Area-wide IPM Program for Virginia Creeper Leafhopper in northern California vineyards



Houston Wilson, Lucia Varela, Glenn McGourty, Serguei Triapitsyn, Kent Daane

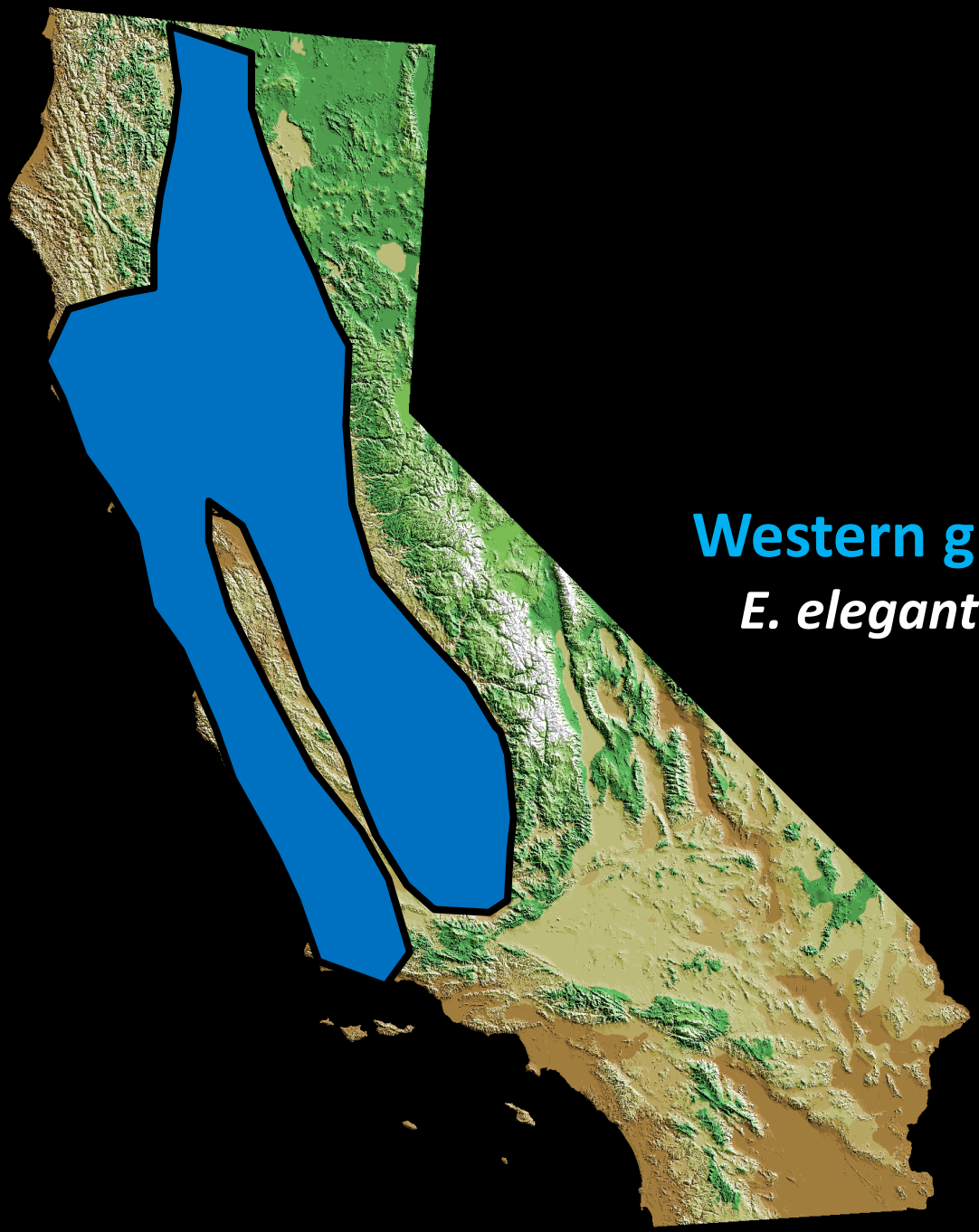
UC Cooperative Extension

Dept. Enviro. Sci., Policy and Management, UC Berkeley

Entomology Research Museum, Dept. Entomology, UC Riverside

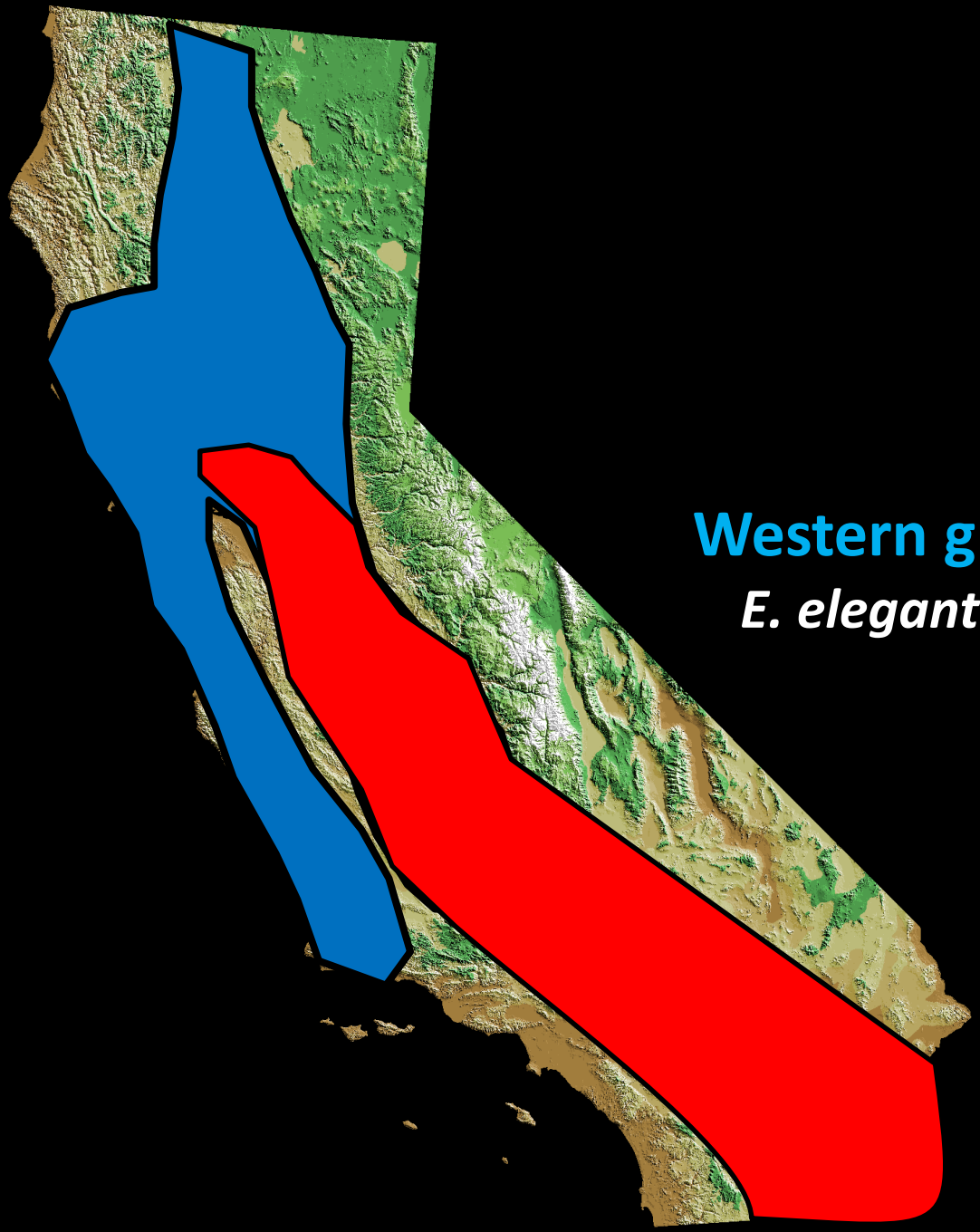
Erythroneura Leafhoppers in California

Distribution, Biology and Key Natural Enemies



Western grape

E. elegantula

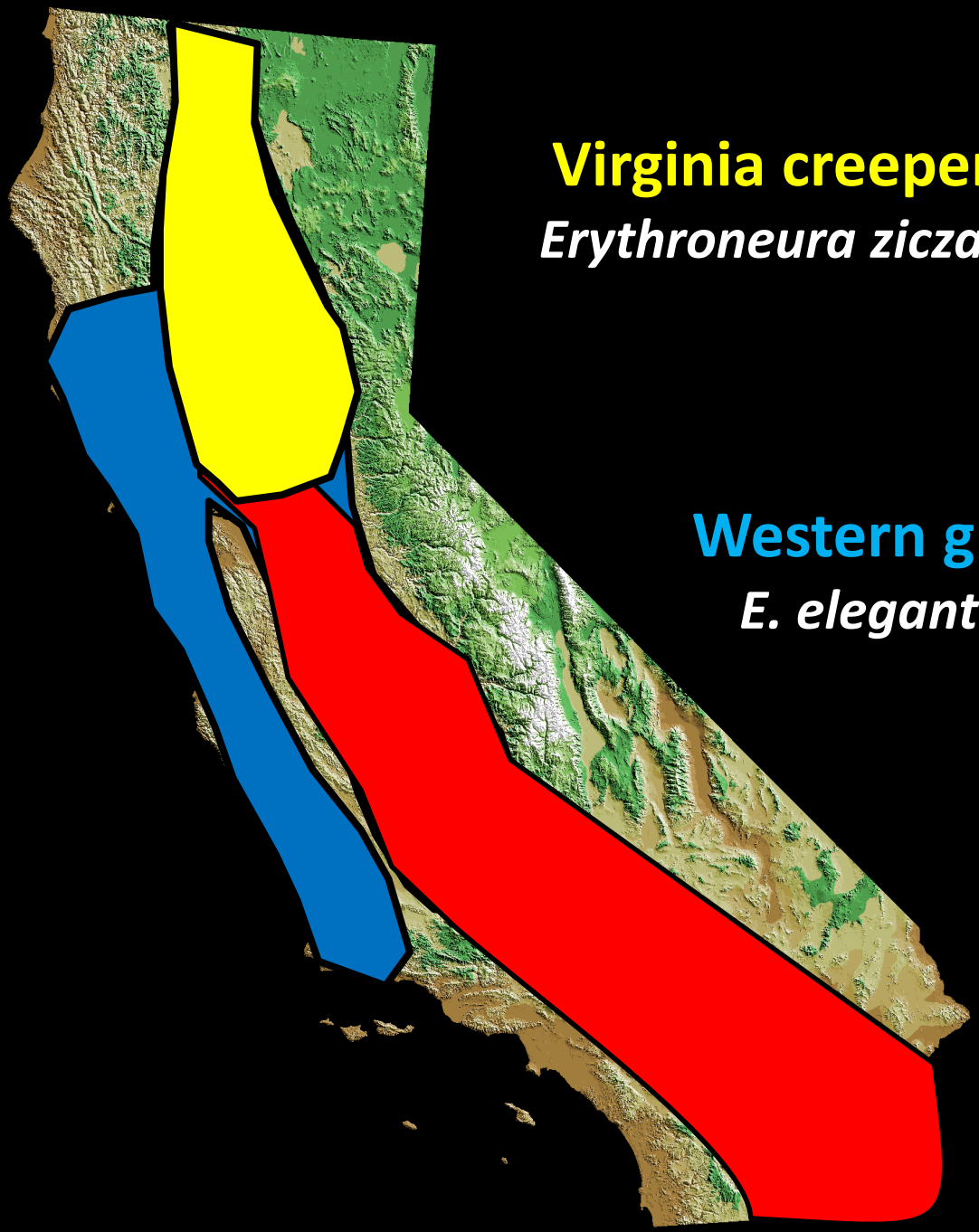


Western grape

E. elegantula

Variegated

E. variabilis



Virginia creeper

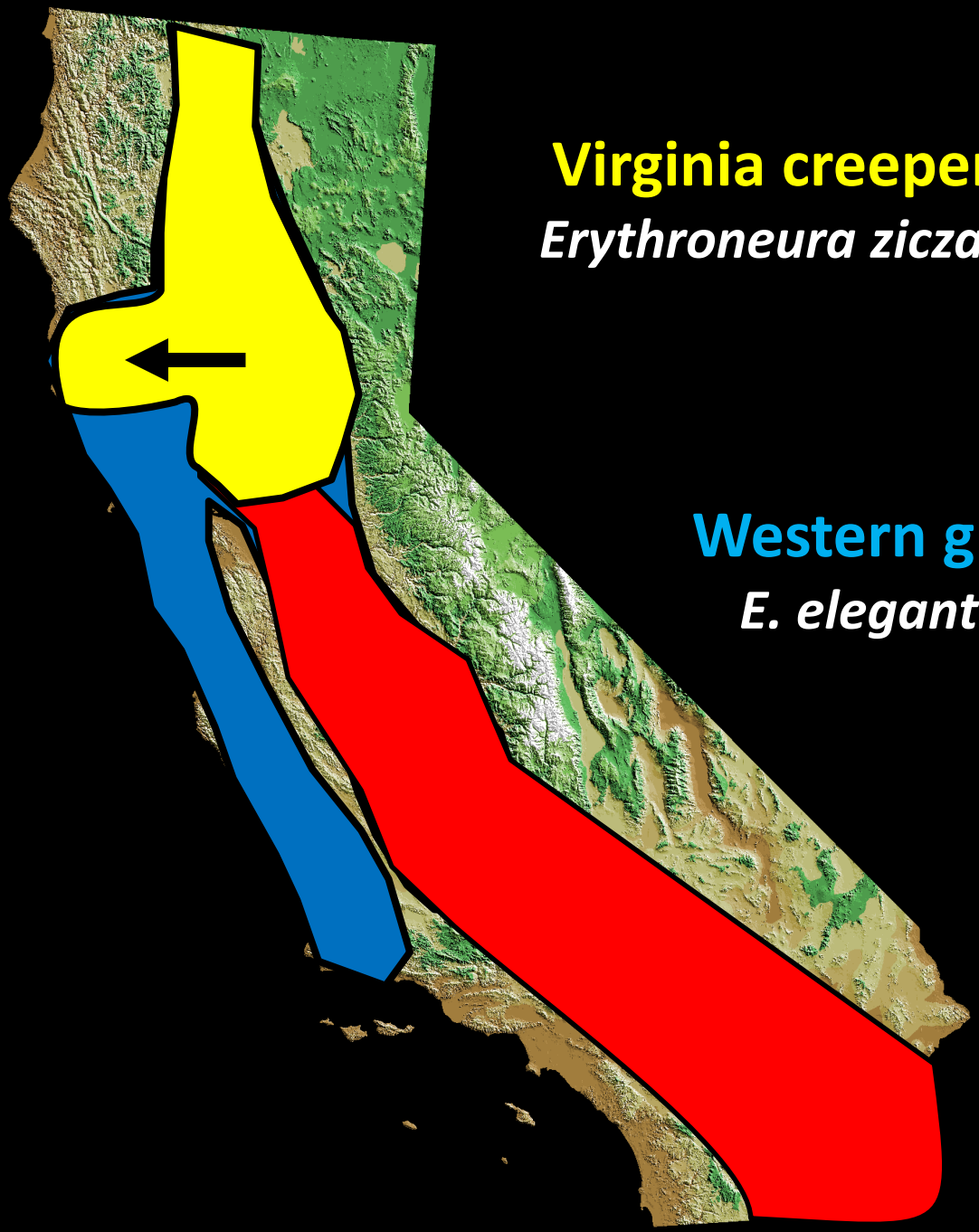
Erythroneura ziczac

Western grape

E. elegantula

Variegated

E. variabilis



Virginia creeper

Erythroneura ziczac

Western grape

E. elegantula

Variegated

E. variabilis

Erythroneura Leafhoppers in California

Virginia creeper
(*E. ziczac*)

Four red/brown spots

Western grape
(*E. elegantula*)

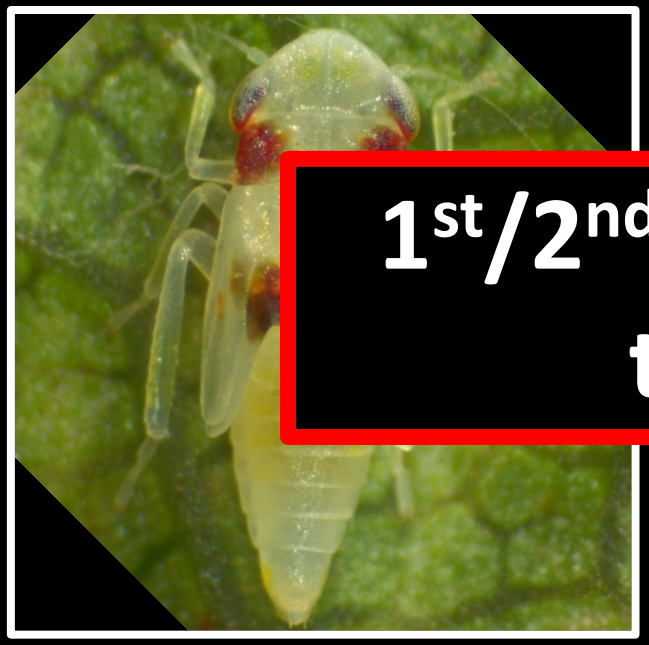
No spots

Variegated
(*E. variabilis*)

"Race stripes"

Erythroneura Leafhoppers in California

Virginia creeper
(*E. ziczac*)

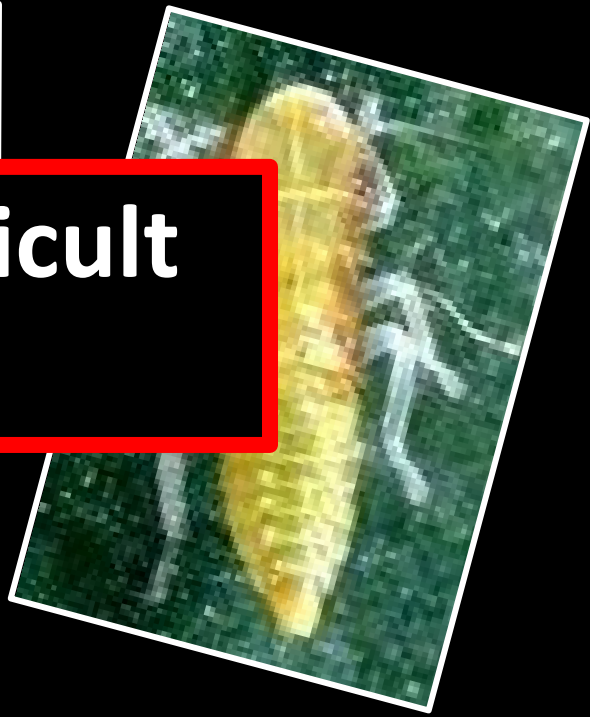


Four red/brown spots

Western grape
(*E. elegantula*)

No spots

Variegated
(*E. variabilis*)



"Race stripes"

1st/2nd instars are difficult to distinguish!

Erythroneura Leafhoppers in California

Leaf Stippling Impacts Yield/Quality

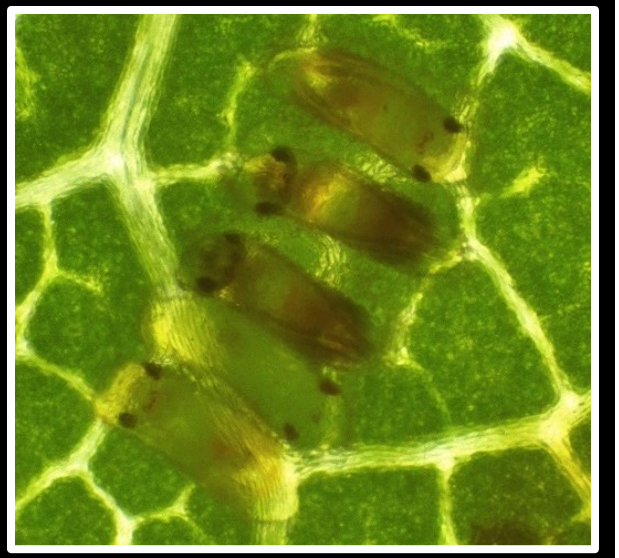
Plus a Nuisance at Harvest

Erythroneura Leafhoppers in California

Key Parasitoids

Anagrus spp. (Mymaridae)

Anagrus daanei
Anagrus erythroneurae
Anagrus tretiakovae



Erythroneura Leafhoppers in California

Key Parasitoids

Anagrus spp. (Mymaridae)

Leafhopper	*Anagrus* parasitoids
Virginia creeper	• *A. tretiakovae* • *A. daanei*
Western grape	• *A. daanei* • *A. erythroneurae*
Variegated	• *A. erythroneurae* • *A. tretiakovae*

Erythroneura Leafhoppers in California

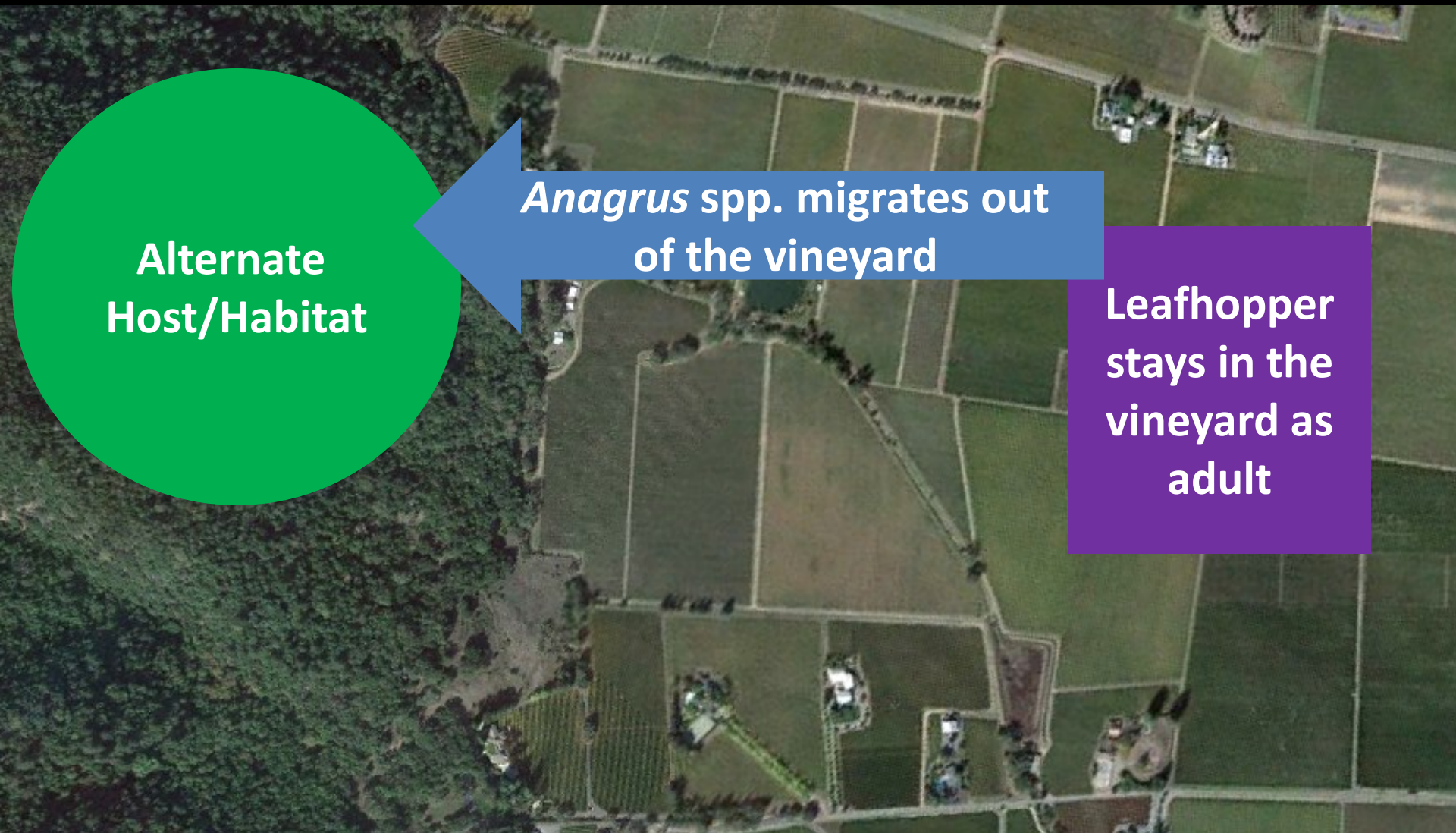
Overwintering Biology

Summer

Erythroneura Leafhoppers in California

Overwintering Biology

Fall



Erythroneura Leafhoppers in California

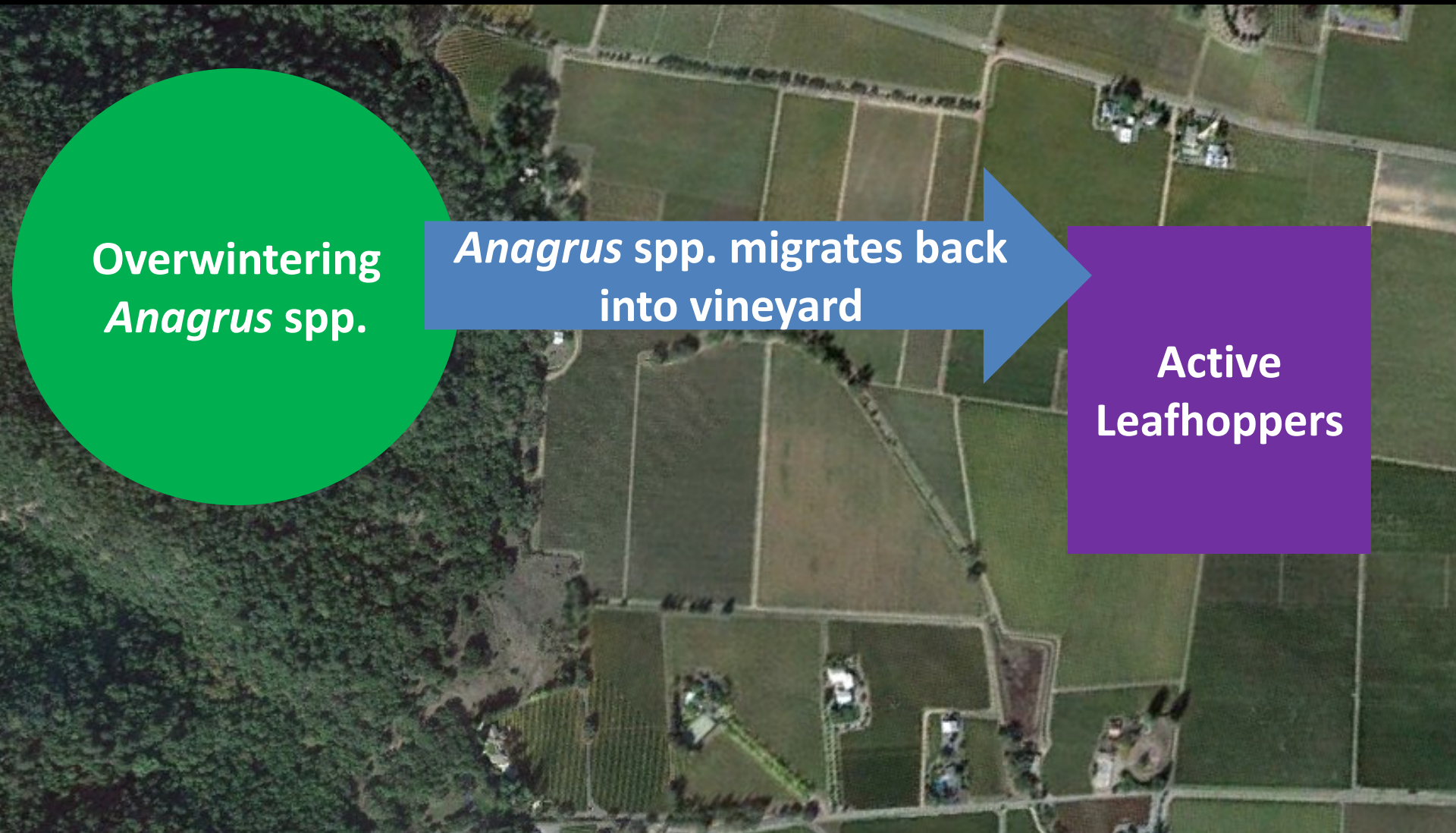
Overwintering Biology

Winter

Erythroneura Leafhoppers in California

Overwintering Biology

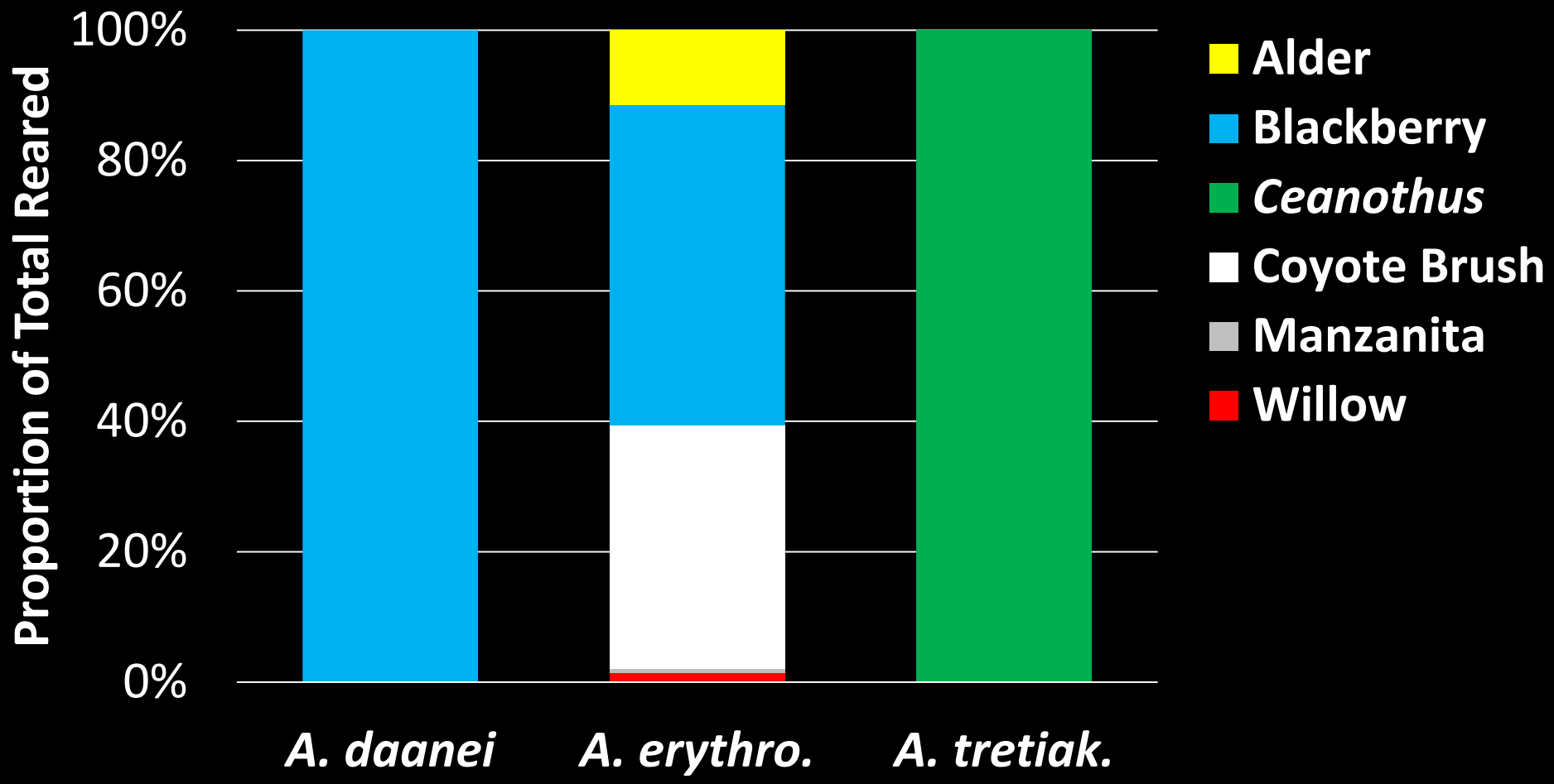
Spring



Erythroneura Leafhoppers in California

Anagrus Overwintering Habitat

Natural Habitats

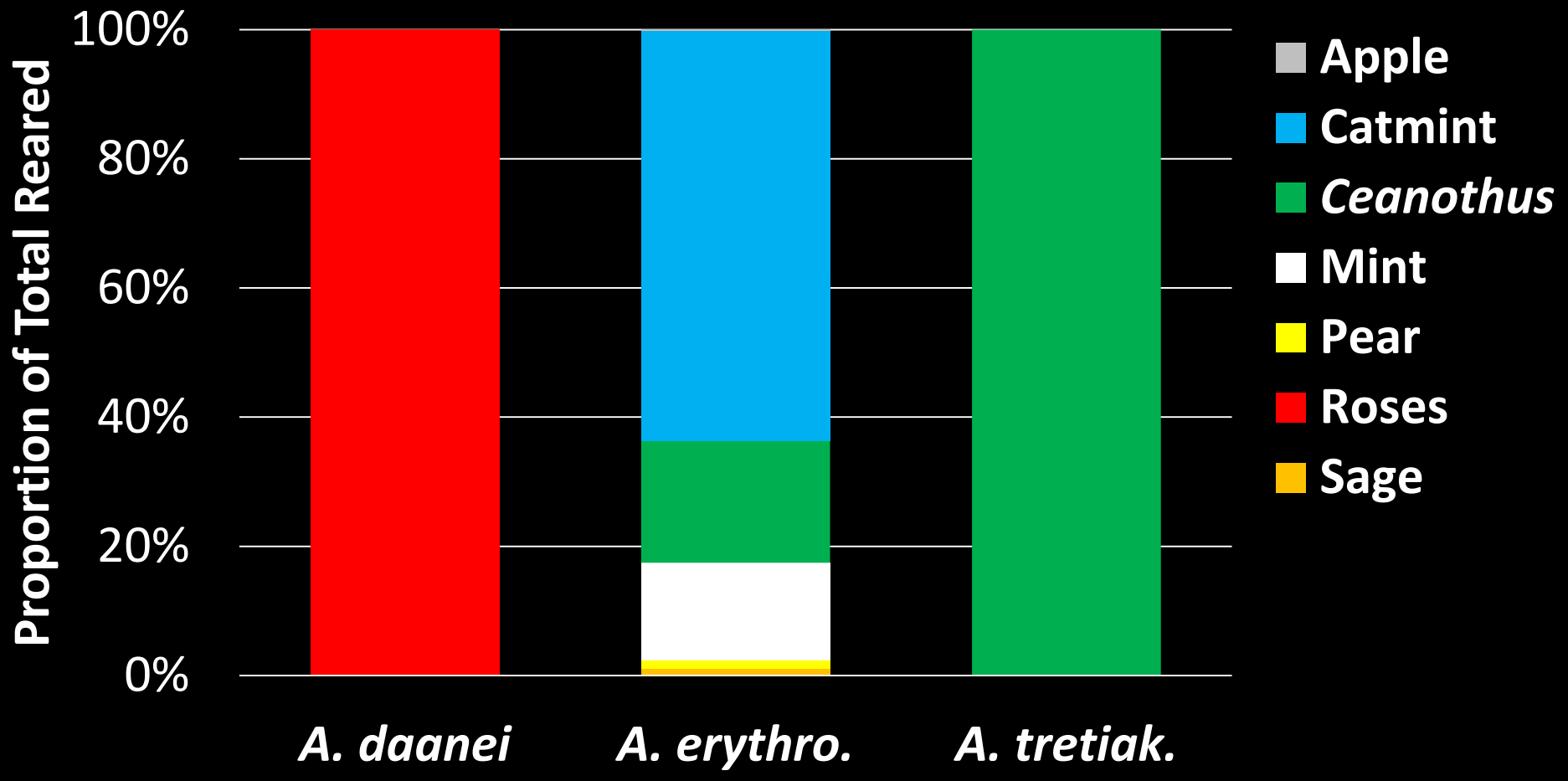


Wilson et al. 2016 *Environmental Entomology* 45(3): 602-615

Erythroneura Leafhoppers in California

Anagrus Overwintering Habitat

Gardens, Hedgerows



Wilson et al. 2016 *Environmental Entomology* 45(3): 602-615

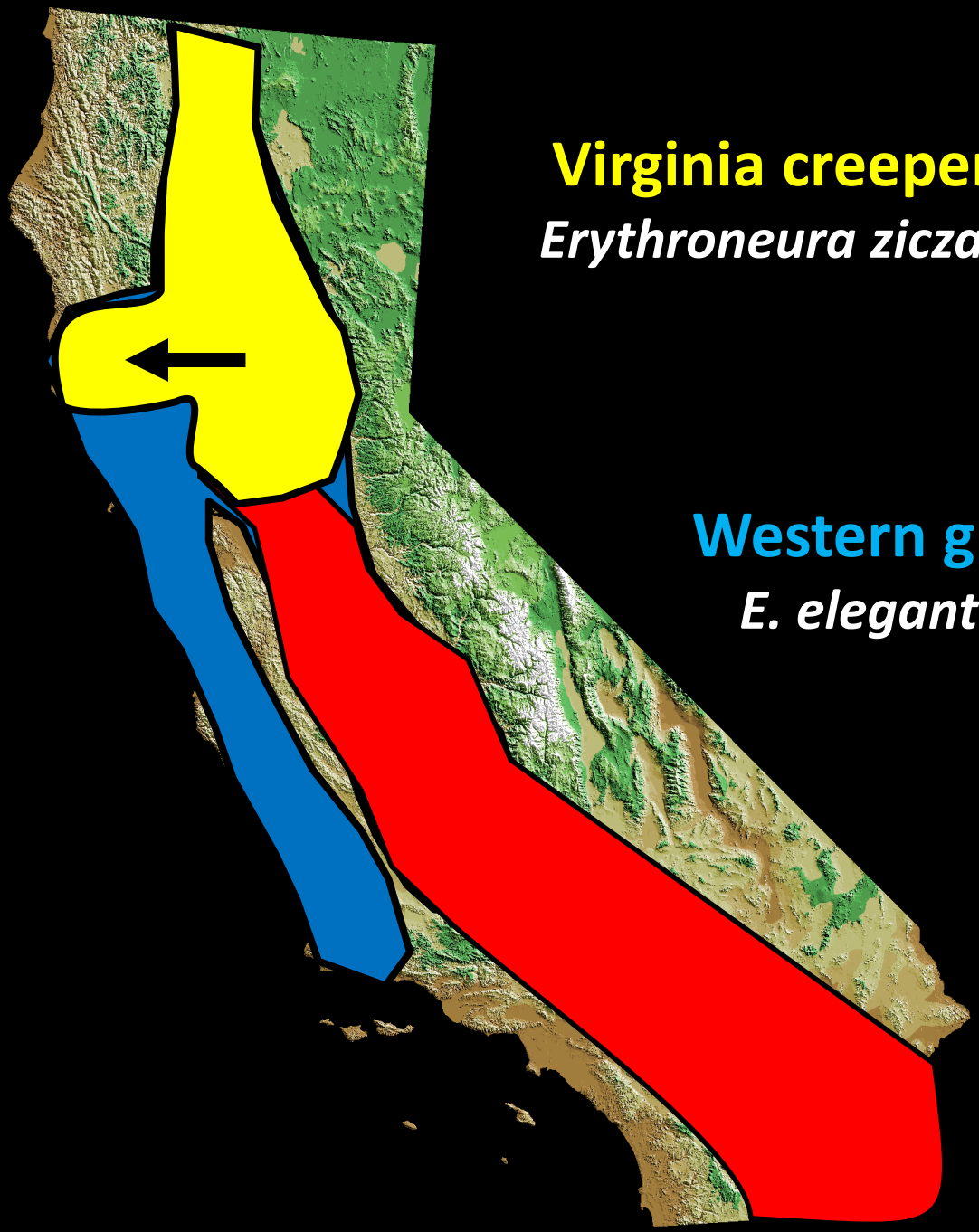
Erythroneura Leafhoppers in California

- Three species
  - Western grape
  - Variegated
  - Virginia creeper

- *Anagrus* spp. are key parasitoids

- Overwintering habitat is critical for *Anagrus*
  - Blackberry, coyote brush, roses, mints
- Leafhoppers prefer vigorous vines
  - Elevated nitrogen content + irrigation levels

Virginia Creeper Leafhopper Area-wide IPM Program in the North Coast



Virginia creeper

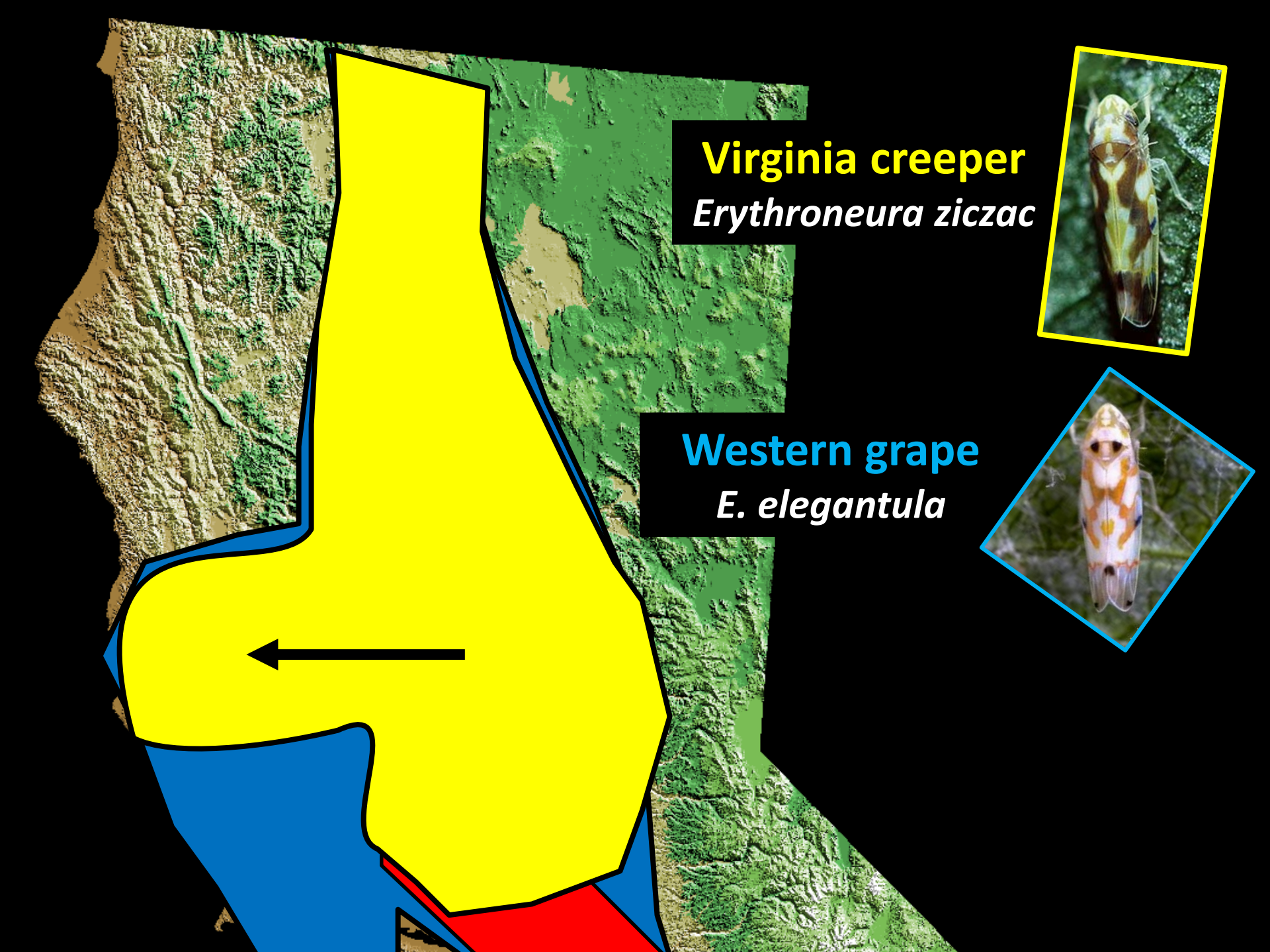
Erythroneura ziczac

Western grape

E. elegantula

Variegated

E. variabilis


Virginia creeper
Erythroneura ziczac
Western grape
E. elegantula

VCLH Area-wide IPM Project

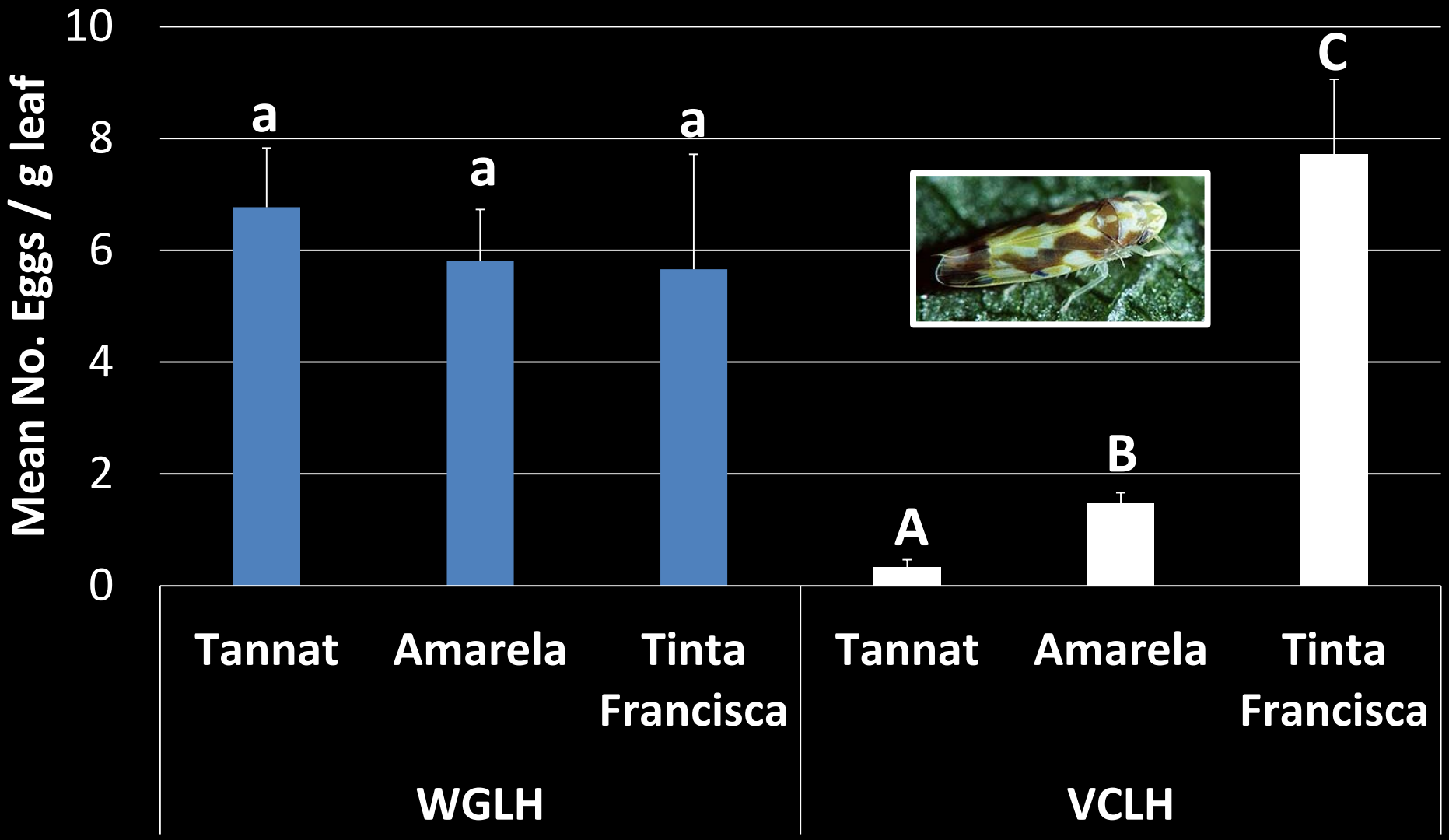
Initial Outbreaks in Mendocino/Lake County

2011-2012

VCLH Area-wide IPM Project

Differences in VCLH + WGLH Biology

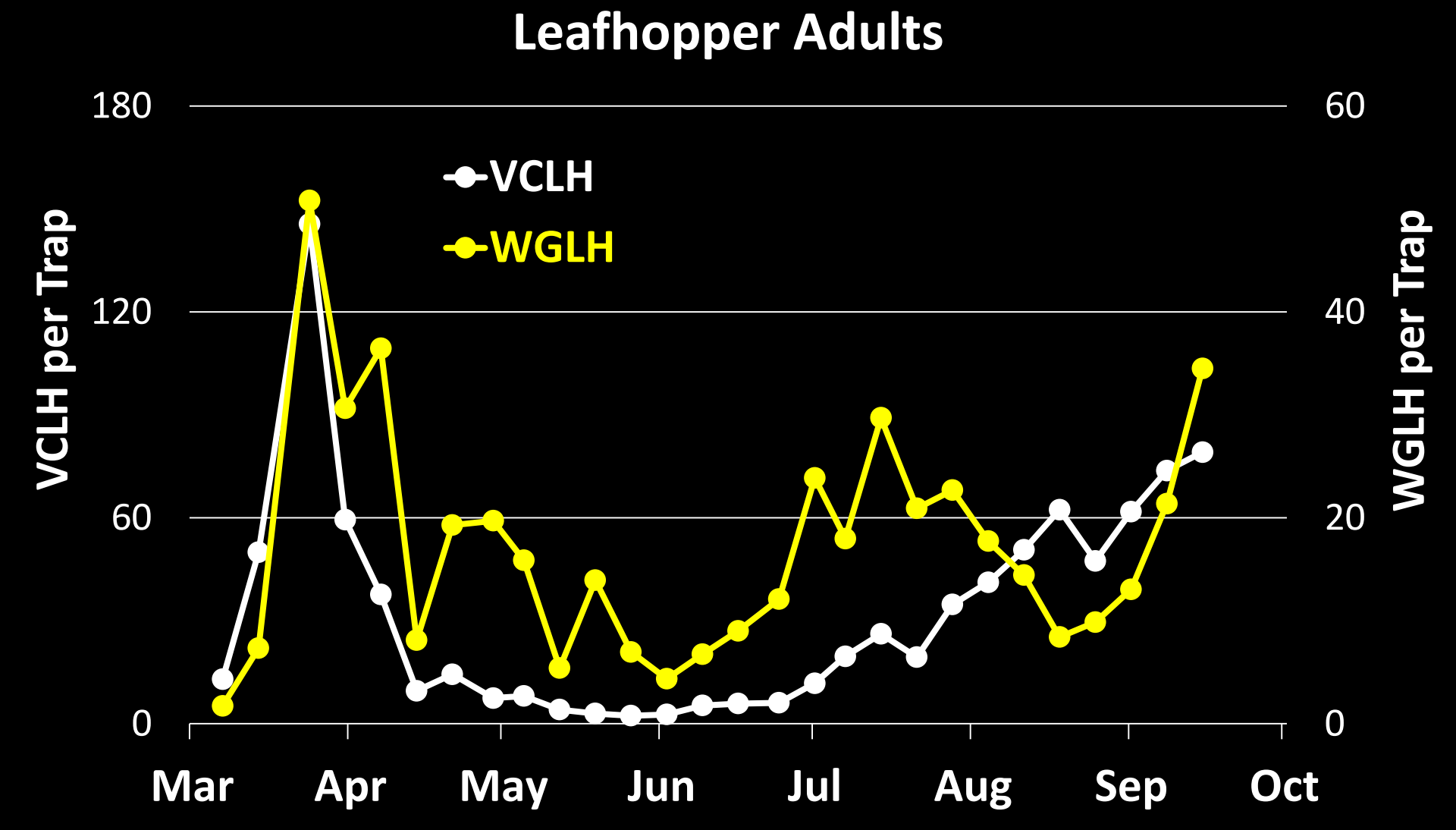
VCLH Preference for Glabrous Leaves



VCLH Area-wide IPM Project

Differences in VCLH + WGLH Biology

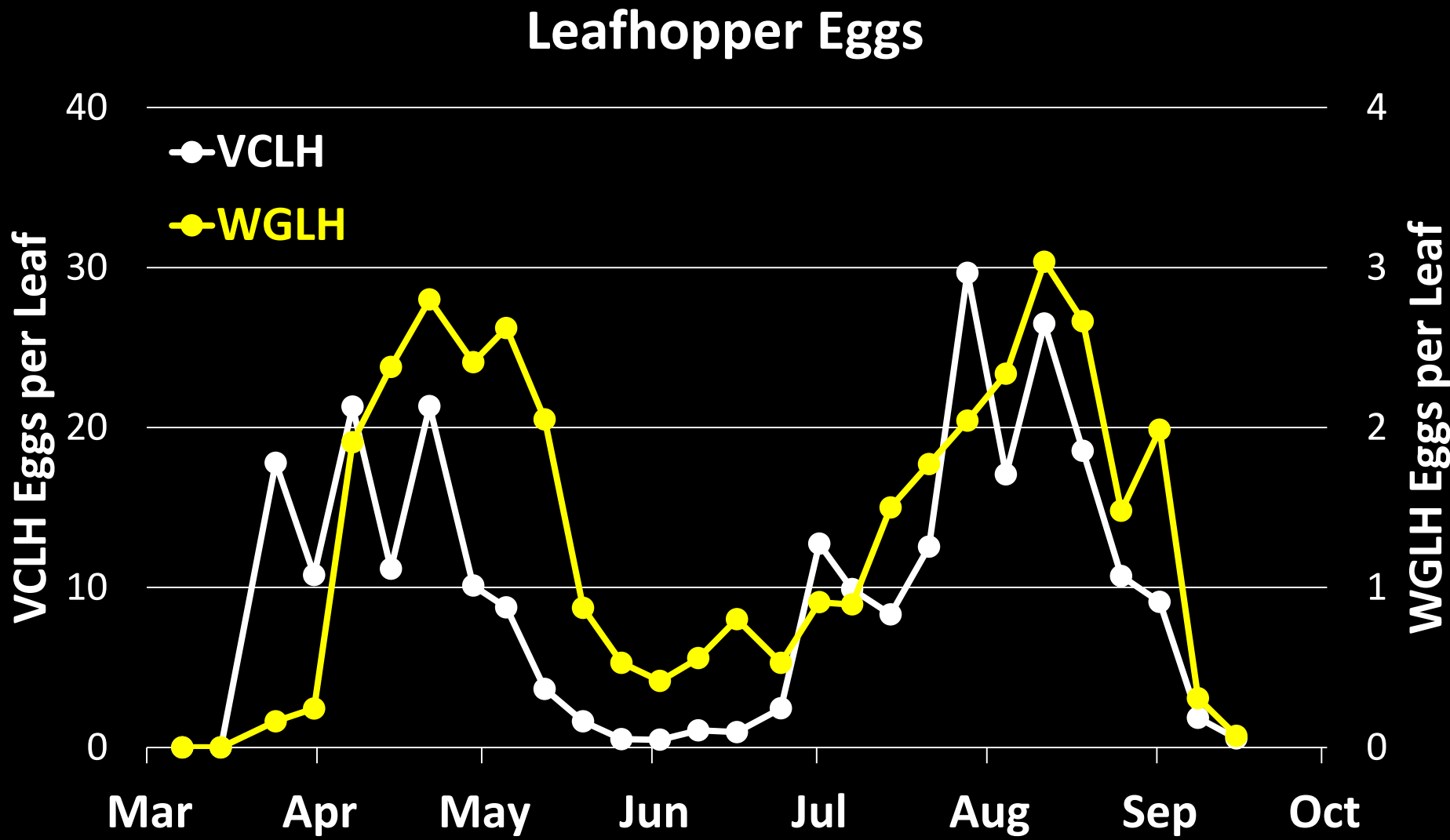
Earlier Egg Deposition + Nymph Emergence



VCLH Area-wide IPM Project

Differences in VCLH + WGLH Biology

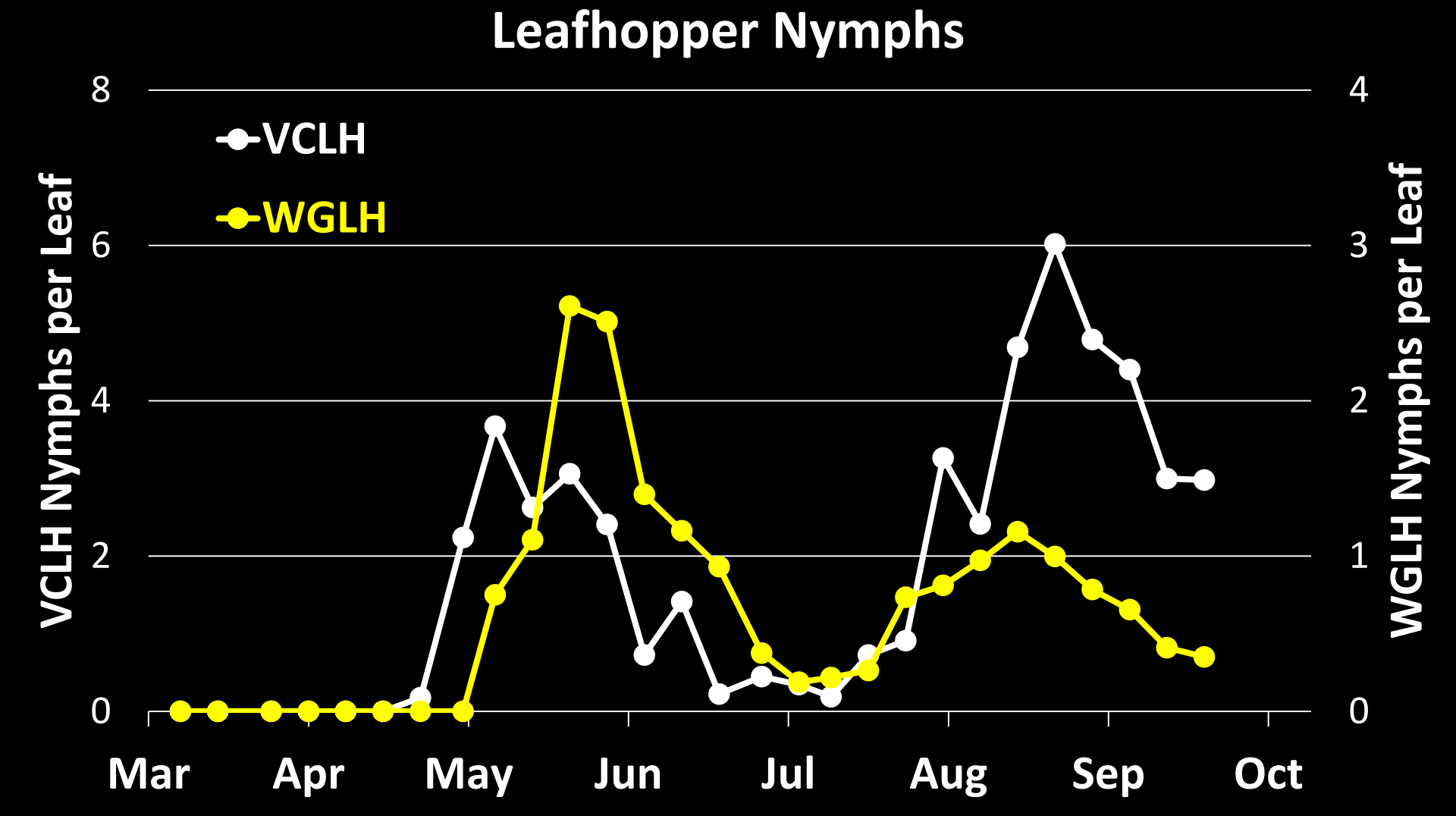
Earlier Egg Deposition + Nymph Emergence



VCLH Area-wide IPM Project

Differences in VCLH + WGLH Biology

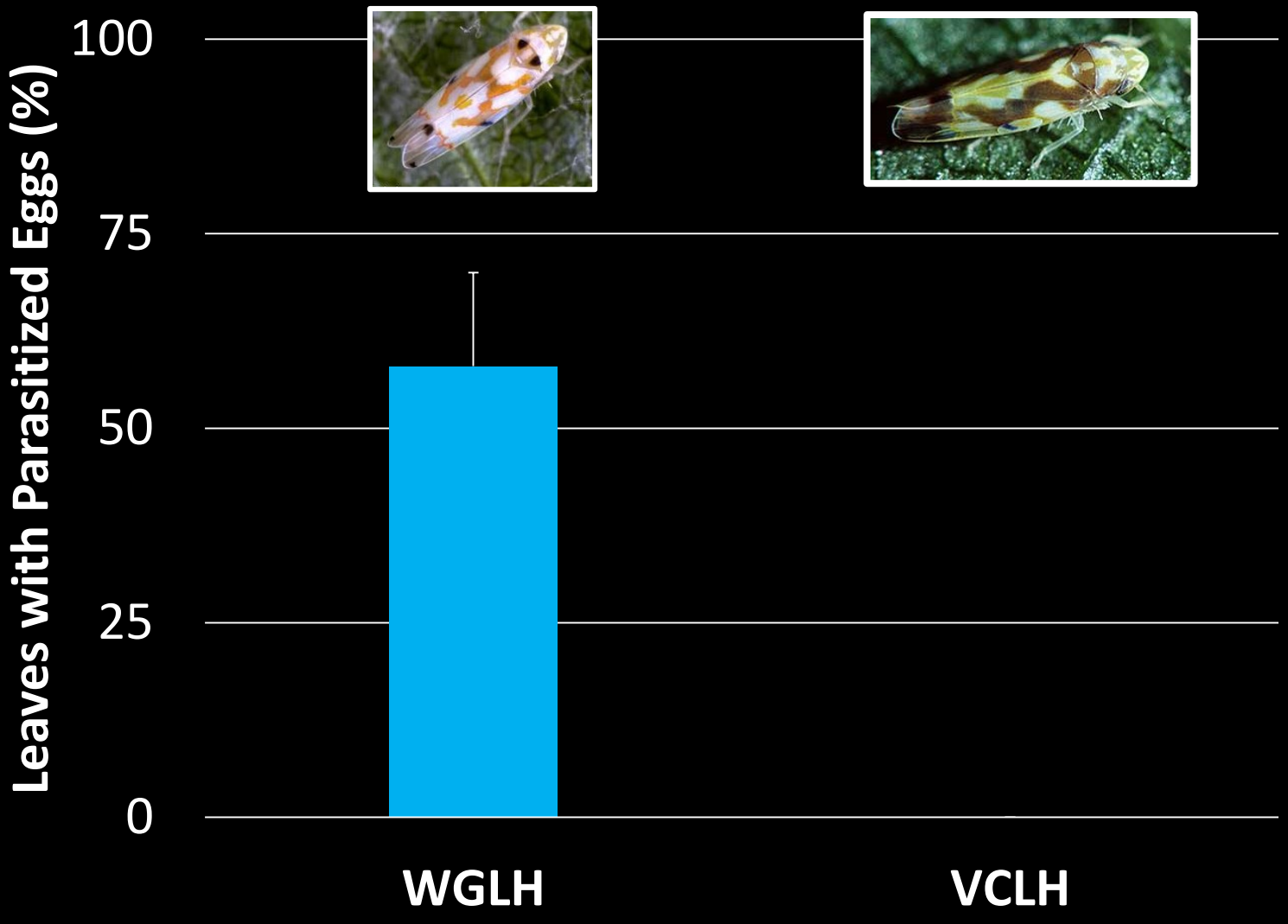
Earlier Egg Deposition + Nymph Emergence



VCLH Area-wide IPM Project

Differences in VCLH + WGLH Biology

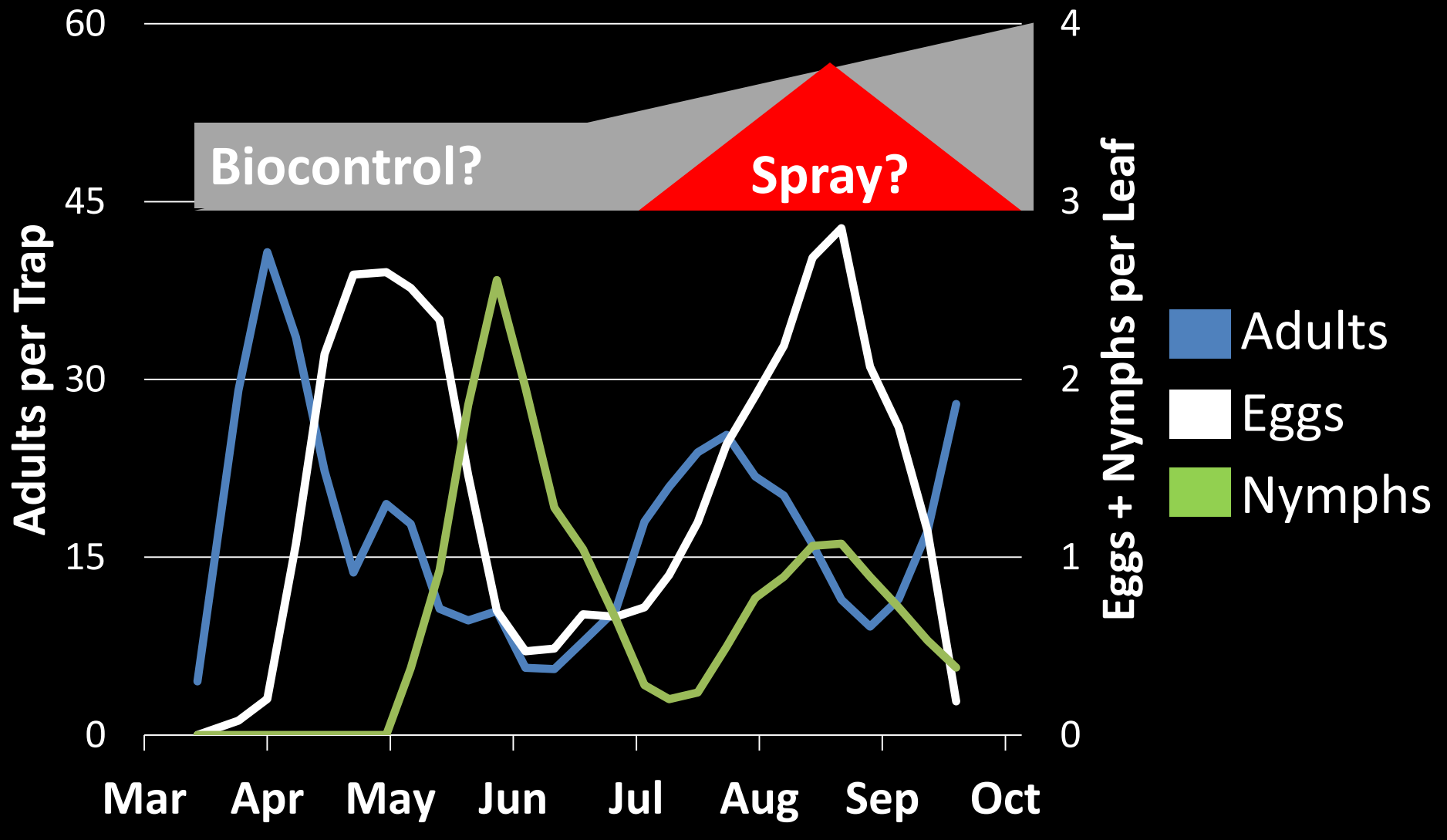
Lack of VCLH Parasitism



VCLH Area-wide IPM Project

Key Differences in VCLH + WGLH Biology

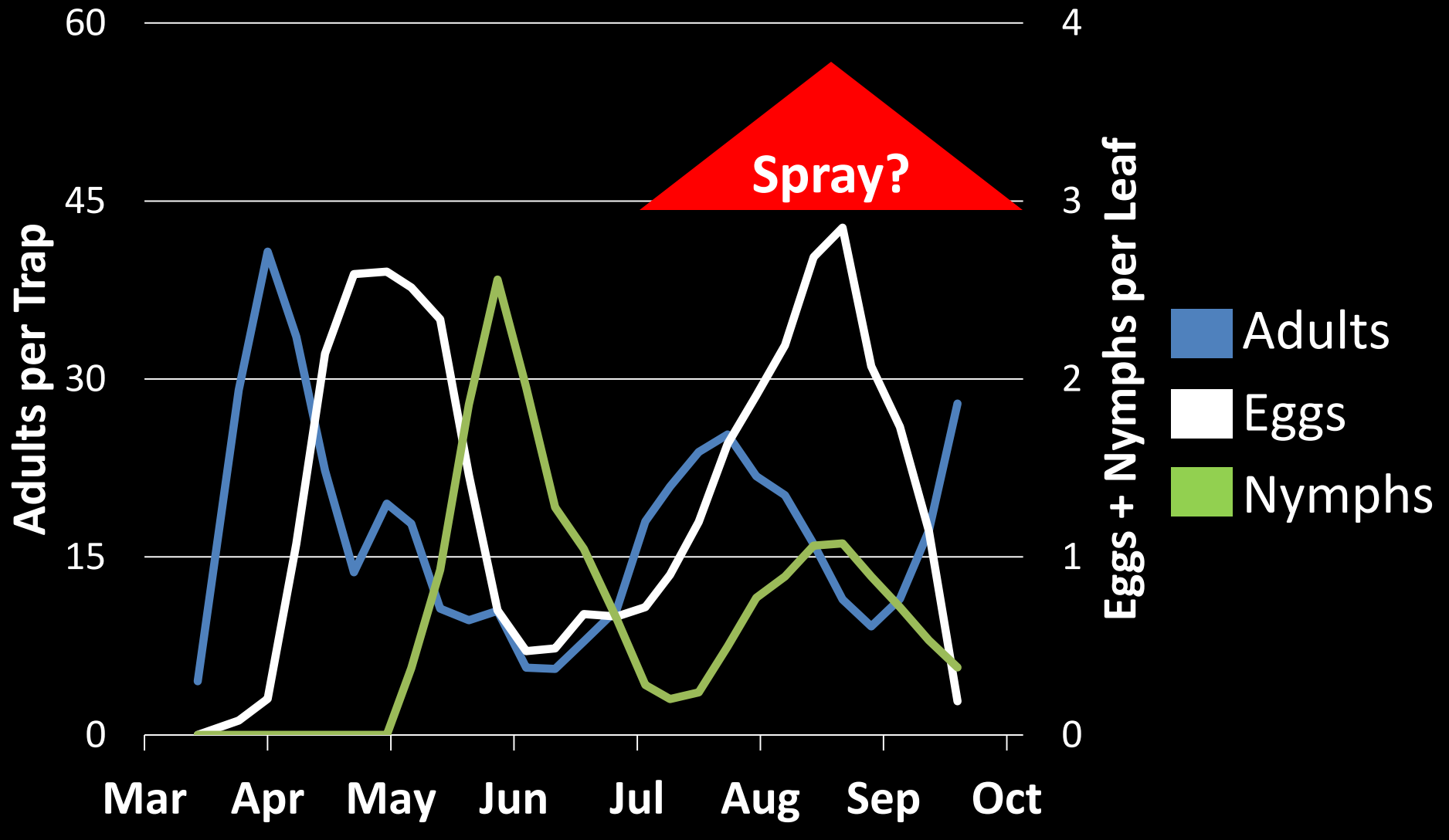
Standard Focus is on Late Season Densities



VCLH Area-wide IPM Project

Key Differences in VCLH + WGLH Biology

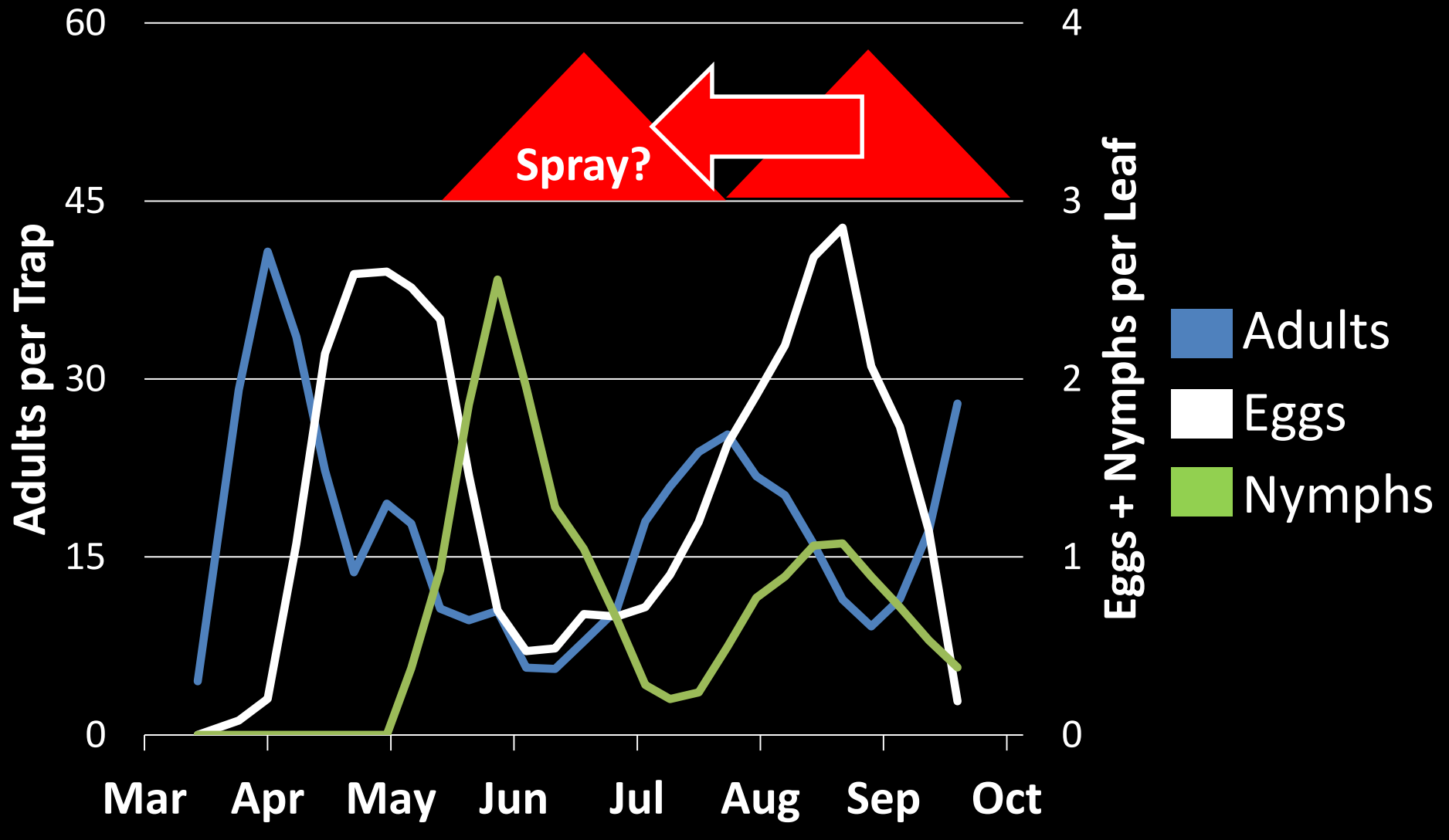
Absence of Biocontrol → Spray Timing Adjustments



VCLH Area-wide IPM Project

Key Differences in VCLH + WGLH Biology

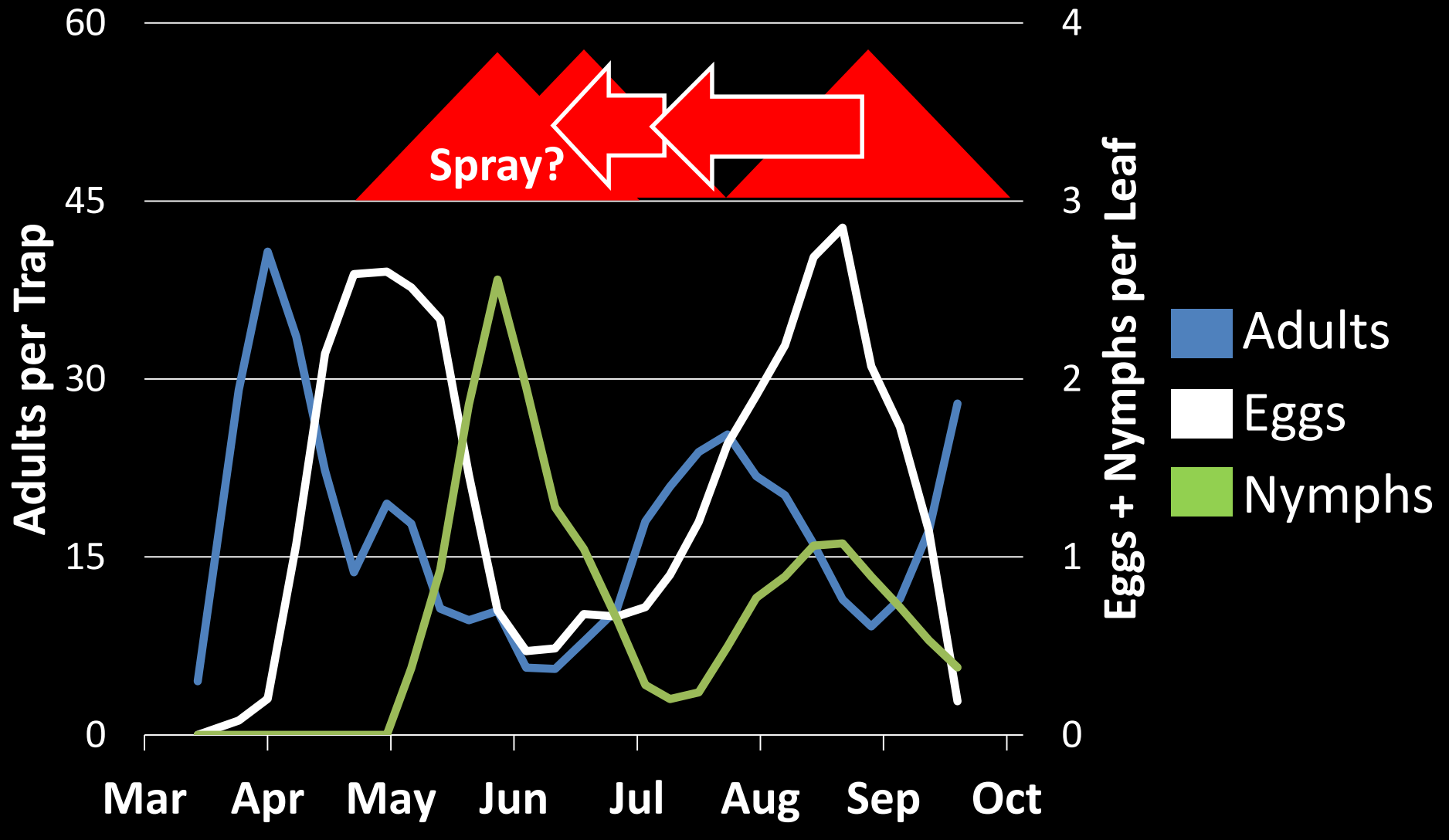
Absence of Biocontrol → Spray Timing Adjustments



VCLH Area-wide IPM Project

Key Differences in VCLH + WGLH Biology

Absence of Biocontrol → Spray Timing Adjustments



VCLH Area-wide IPM Project

Spray Trials with OMRI Material

Products	A.I.	2013	2014	2015	2016
PyGanic	pyrethrin	Nymphs	Nymphs	Nymphs	-
Grandevo	*Chromobacterium* sp.	Nymphs	-	-	-
Mycotrol	*Beauveria bassiana*	Nymphs	-	-	-
Stylet Oil	oil	-	Nymphs	-	-
DeBug Turbo	azadirachtin	-	Nymphs	Eggs	Eggs
PureAg	oil (colloidal)	-	-	Nymphs	-
DeBug Tres	azadirachtin	-	-	-	Eggs

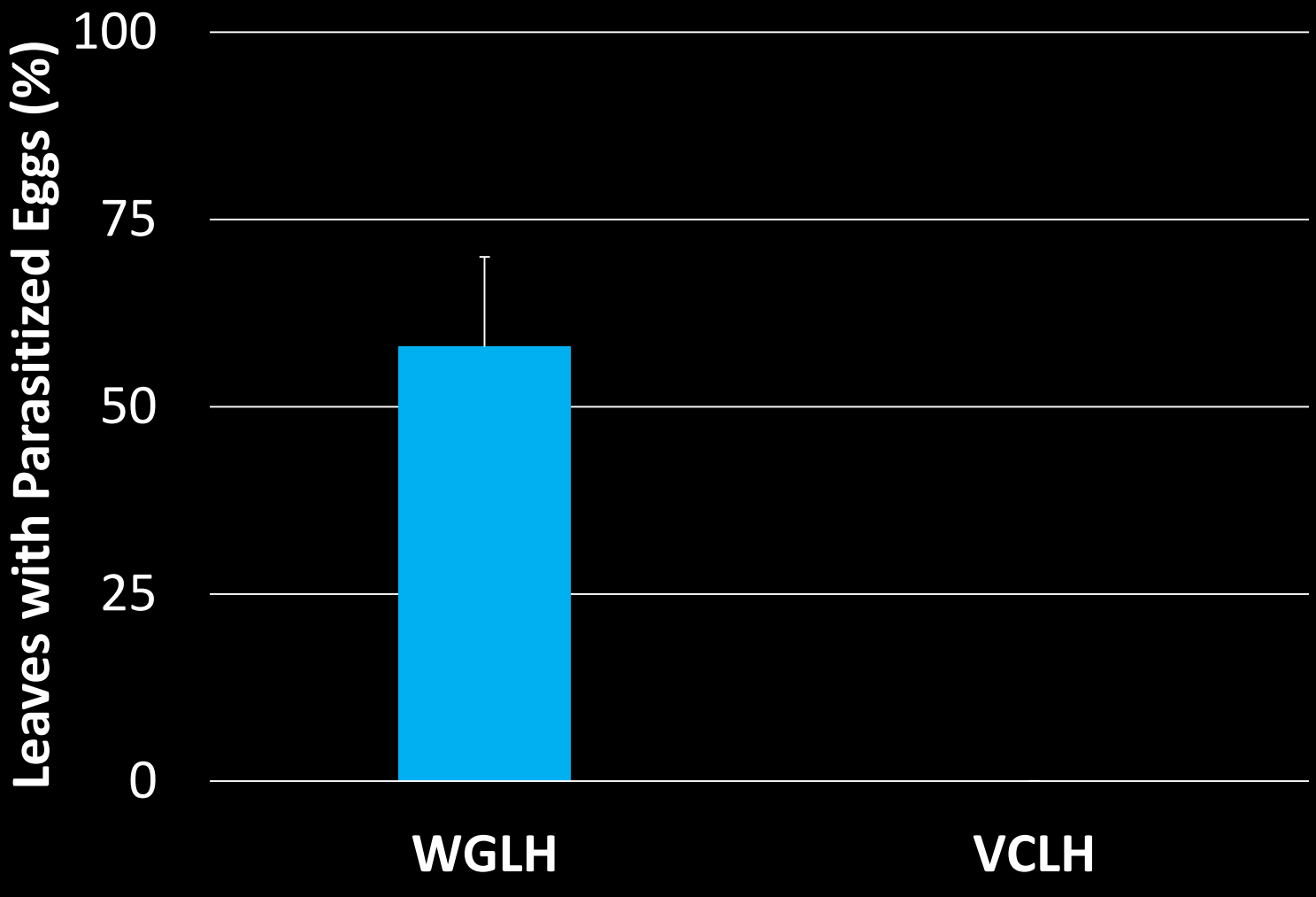
VCLH Area-wide IPM Project

Establish Biological Control

VCLH Area-wide IPM Project

Establish Biological Control

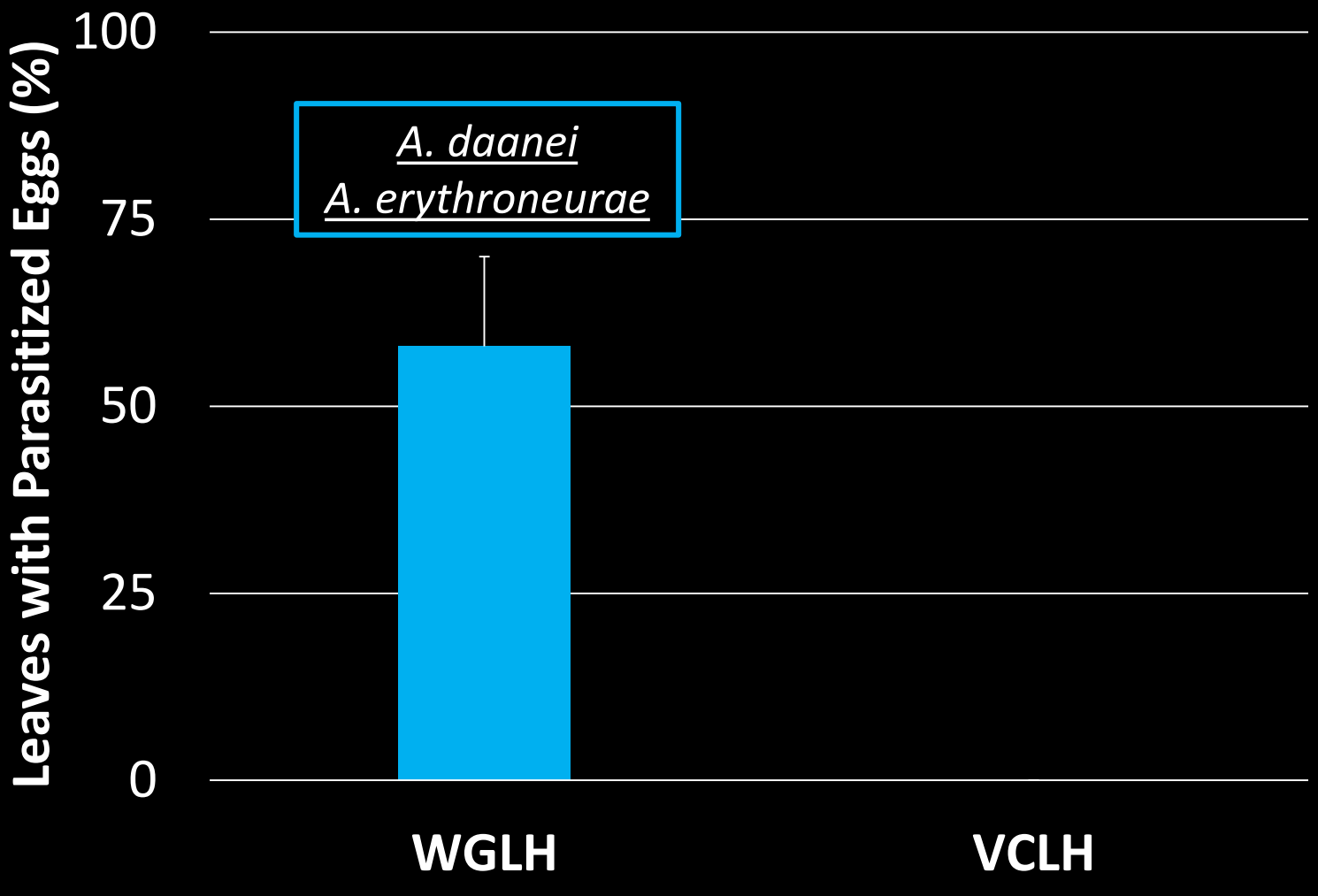
Parasitism Survey - 2013



VCLH Area-wide IPM Project

Establish Biological Control

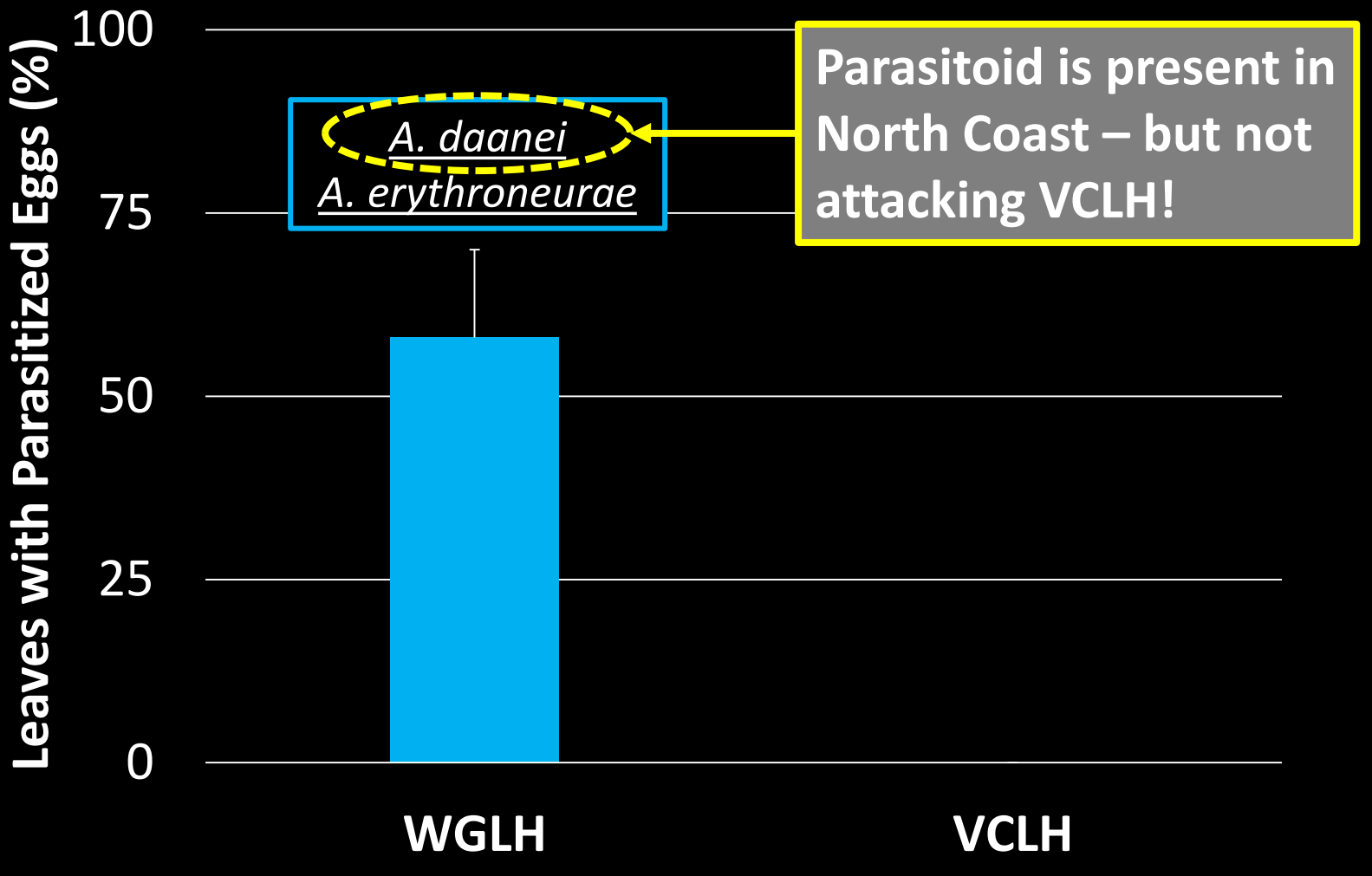
Parasitism Survey - 2013



VCLH Area-wide IPM Project

Establish Biological Control

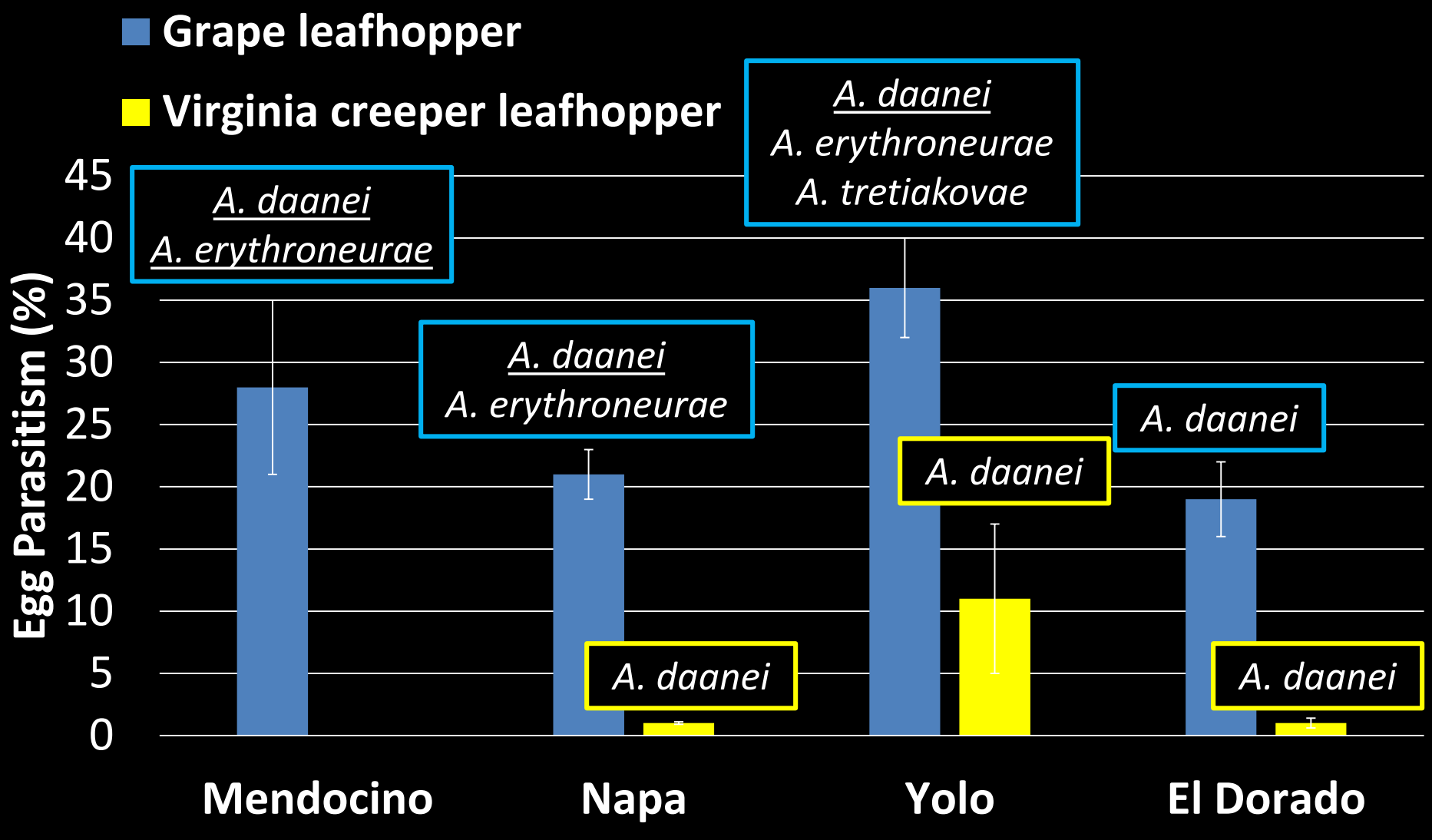
Parasitism Survey - 2013



VCLH Area-wide IPM Project

Establish Biological Control

Expanded Parasitism Survey - 2014



VCLH Area-wide IPM Project

Establish Biological Control

Anagrus daanei Rear-Release Program – 2015

(1) Collect from Abandoned Vineyards in Sacramento Valley

(2) Rear + Aggregate Parasitoids in Greenhouse

(3) Release Near Hopland

A. daanei Rear-Release Program – 2015-2017

Field Release and Follow-up Evaluation

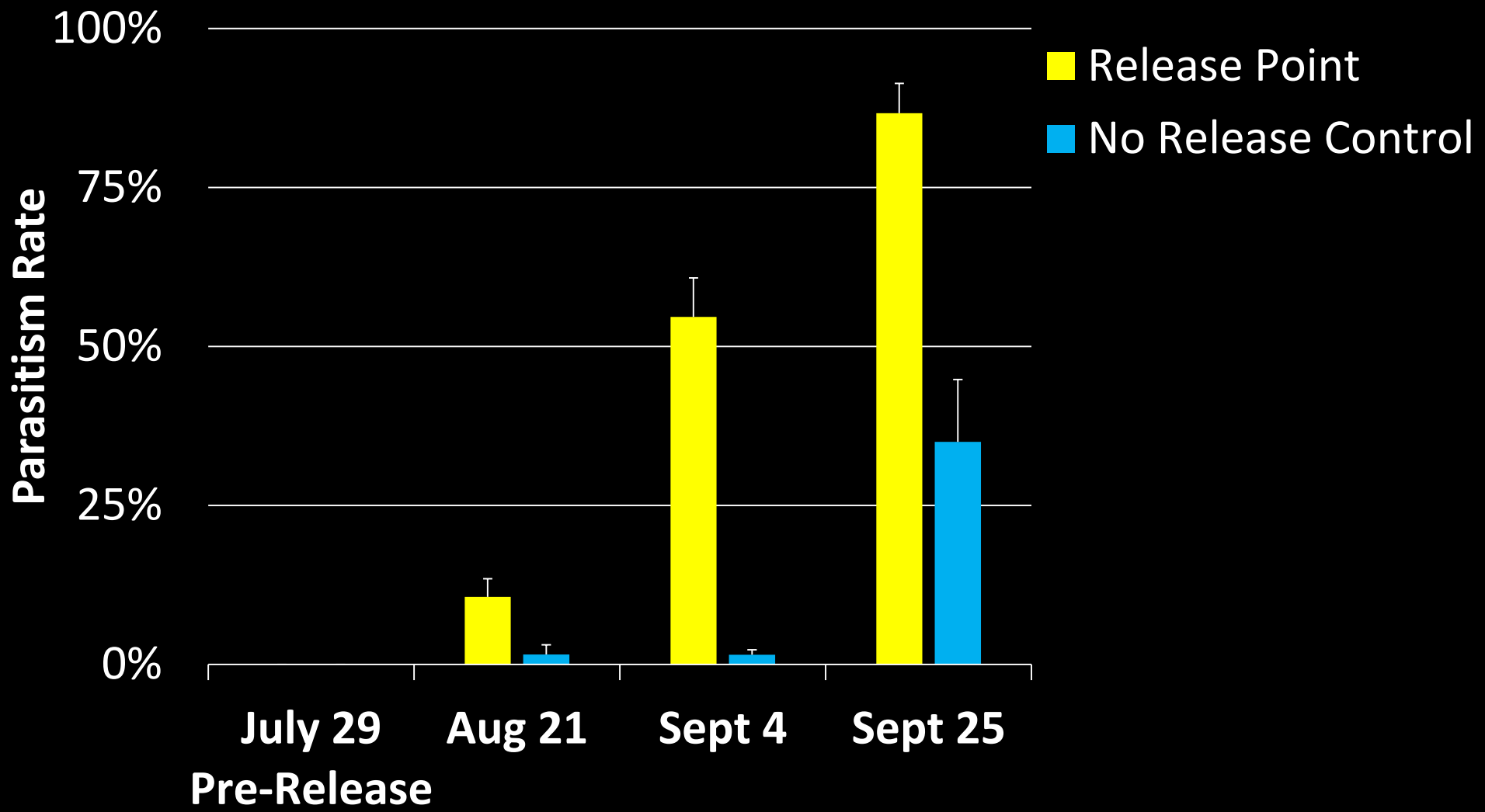
Paired release with a no-release control site

Pre- and post-release evaluation

VCLH Area-wide IPM Project

Establish Biological Control

Success of Initial Release – 2015



VCLH Area-wide IPM Project

Establish Biological Control

Multiple Colonies at UC Berkeley – 2016

VCLH Area-wide IPM Project

Establish Biological Control

Mass Rearing in Greenhouse – 2016

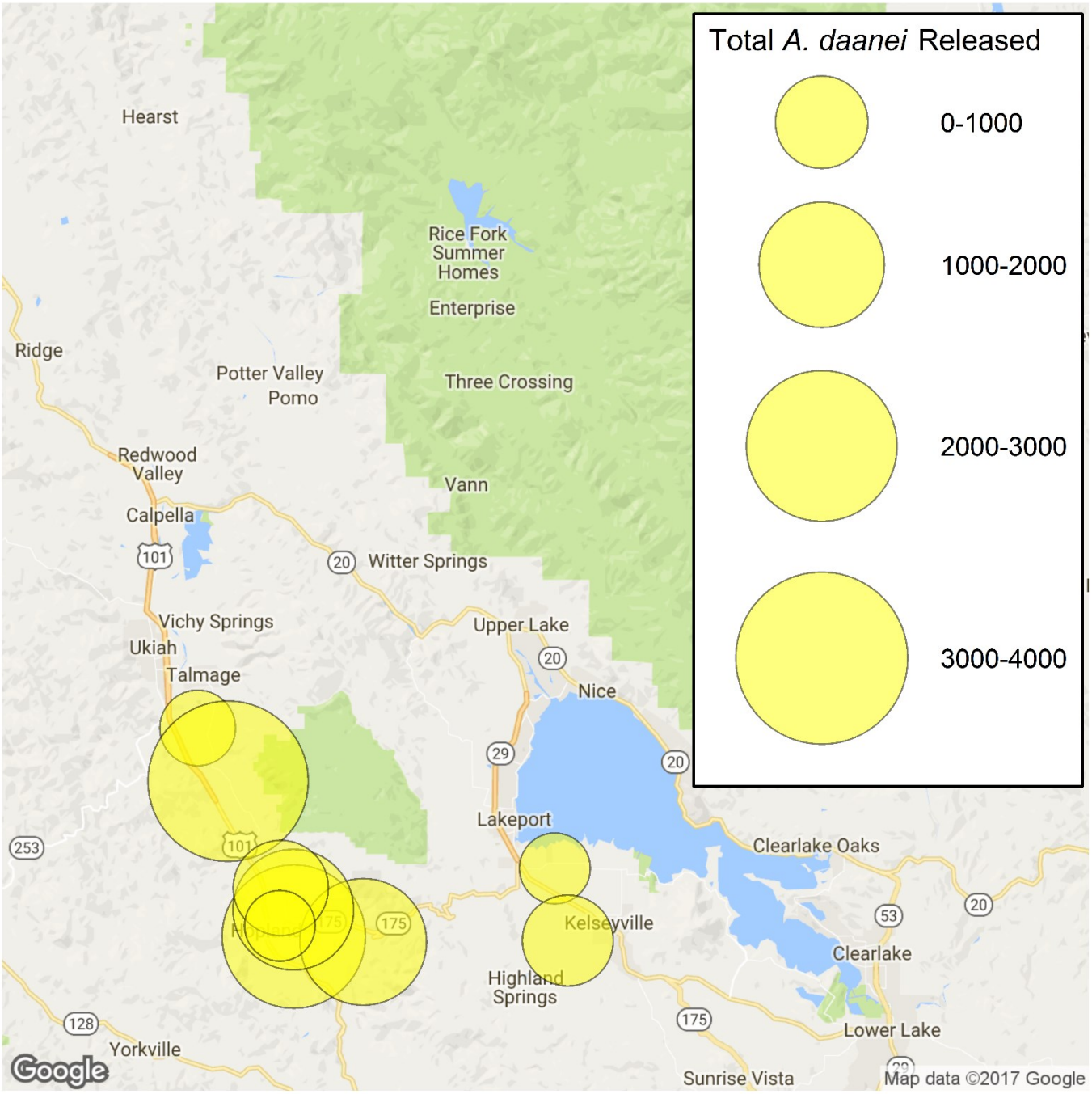
VCLH Area-wide IPM Project

Establish Biological Control

Multiple Releases in Mendocino/Lake – 2016

15,000+ parasitoids across 9 sites

Total *A. daanei* Released - 2016

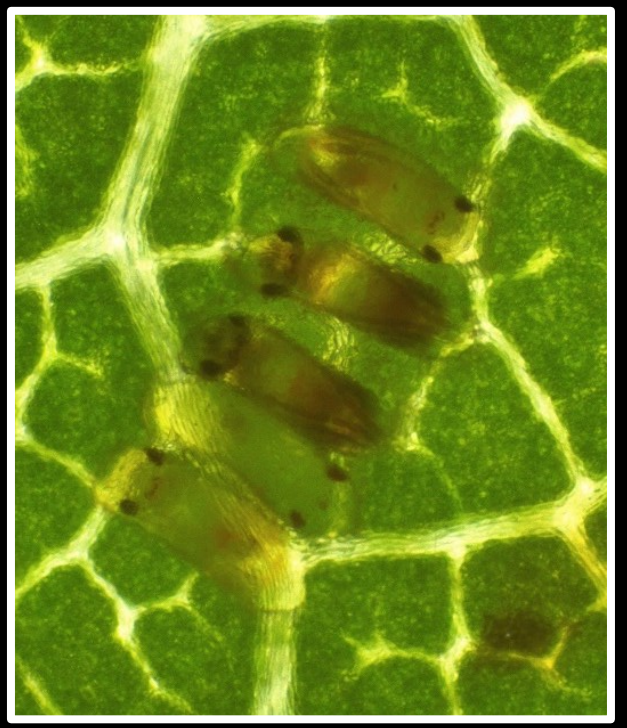


VCLH Area-wide IPM Project

Establish Biological Control

Release Impacts on Parasitism Rate – 2016

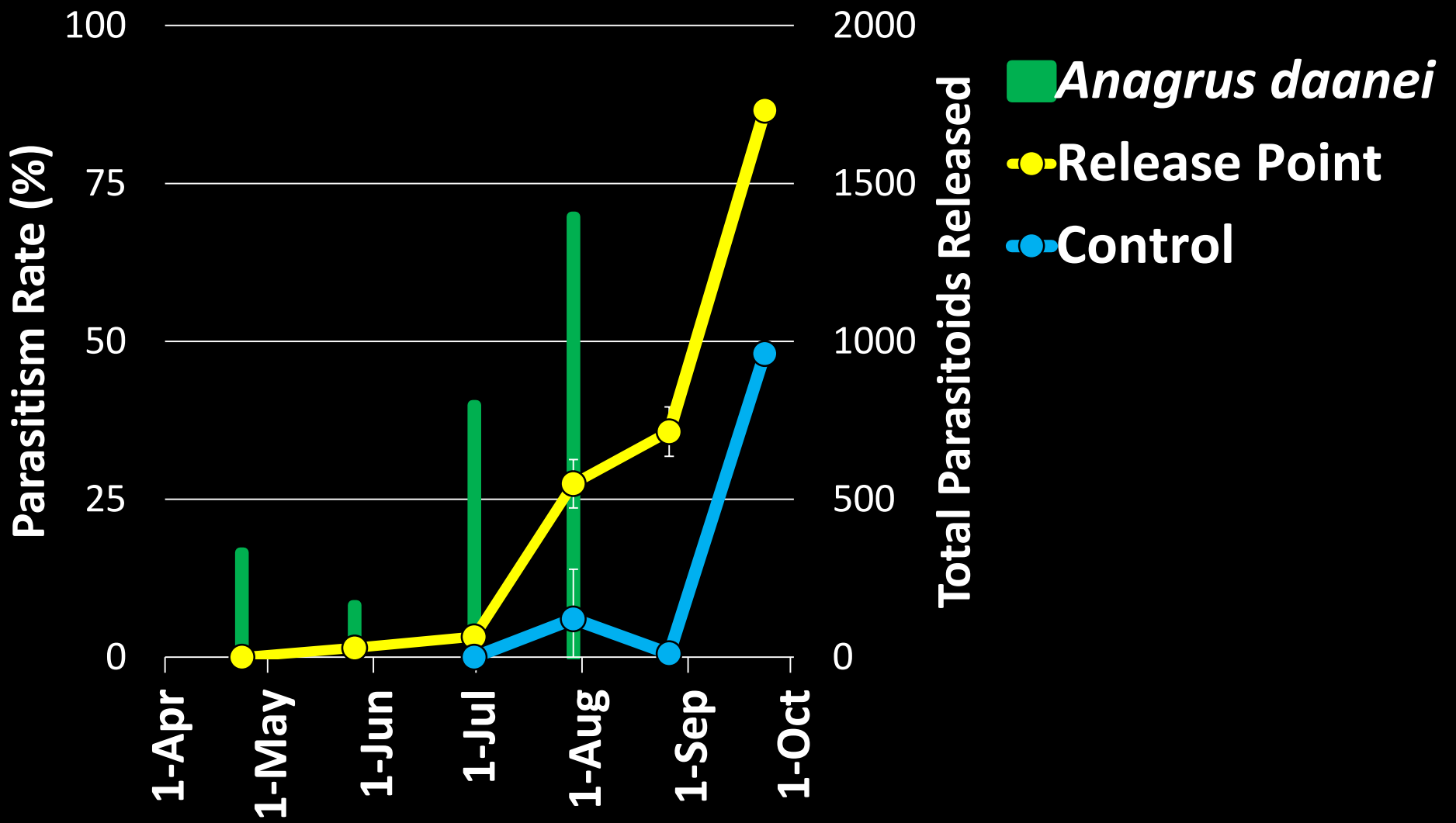
- Consistent parasitism – 1 site
- Some parasitism – 3 sites
- Low/no parasitism – 5 sites



VCLH Area-wide IPM Project

Establish Biological Control

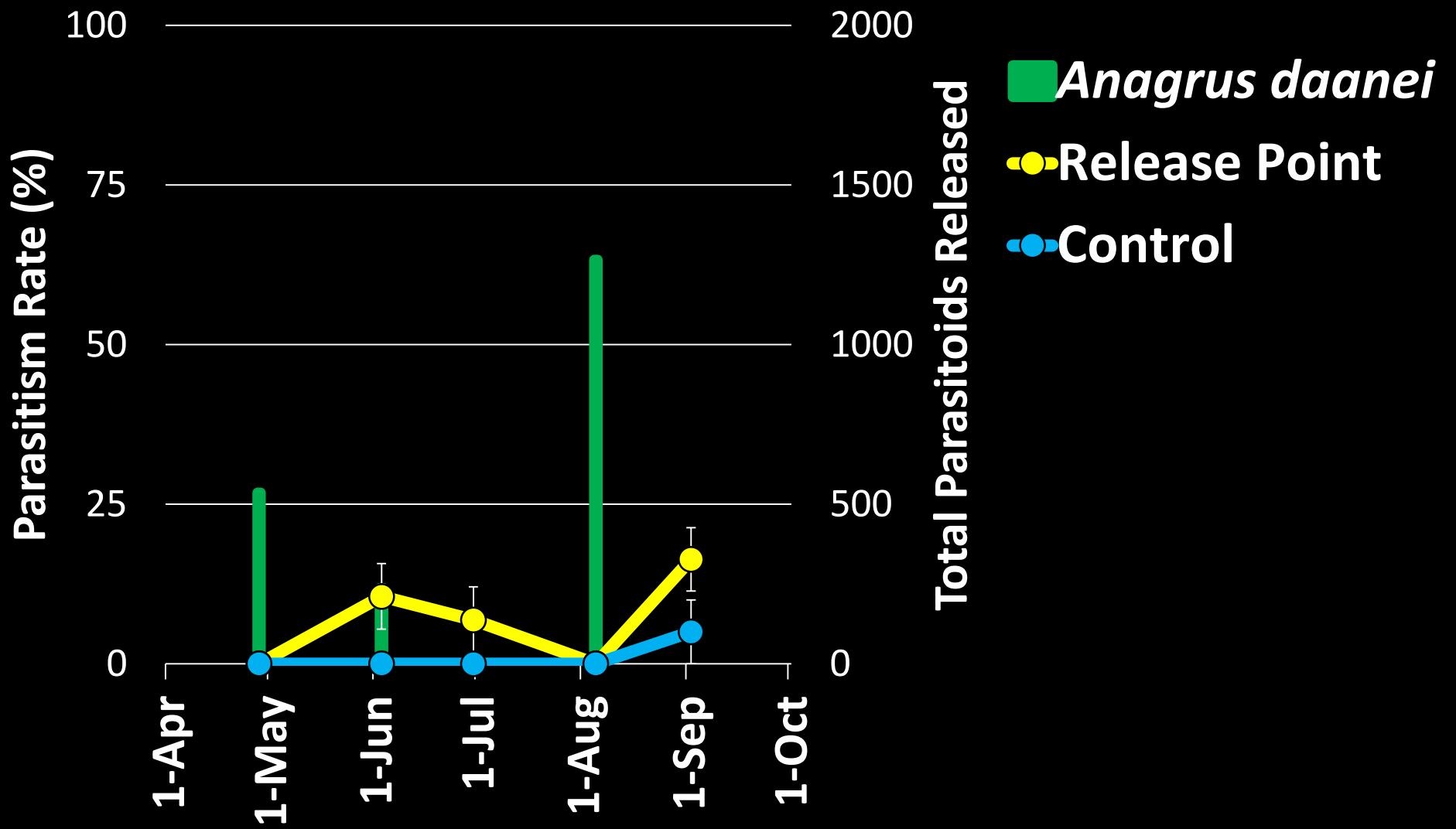
Releases are Early, Frequent and Abundant



VCLH Area-wide IPM Project

Establish Biological Control

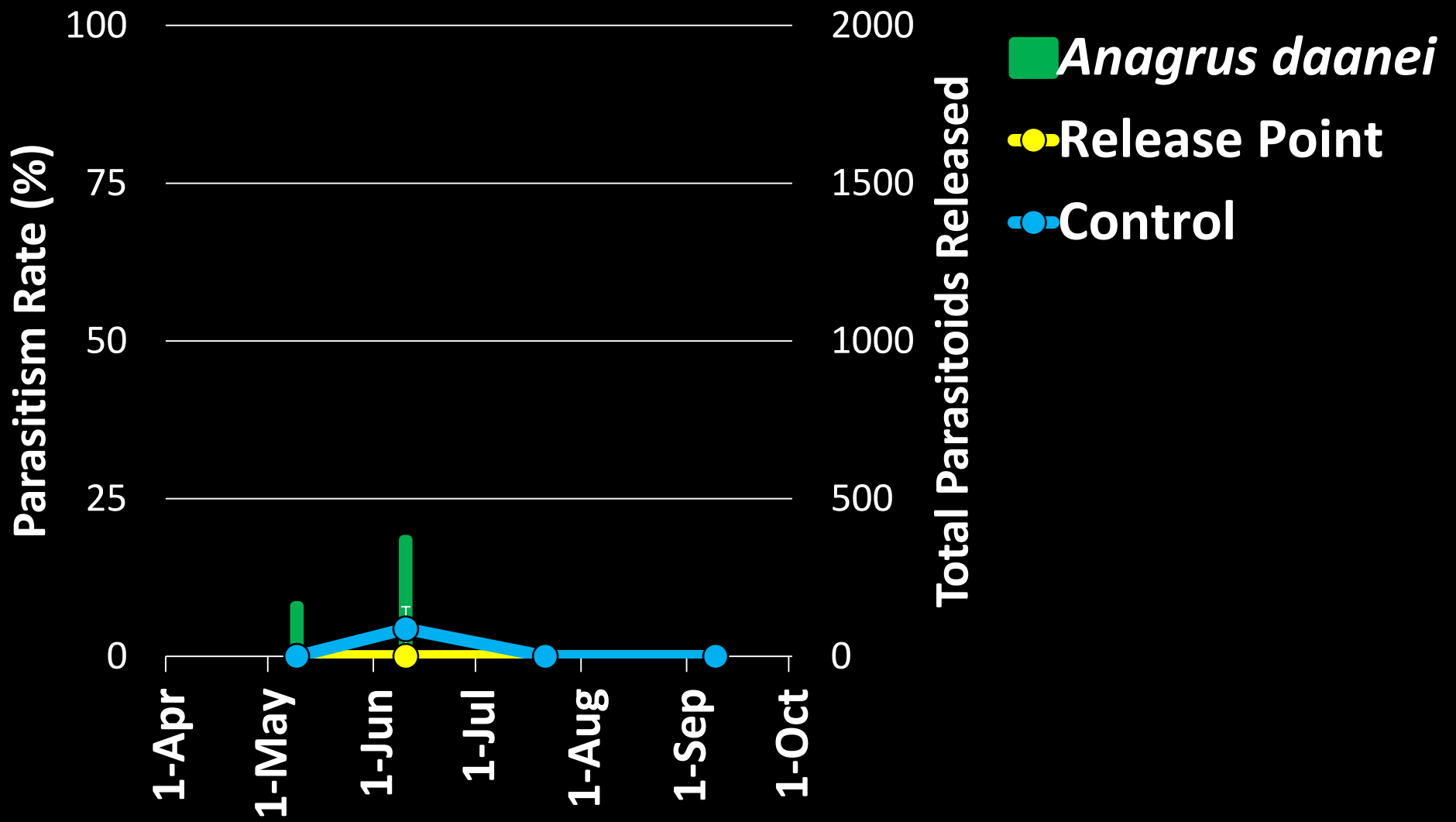
Releases are Early, Frequent ~~and Abundant~~



VCLH Area-wide IPM Project

Establish Biological Control

Releases are Early, ~~Frequent and Abundant~~



VCLH Area-wide IPM Project

Current Status and Plans for 2017

Short-term Goal – Triage Outbreaks ✓

- Pest ID, ecology, varietal preferences, regional hot spots
- Monitoring, spray timing, product selection

Long-term Goal – Establish Biological Control

- Identified and evaluated novel population of *A. daanei*
- Mass rear-release program now in progress

Plans for 2017

- Continue Regional Monitoring + Rear-Release Program
- Developing Pest ID posters (Spanish/English)

VCLH Area-wide IPM Project

Key Take-Aways – VCLH in Sierra Foothills

Monitoring

- Know Your Leafhoppers!
- Monitor Early in the Season
- Know Where to Look
  - Preference for Glabrous Leaves (Grenache, Chard. SB)
  - Preference for Vigorous Vines
- Earlier Egg Deposition = Earlier Nymphs

Management

- Limited Biological Control
- Overwintering Parasitoid Habitat = Blackberry
- Early Season Sprays are Critical – 1st generation nymphs

VCLH Area-wide IPM Project

Resources

Project Website – ucanr.edu/sites/vclh/

SHARE | EMAIL | PRINT | SITE MAP | Enter Search Terms

UC CE University of California Cooperative Extension

Virginia Creeper Leafhopper Areawide Project

- **Home**
- Project Background
- Monitoring and Newsletter
- Parasitoid Releases
- Project Reports
- VCLH in the News
- Leafhopper Identification Videos
- UC IPM Pest Management Guidelines
- Leafhopper Natural Enemies

Improving Control of the Virginia Creeper Leafhopper

Our Mission

This website provides information and resources related to on-going efforts by UC Cooperative Extension to improve biological control of the Virginia Creeper Leafhopper (*Erythroneura ziczac* Walsh) in Mendocino and Lake County wine grape vineyards.

Current VCLH Outbreaks in the North Coast

Since 2011, organic grape growers in Mendocino and Lake County have been experiencing severe outbreaks of the Virginia creeper leafhopper (*Erythroneura ziczac* Walsh) [Hemiptera: Cicadellidae]. Feeding by *E. ziczac* causes stippling of grape leaves which can reduce vine productivity and ultimately effect crop yield and fruit quality. Large adult populations of this pest can also be a nuisance to workers at harvest.

VCLH Area-wide IPM Project

Resources

Leafhopper Blog – ucanr.edu/blogs/leafhopperblog/

LEAFHOPPER BLOG

Regional monitoring and updates about leafhoppers in Mendocino and Lake County

Egg Deposition Continues, First VCLH Nymphs

Author: Houston Wilson **Published on: May 15, 2017**

Leafhopper egg deposition continues on both white and red varieties. Eggs of western grape leafhopper (WGLH) are now present at all of the monitoring sites.

Eggs of Virginia creeper leafhopper (VCLH) on white varieties are close to full maturity (eye spot is present) and we observed our first VCLH nymphs (1st instars) last week at the "Hopland" and "Ukiah/Talmage" sites (both are Chardonnay).

Nymph emergence will continue to increase in the coming weeks, so now is the time to start thinking about monitoring nymph populations in your vineyard. Leafhopper nymph identification guidelines are available here (video) and here (text version).

Due to the lack of biological control, effective early-season control of VCLH is critical. Based on

VCLH Area-wide IPM Project

Resources

UC IPM – ipm.ucanr.edu

UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES

UC IPM

Statewide Integrated Pest Management Program

HOME

SEARCH

ON THIS SITE

- What is IPM?
- Home & landscape pests
- Agricultural pests
- Natural environment pests
- Exotic & invasive pests
- Weed gallery
- Natural enemies gallery
- Weather, models & degree-days
- Pesticide information
- Research
- Publications

How to Manage Pests

UC Pest Management Guidelines

| All grape pests | All crops | About guidelines |

Grape

Leafhoppers

Scientific names:
Western grape leafhopper: *Erythroneura elegantula*
Variegated leafhopper: *Erythroneura variabilis*
Virginia creeper leafhopper: *Erythroneura ziczac*
(Reviewed 7/15, corrected 12/16)

In this Guideline:

- Description of the pests
- Damage
- Management
- Important links
- Publication
- Glossary

DESCRIPTION OF THE PESTS

The grape leafhopper is a pest of grapes north of the Tehachapi Mountains, especially in the San Joaquin, Sacramento, and North Coast valleys. It is also a problem in warmer, interior Central Coastal valleys. The variegated leafhopper is the major pest of grapes in southern California and in the Central Valley as far north as San Joaquin County. Variegated

Houston Wilson – Houston@Berkeley.edu

Project Website – ucanr.edu/sites/vclh/
Leafhopper Blog – ucanr.edu/blogs/leafhopperblog/
UC IPM – ipm.ucanr.edu/

Acknowledgements:

[Funding] CA Department of Pesticide Regulation, American Vineyard Foundation; [UCCE] Lucia Varela, Kent Daane, Glenn McGourty, Monica Cooper, Lynn Wunderlich; [UCR] Serguei Triapitsyn, Richard Stouthamer, Paul Rugman-Jones; [Growers/PCAs] Numerous growers/PCAs throughout the North Coast.