any sheep untreated
 - If any sheep is struck the system may fail
 - Any maggots on struck sheep must be killed

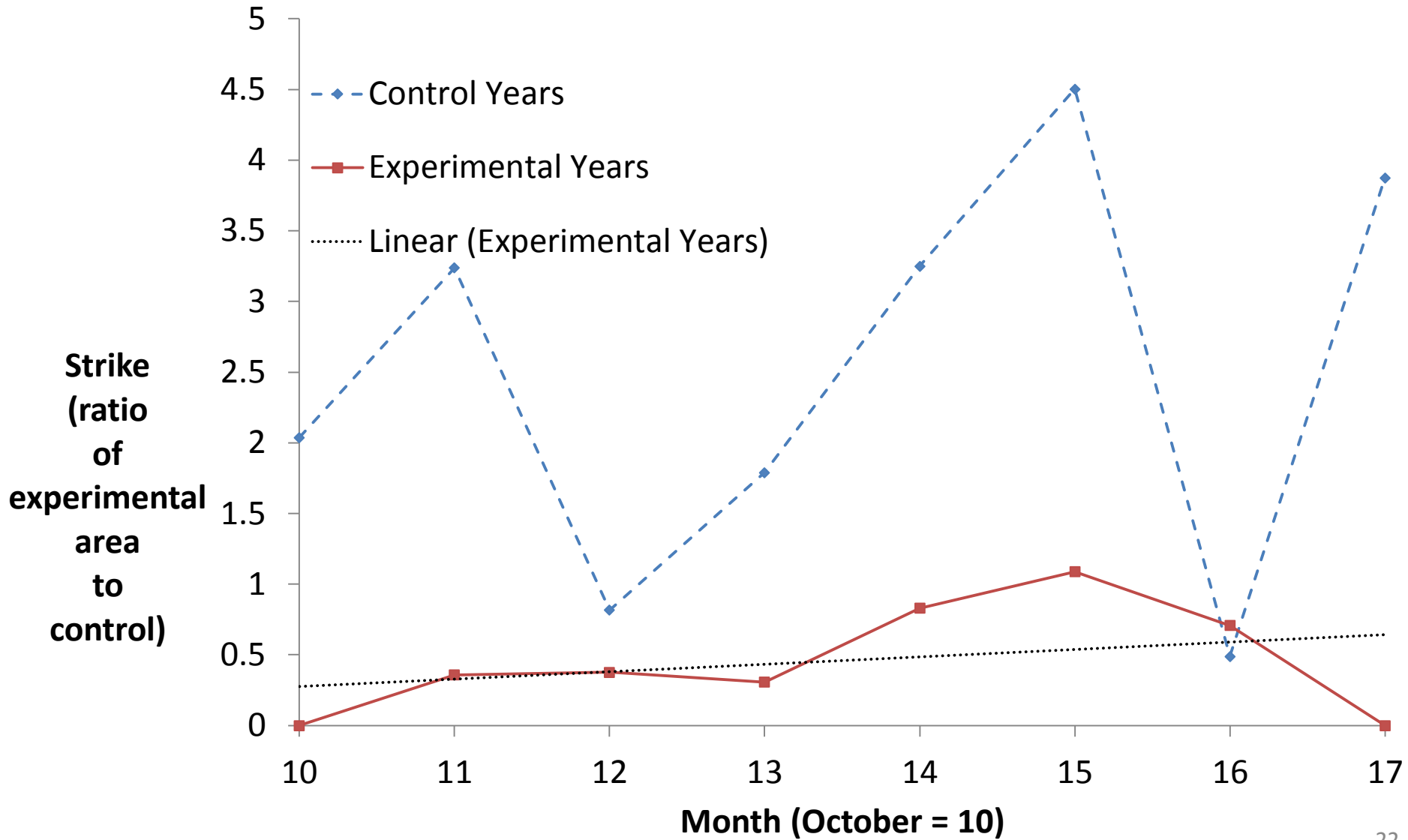
Treat Early



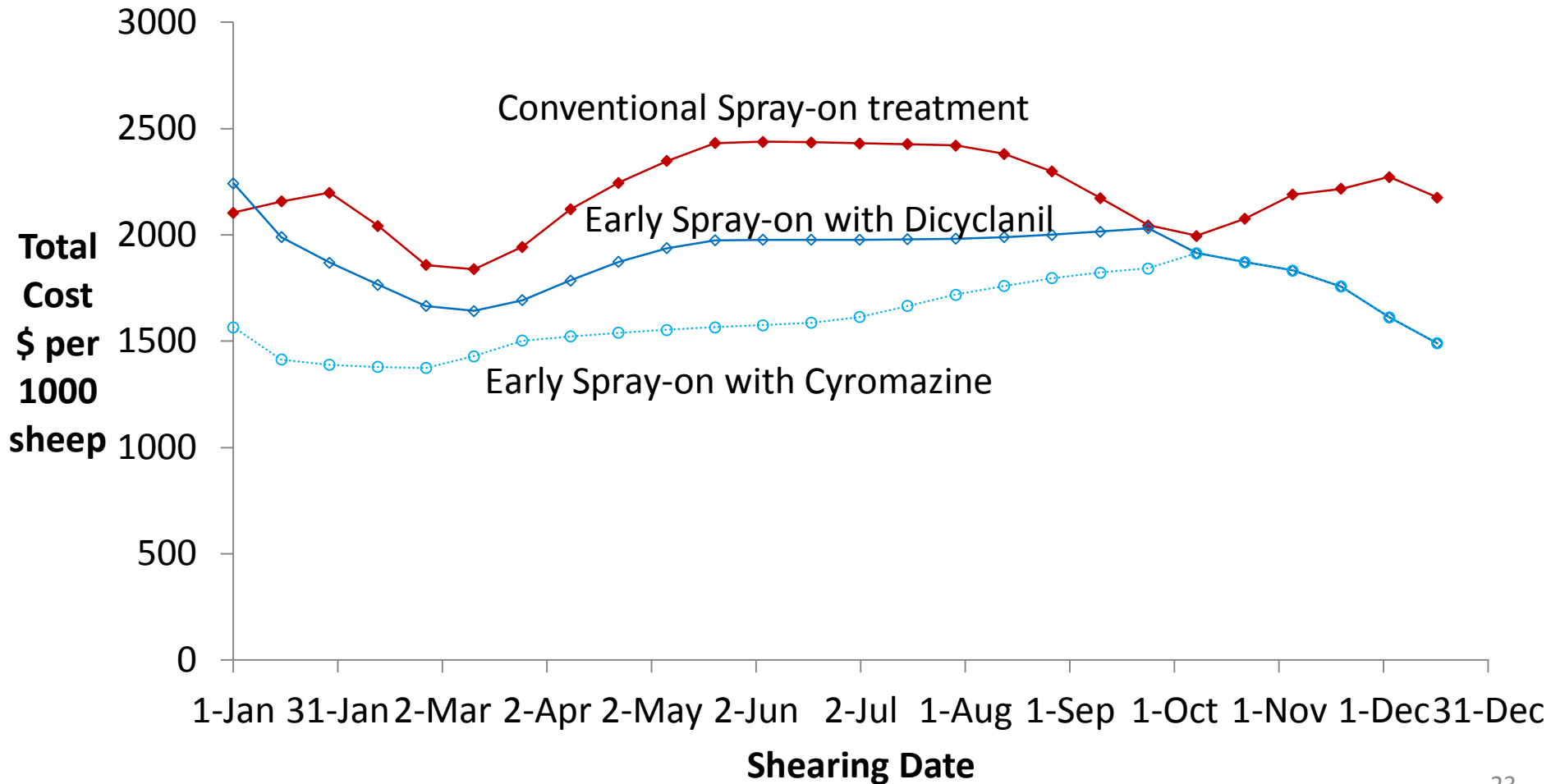
Treat Early



Treat Early



Early Treatment at Gunning



Treat Early

- Only tested on one property, with Cyromazine
- Use over wide areas may be very effective
- Requires every sheep to be treated
- Modelling suggests it reduces costs, reduces strike and reduces total chemical applied
- May increase resistance
- Relies on assumption that *L.cuprina* only reproduce on live sheep