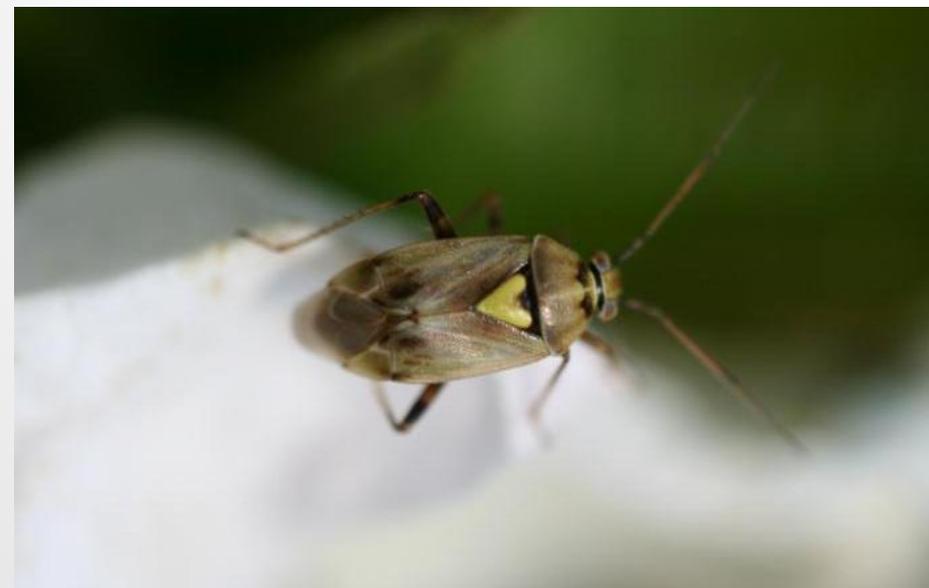


Re-evaluating Lygus bug IPM

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Background – *Lygus hesperus*



- Lygus causes direct damage to fruit a.k.a “cat-facing”

It's the #1 Insect Pest in California Strawberry Production

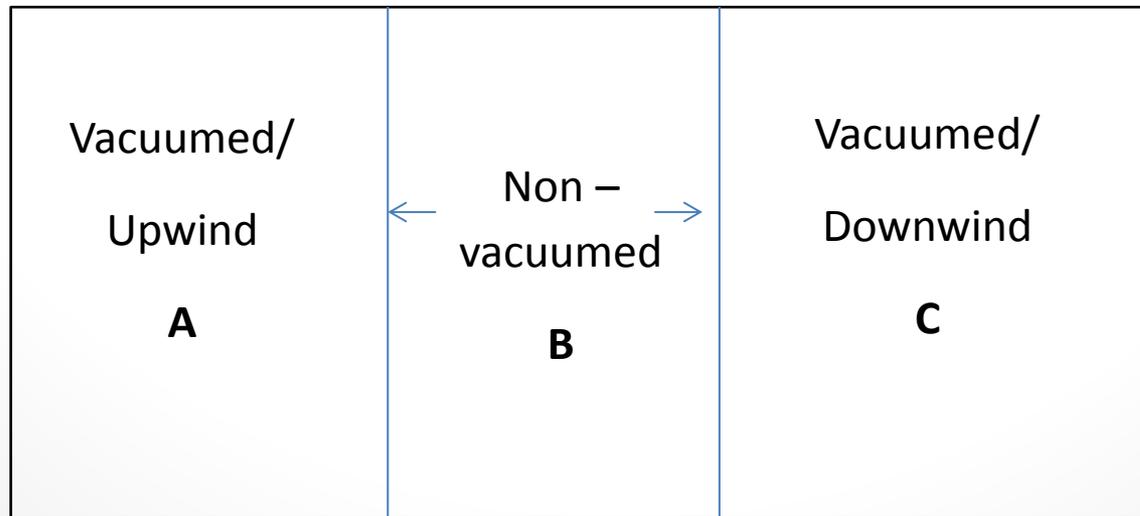
- Its native, abundant and has many hosts
- It's highly mobile
- Production system challenges
- Limited effective management tools
- Widespread resistance

California Strawberry Commission Program

- 2011: IPM implementation
- 2012: Monitoring program
- 2013:
 - Vacuums in first and second year management
 - Vacuum efficacy evaluation
 - Economic loss & threshold evaluation

Vacuum exclusion experiments

- 14 fields total in Santa Maria & Watsonville-Salinas; 5 second year fields



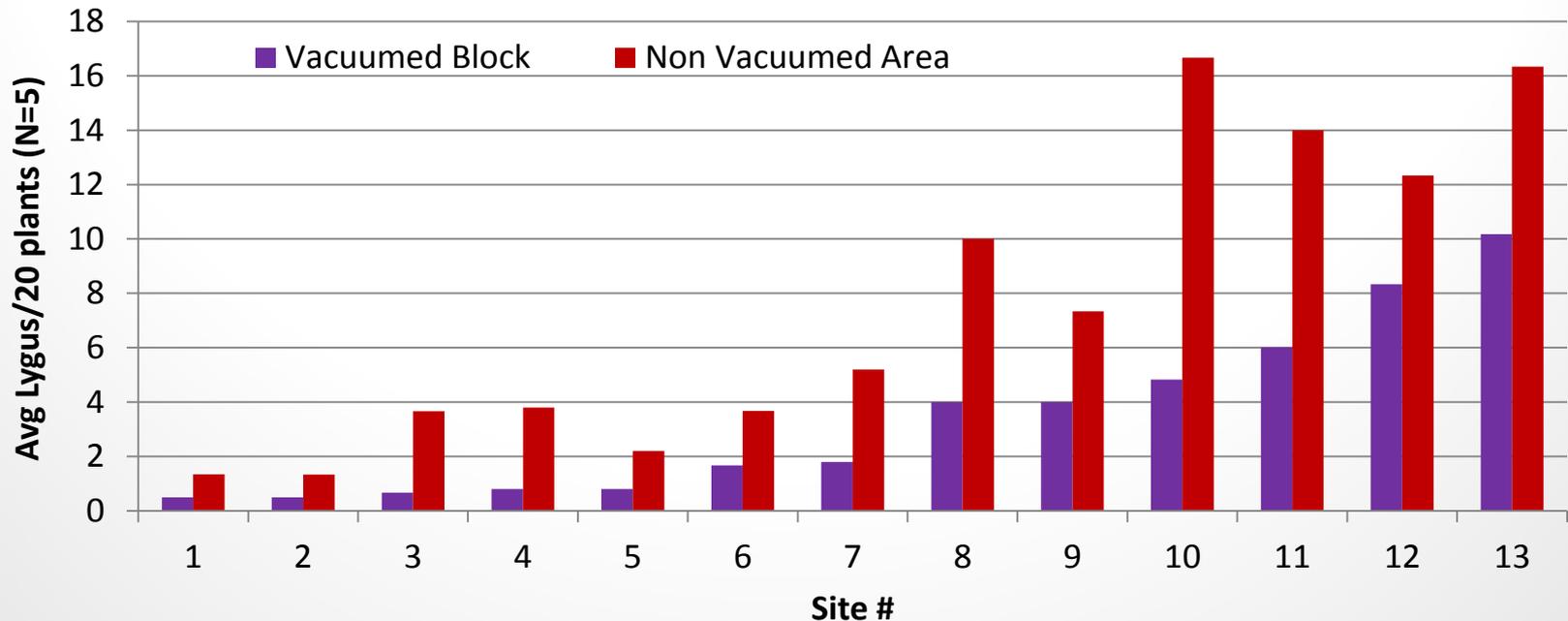
- Excluded avg .11 acres of vacuuming in center of 5-8 acre blocks
- Five 20-plant beat samples/week in each section
- Vacuum "efficacy" and fruit cull evaluations at 6-8 weeks minimum

Vacuum Exclusion Exps

- Monterey, San Andreas, Albion, 2 proprietary varieties
- Only two first year sites had an avg. Lygus count below 1 (purported economic threshold) at onset of experiment
- Avg/20 plants (N=5) for 2nd year fields: 1.74 ± 0.36 in April
- Avg for 1st year fields: 3.43 ± 0.81 ; various start times

Vacuum Exclusion Results

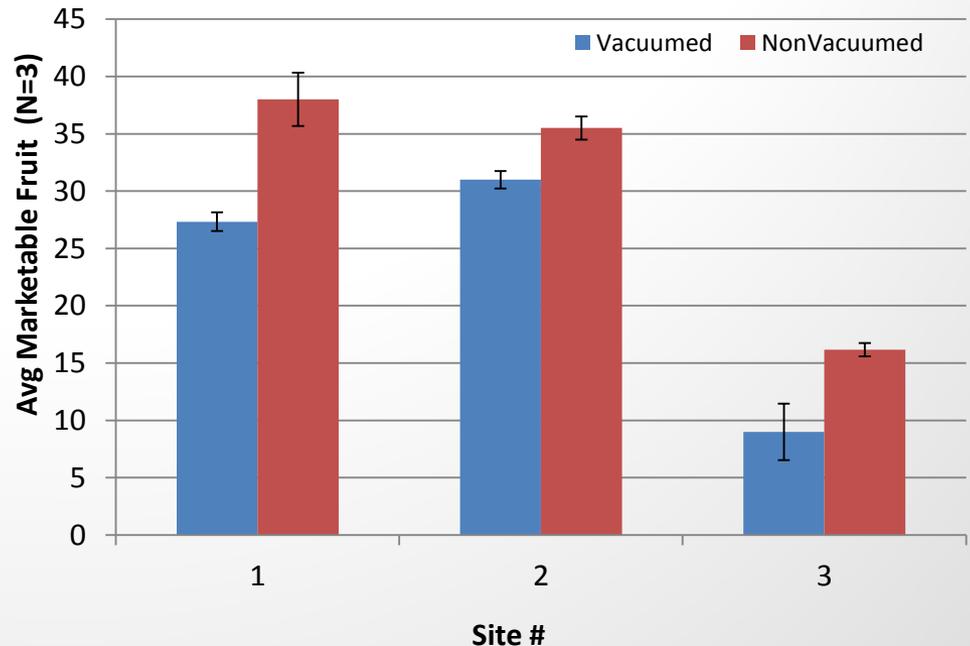
Mean diff = 1.52, SE: 0.32, p=0.0007, N=12



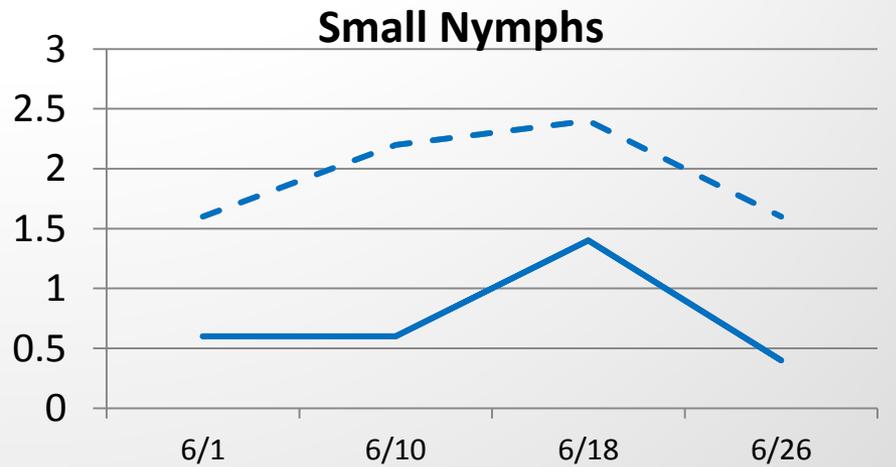
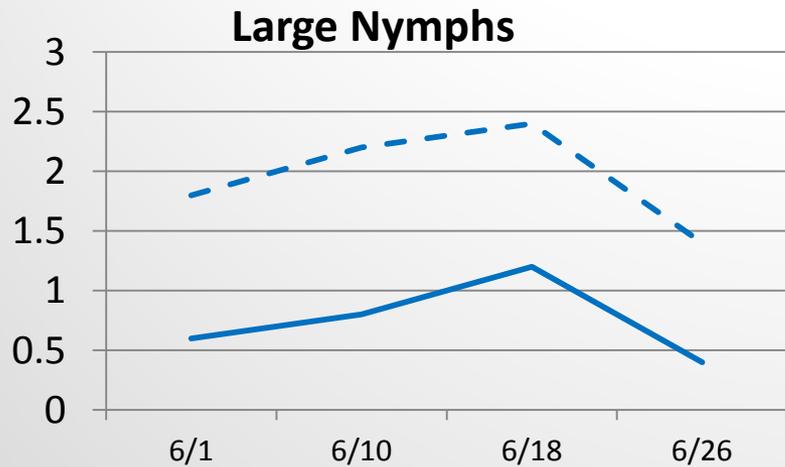
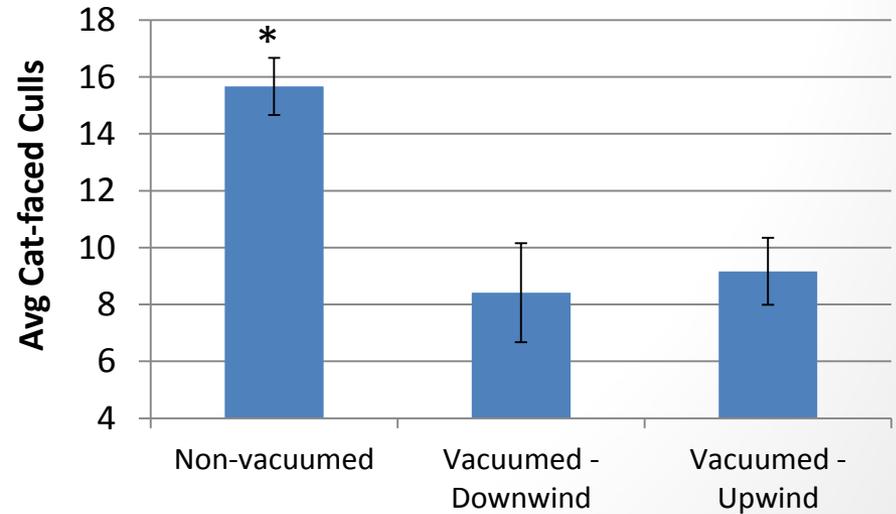
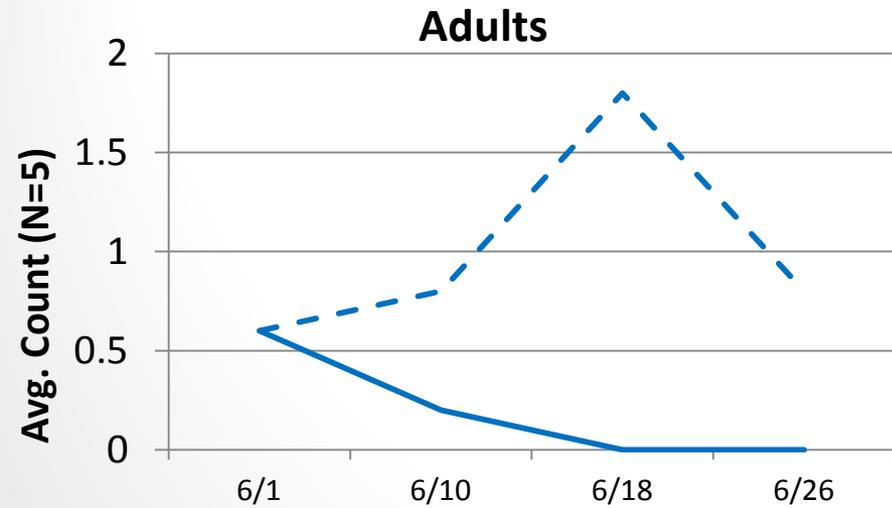
- On average, the vacuumed area had 40.4%± 0.04 less Lygus than the non-vacuumed areas (N=13)**

Vacuuming Effect on marketable fruit

- Samples of 50 fruit (N=3)
- Significantly more marketable fruit at 9 of 13 sites



2nd year Vacuum exclusion trial



Vacuum Assessments - Methods



Vacuum assessments – Insects

- Small lygus nymphs, Drosophila, thrips and beneficial insects were common in the samples
- Some beneficials survived (Orius, Nabis)
- **55% of small nymphs, 28% of large nymphs and 20% of adults remain viable after exiting fan blade**

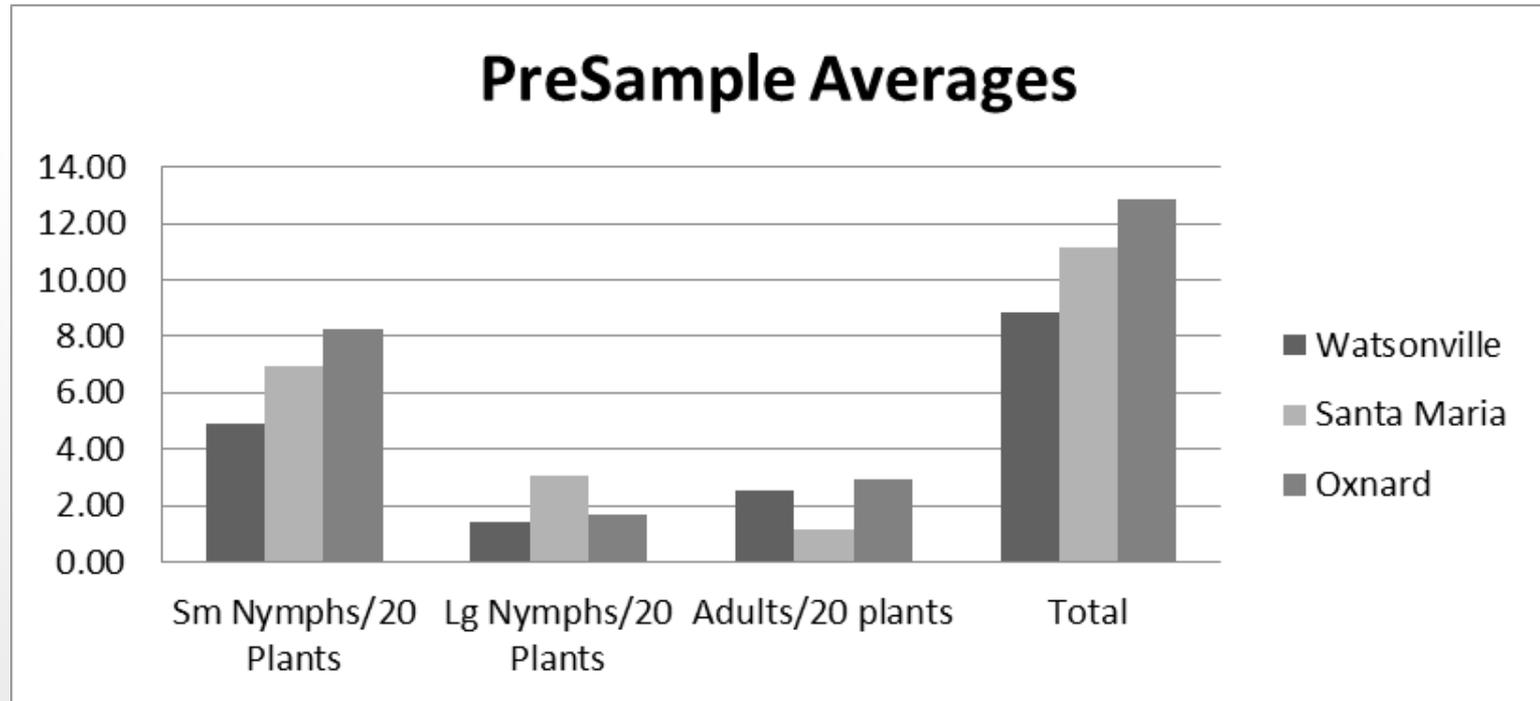
Vacuum Efficacy Assessment findings

- High variation in performance
- Avg. windspeed at fan: 29 mph (N=15)
- No significant correlations between the parameters we measured and performance
- Season long maintenance may have affected vacuum performance over time
- Are they optimized?

site	%dead adults
1	25.81
2	49.74
3	75.14
4	78.19
5	80.10
6 - organic	89.48
7	93.55
8	100*

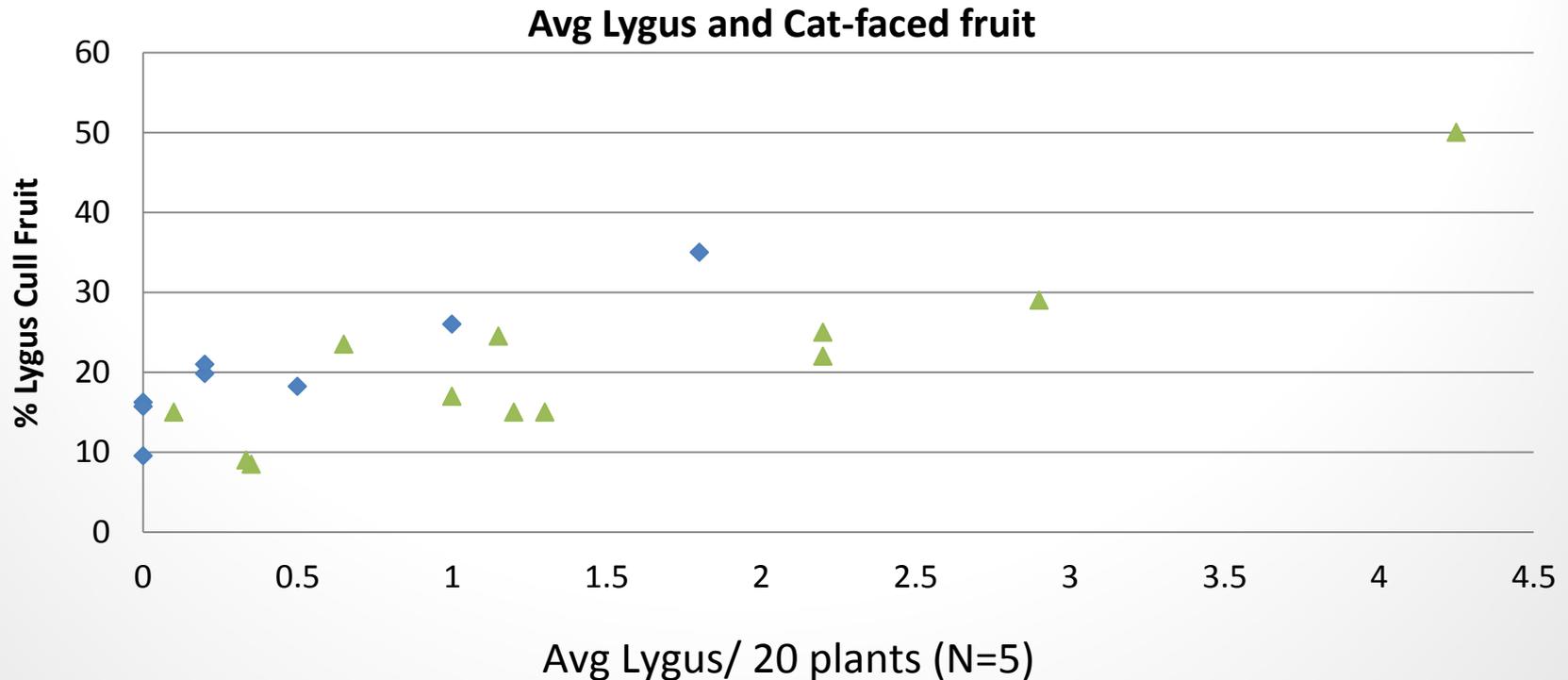
Avg. Background pressure at time of vacuum evaluations (most June, July)

Avg of 10.77 ± 2.62 Total Lygus



At time of vacuum assessments, all fields had significant Lygus populations

Population pressure & Fruit Damage



The majority of farming operations lose control of Lygus; the damage is of serious economic significance even at or below threshold.

Conclusions 1

- Vacuums are an important tool - they have a significant effect on Lygus populations and yield, on par with previous research findings
- Avg. 40% reduction in population, likely an underestimate
- But on average only 75% mortality
- Vacuum performance is not optimized, maintenance is an issue
- Training can address some issues
- Engineering evaluation on vacs



Conclusions – Economic Threshold

- Threshold tolerance for economic damage is likely too high
- Early season (Winter) management may be key
- Is there a real threshold value or is this IPM jargon?
- What is the best winter management strategy? Season long strategy?