

Optimizing the use of the commercially available entomopathogenic fungus, *Beauveria bassiana* GHA to control CBB in the Kona coffee growing region of Hawaii

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CBB Conference

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Persistence & Efficacy of *B. bassiana* GHA

- Determine how timing and frequency of commercial *Beauveria* applications effect persistence and efficacy
- **Timing** (early morning, late afternoon);
Frequency (1x/month, 2x/month, spray as needed);
Rates (full; half)
- **Suppression sprays**
- **Strip pick**



Elevation:

Honaunau High, 1800 ft

Honaunau Low, 624 ft

(shade)

Persistence & Efficacy of *B. bassiana* GHA

- Persistence: *Beauveria* GHA
 - Rate: 32 oz in 30 gal of water/acre
 - Half rate: 16 oz in 30 gal of water/acre
- Efficacy (Destructive method)
 - % AB alive, % AB Dead, % CD, % Infestation, % *Beauveria*
- Rate of Infestation (Non-destructive method)
 - % Infestation, % *Beauveria*
- Environmental Conditions
 - Temp, % RH, Leaf moisture, Rainfall, UV
- Quality/Harvest
- Multiyear study



Photos: Steve & Sandy Wraight

Field & Lab Samples per Tree

Persistence

high



middle

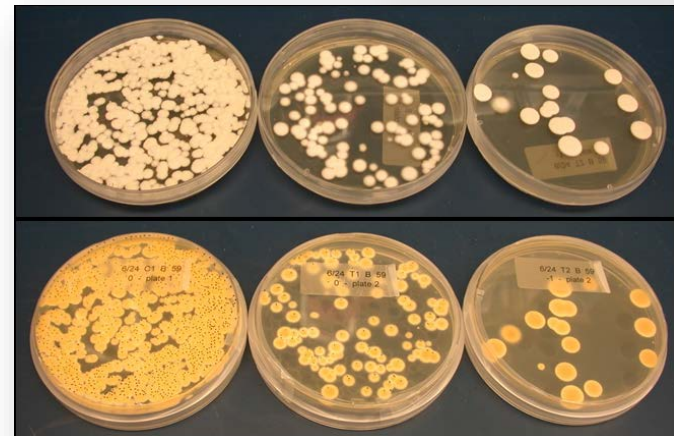
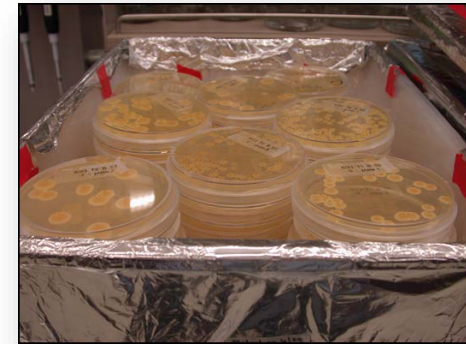


low

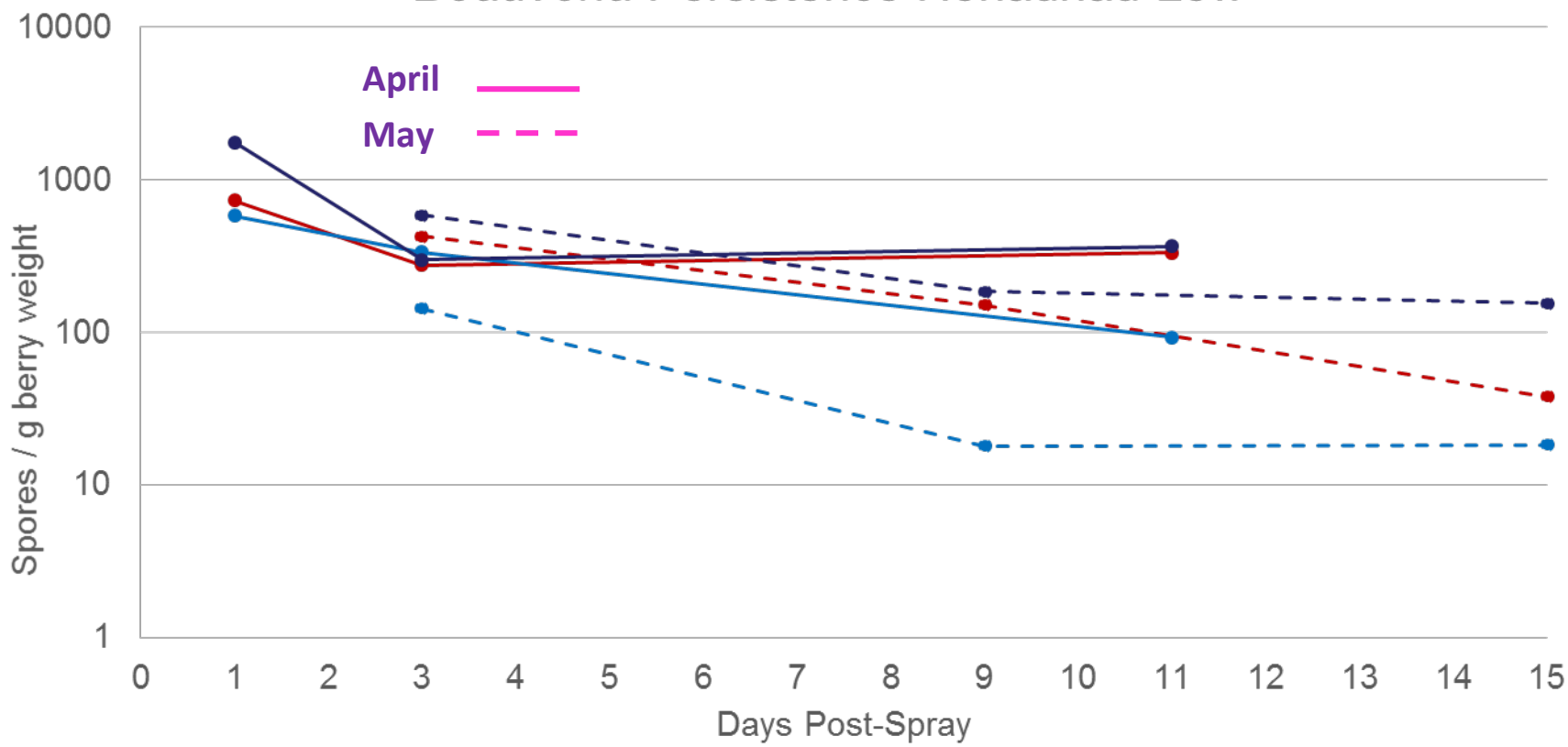


1 subsample = 15 random berries
10 trees

Weigh
Wash
Dilute
Plate
Count *Beauveria*



Beauveria Persistence Honaunau Low



- NE-23 April 2017 Spray
- NE-21 May 2017 Spray
- NW-23 April 2017 Spray
- NW-21 May 2017 Spray
- SW-23 April 2017 Spray
- SW-21 May 2017 Spray

Factors Affecting Persistence

Response: log(spores)

	Estimate	SE	<i>t</i>	<i>p</i>
(Intercept)	1.795	4.237	0.4	0.6723
log(days since spray)	-0.770	0.147	-5.3	3.86E-07
Cum. Rain	-0.058	0.042	-1.4	0.1681
Mean RH	0.062	0.015	4.1	5.34E-05
Mean Temp	-0.009	0.054	-0.2	0.8662
Field	0.800	0.430	1.9	0.0647

Multiple R-squared: 0.3963

* Significant effects of days since spray, RH

* This model allows us to make predictions of active *Bb* in the field given weather and time since spraying

Nick Manoukis (ARS Hilo) and Ray Carruthers (UH CTAHR)

Field & Lab Samples per Tree

Efficacy: Destructive

high



middle



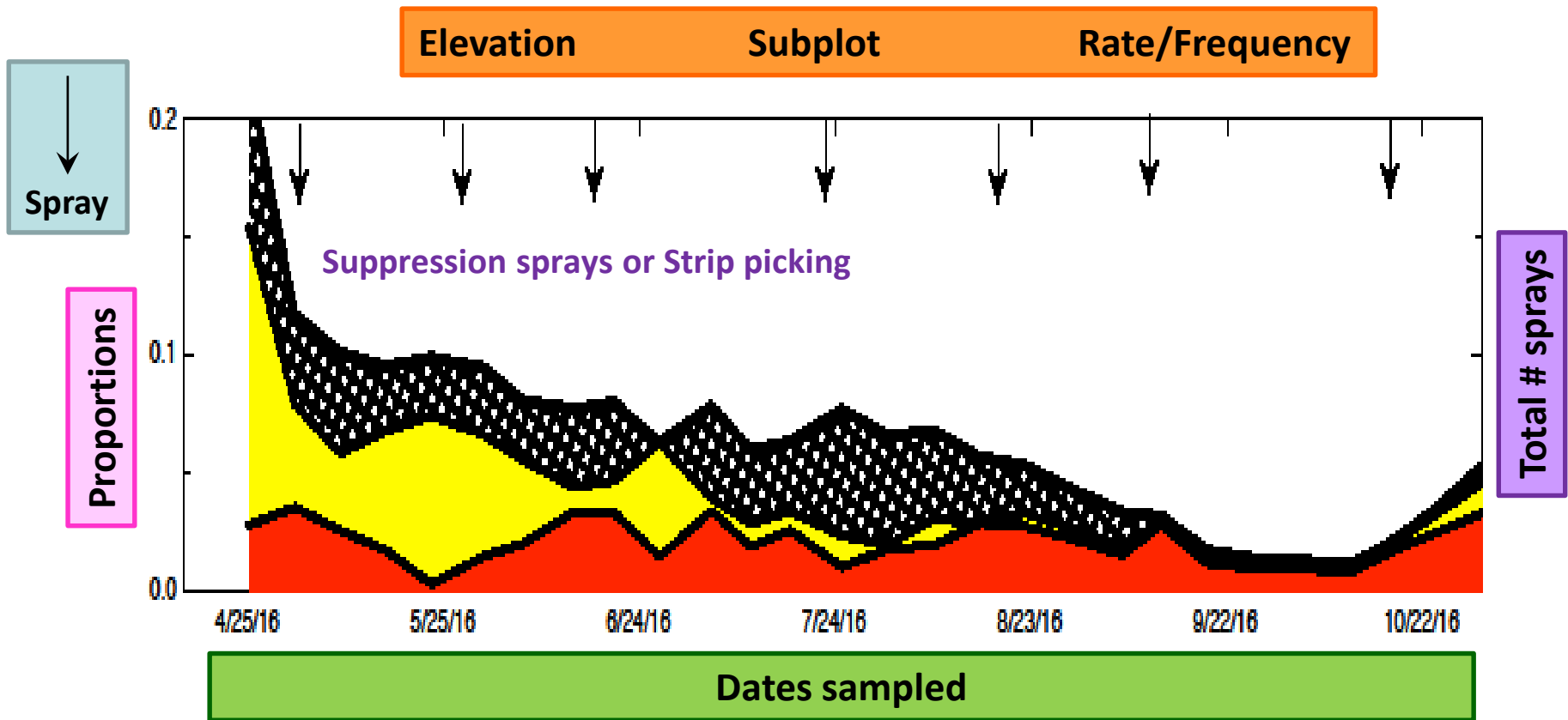
low



1 subsample = 10 green berries
4 trees



Dissect berries
Count beetles
% AB alive/dead; CD; *Beauveria*



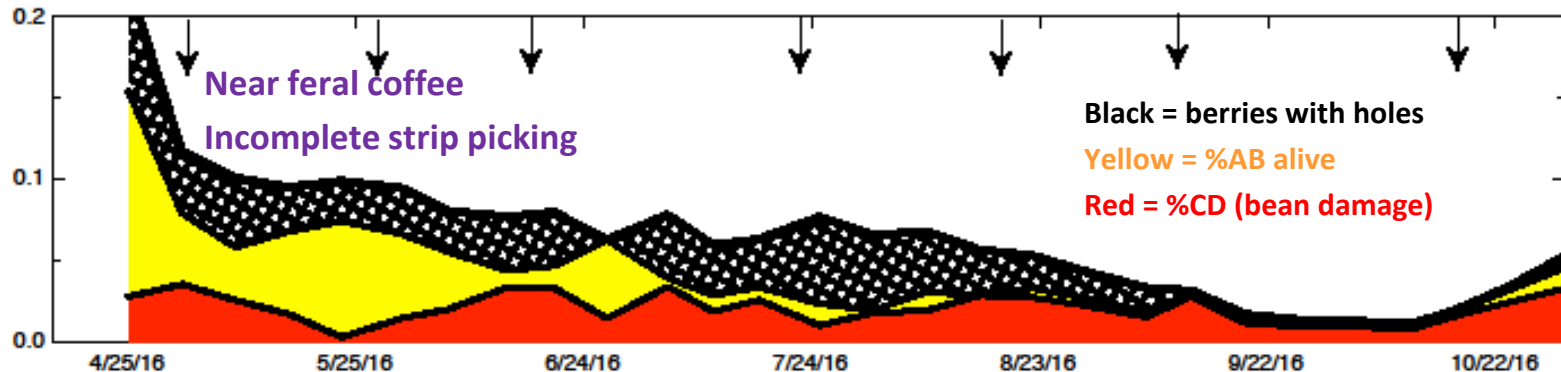
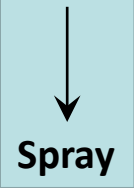
Black = overall proportion of berries with holes in them

Yellow = proportion of berries that had beetles in the A/B Alive stage (those threatening to cause damage, but still able to be controlled)

Red = proportion of the berries that have actual coffee bean damage (those in the C/D stage)

Honaunau Low

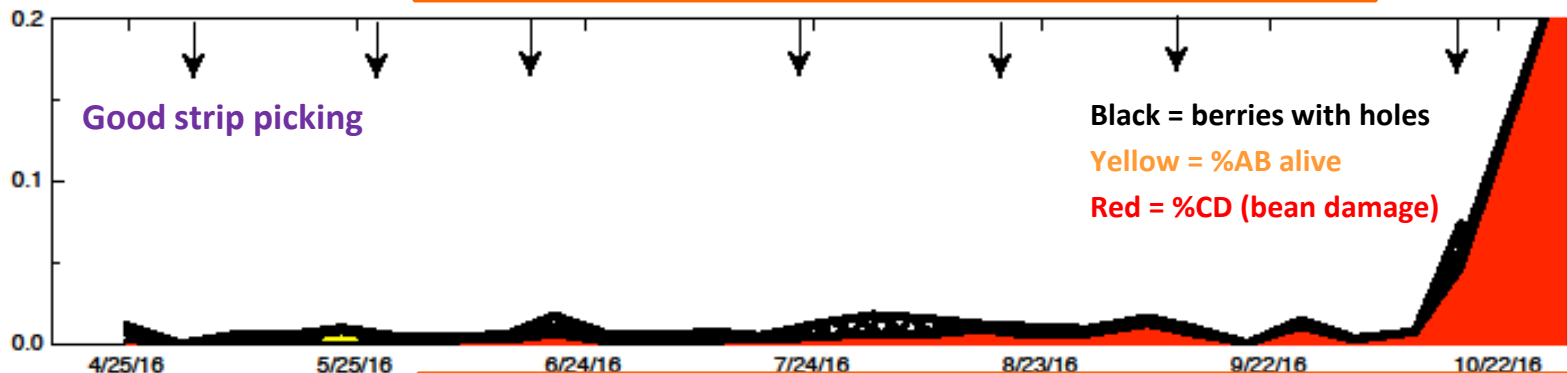
624 ft elevation | Farm 2016-Plot 1 | Label rate, 1x/month



7

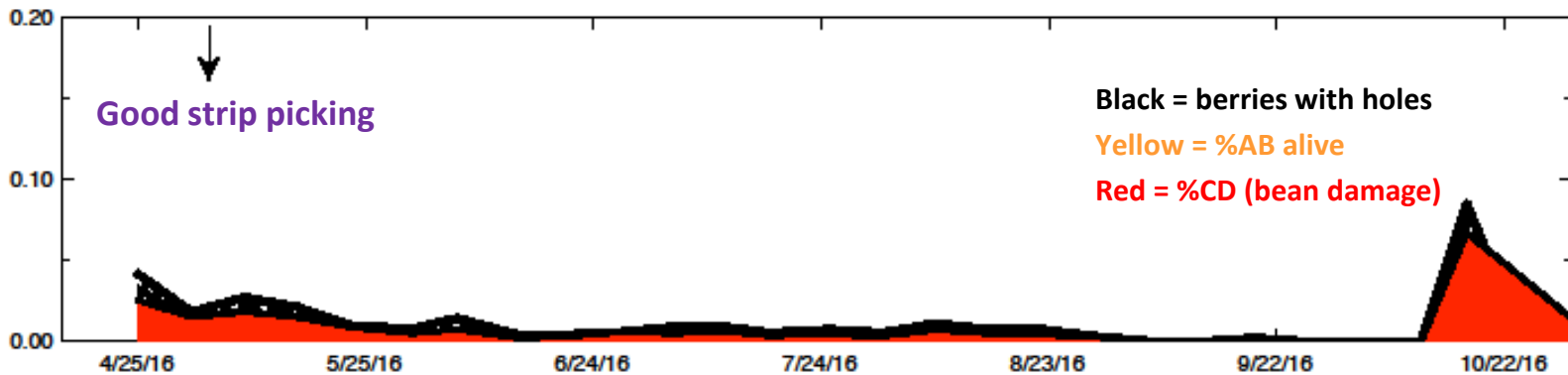
624 ft elevation | Farm 2016-Plot 2 | 1/2 Label rate, 1x/month

Proportions



7

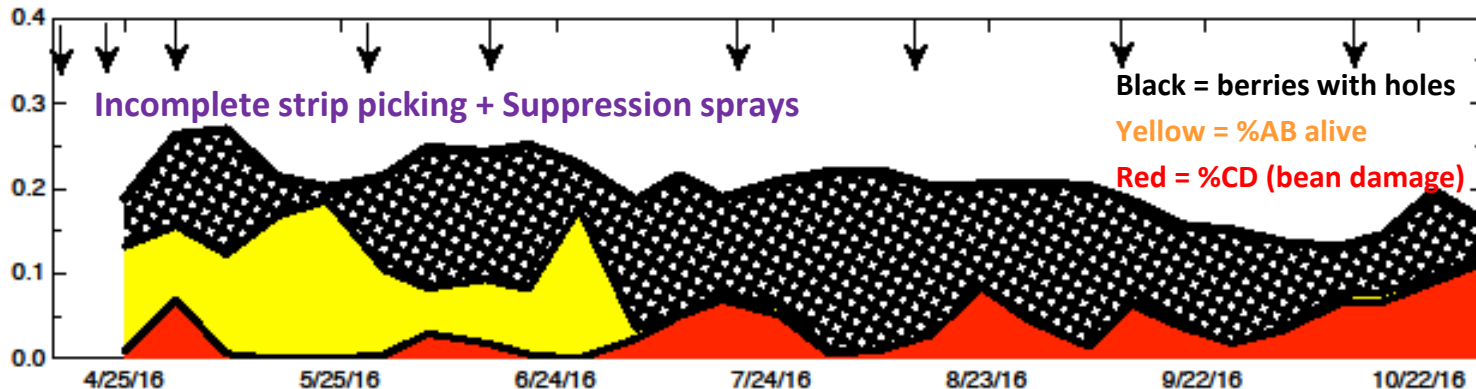
624 ft elevation | Farm 2016-Plot 3 | Monitor and spray as necessary (10% AB alive)



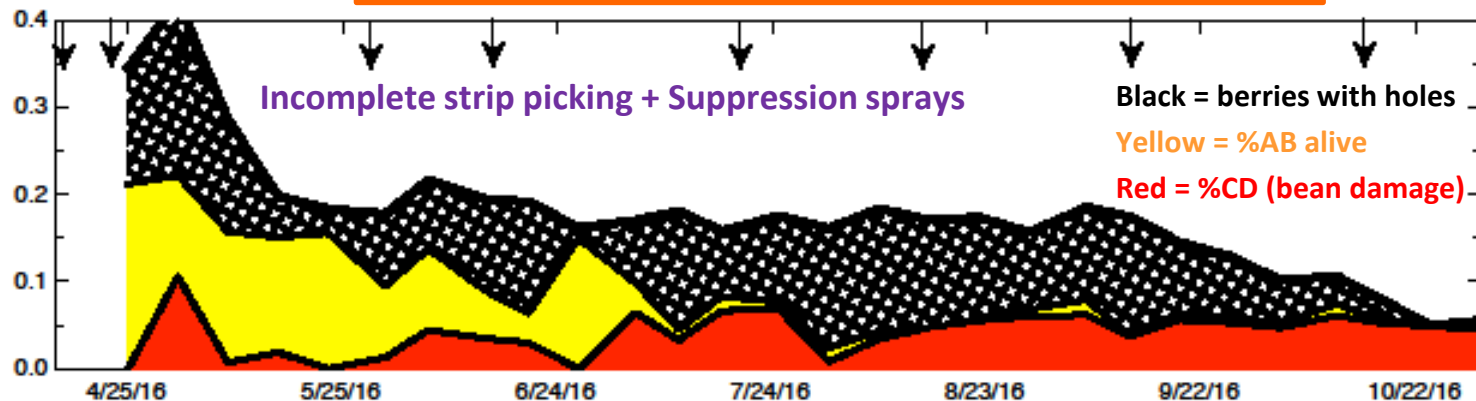
1

Honaunau High

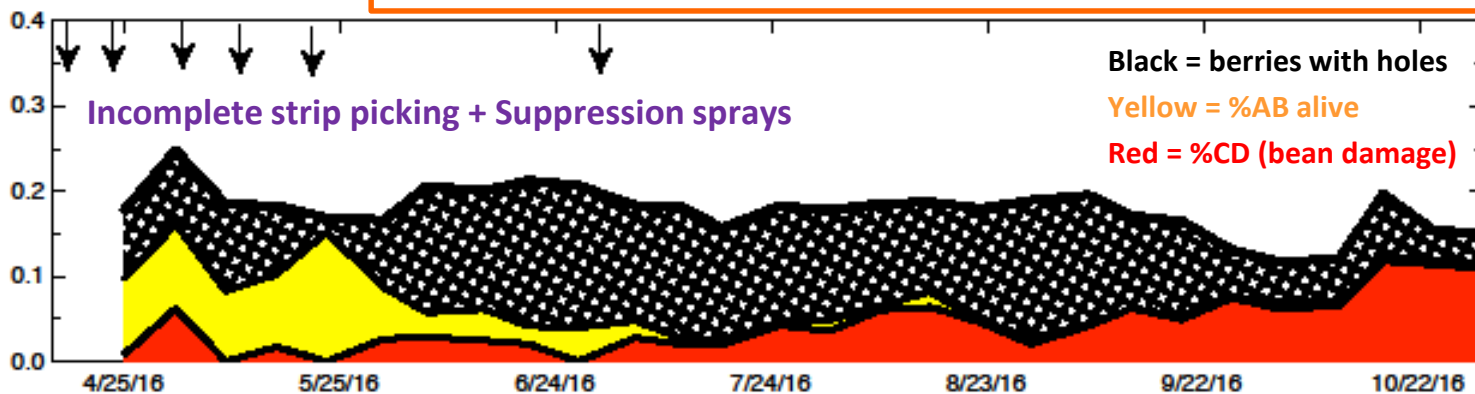
1800 ft elevation | Farm 2016-Plot 1 | Label rate, 1x/month



1800 ft elevation | Farm 2016-Plot 2 | 1/2 Label rate, 1x/month



1800 ft elevation | Farm 2016-Plot 3 | Monitor and spray as necessary (10% AB alive)



Infestation Levels Over Time

Efficacy: Nondestructive



middle



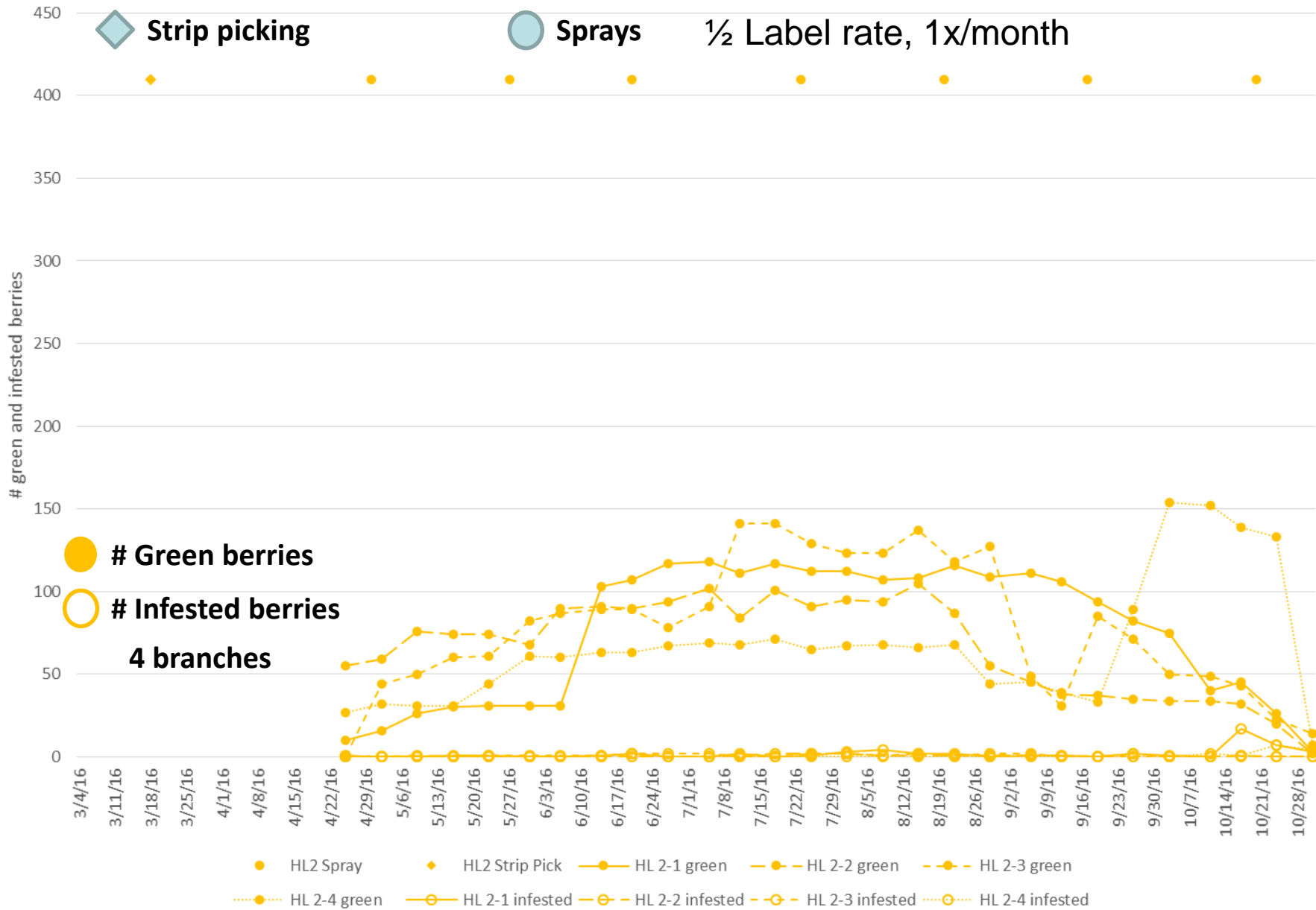
1 subsample = branch
4 trees

Count # berries and
damaged berries
through time

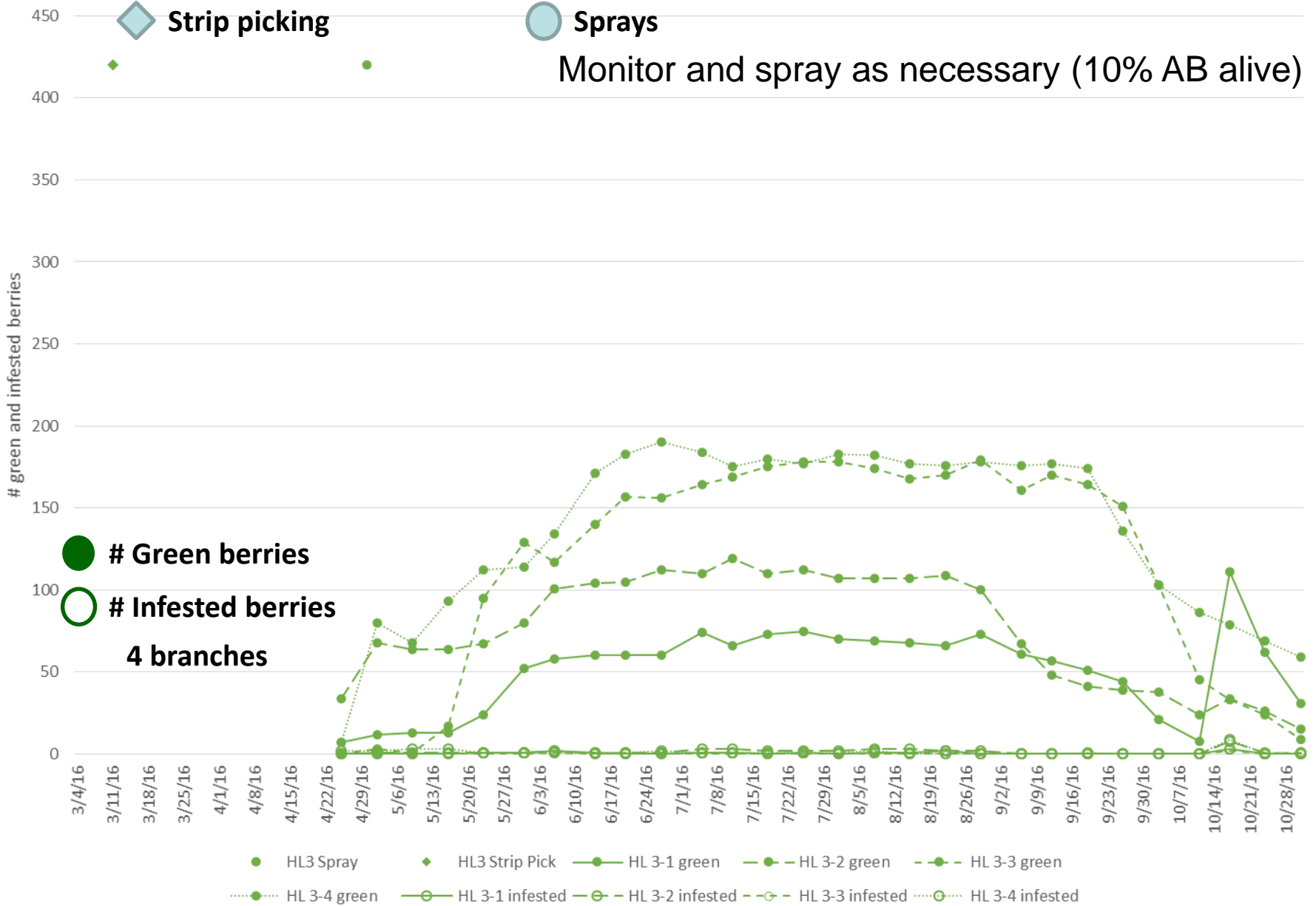
Proportion of
infestation levels in
them

*Doesn't necessarily
mean there is
bean damage

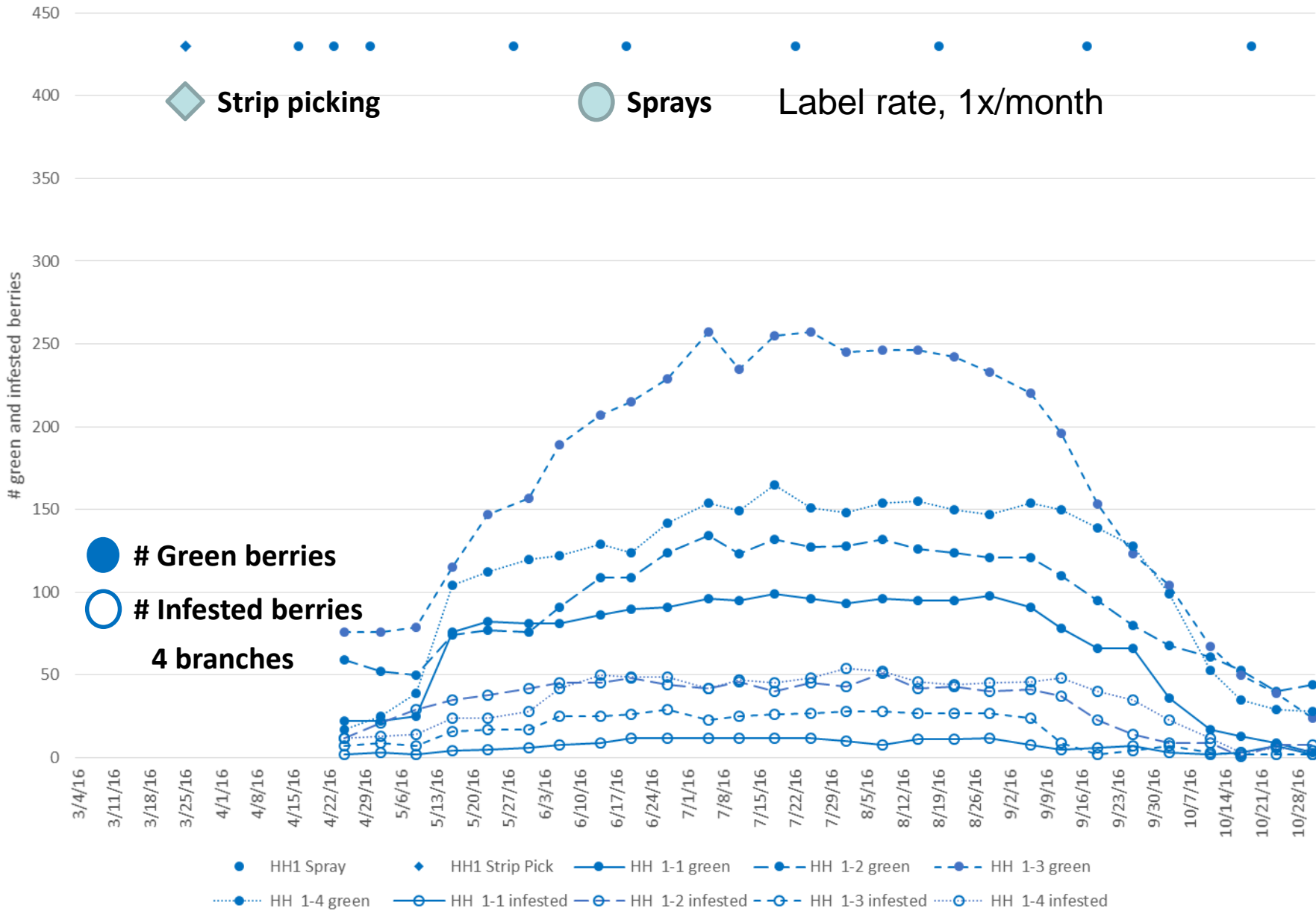
2016 Honaunau Low 2



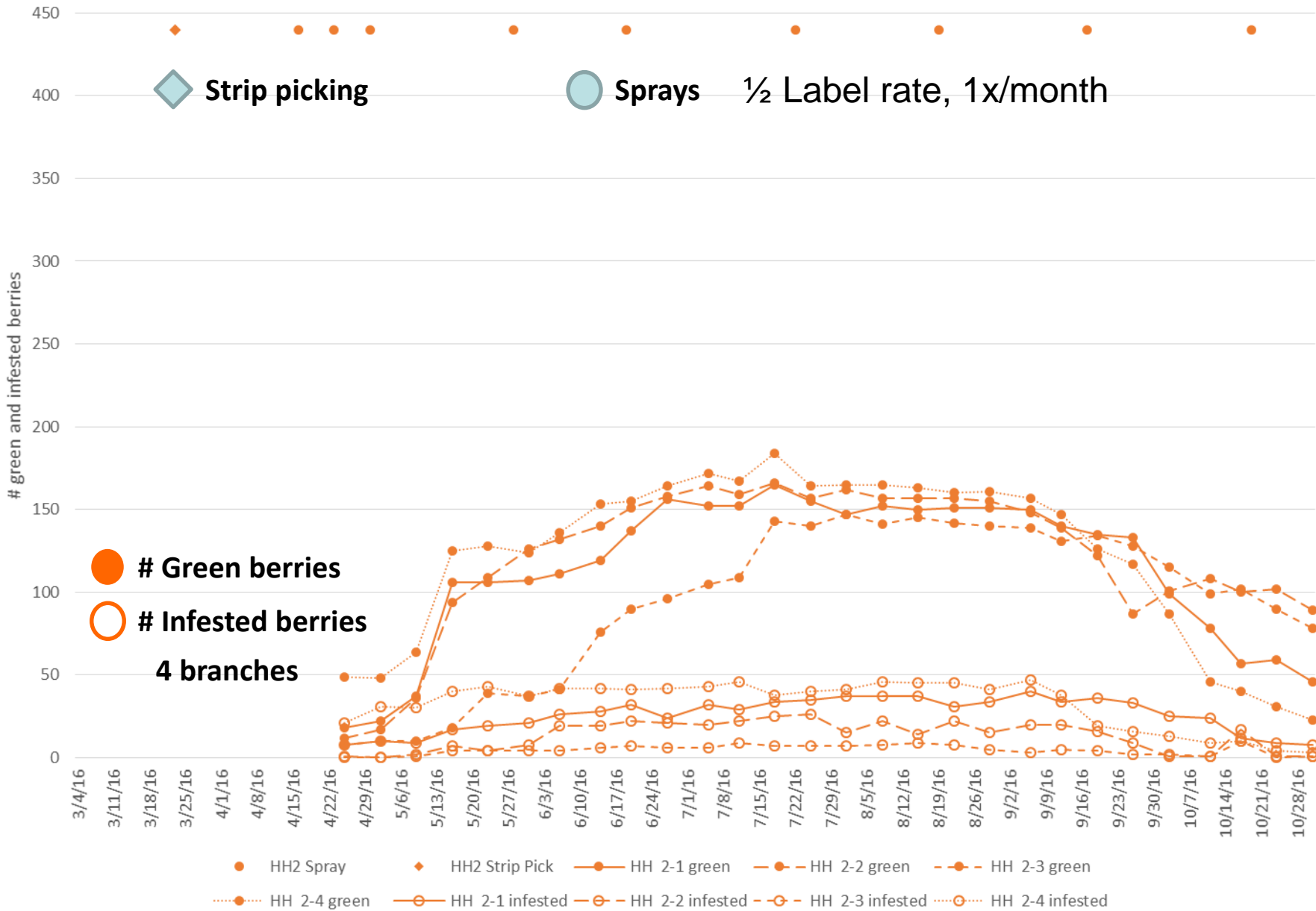
2016 Honaunau Low 3



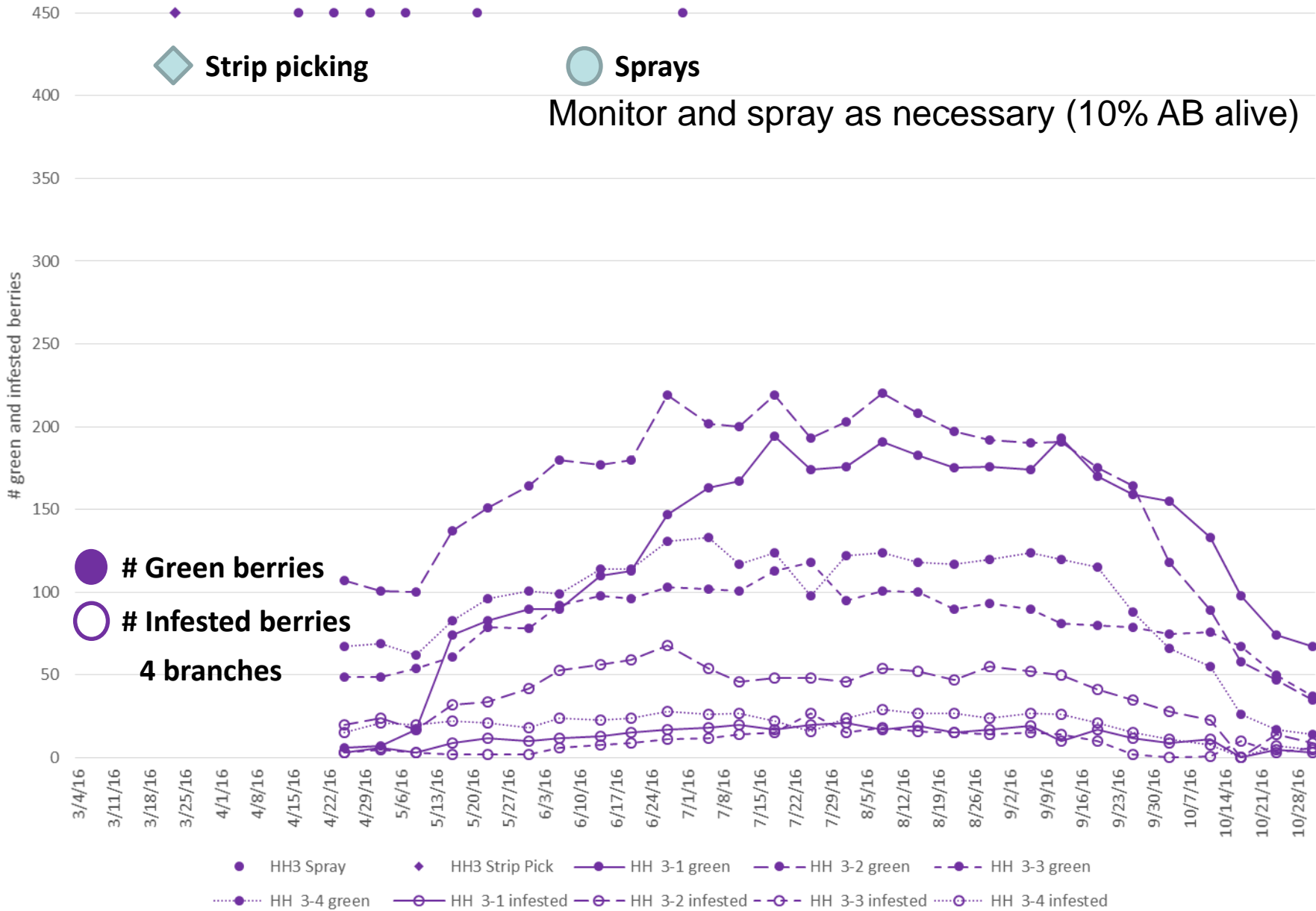
2016 Honaunau High 1



2016 Honaunau High 2



2016 Honaunau High 3




Conclusions/Observations

- Spray applications: best during mid - late afternoon when CBB flight activity is greatest (avoid applications when there is a high probability of significant rainfall)
- Spray applications can result in 50 to 70% mortality of foundress CBB populations (but this is not sufficient to control the pest)
- Must be used in a well coordinated IPM program (includes sanitation since CBB in raisins are protected from Bb infection)
- Control is primarily due to direct spray contact
- ½ the recommended rate looks promising (unless larger volumes are being applied, ie. 100 gal/ac)

Conclusions/Observations

- Each farm/location is unique:
Observed differences in:
 - subplots of a single farm in a single season
 - at the same farm over a number of seasons
 - location of farms
- Good CBB control can be achieved!
- Farmers should strip pick, visually monitor their fields, assess CBB infestation levels, and spray *B. bassiana* GHA when necessary



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