Update on potato psyllids and zebra chip in Idaho – Dec 2015





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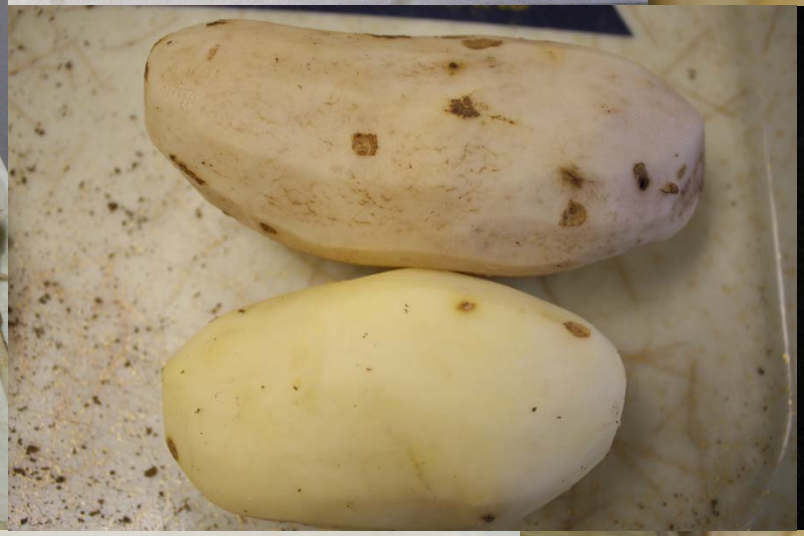
Zebra chip (ZC) disease

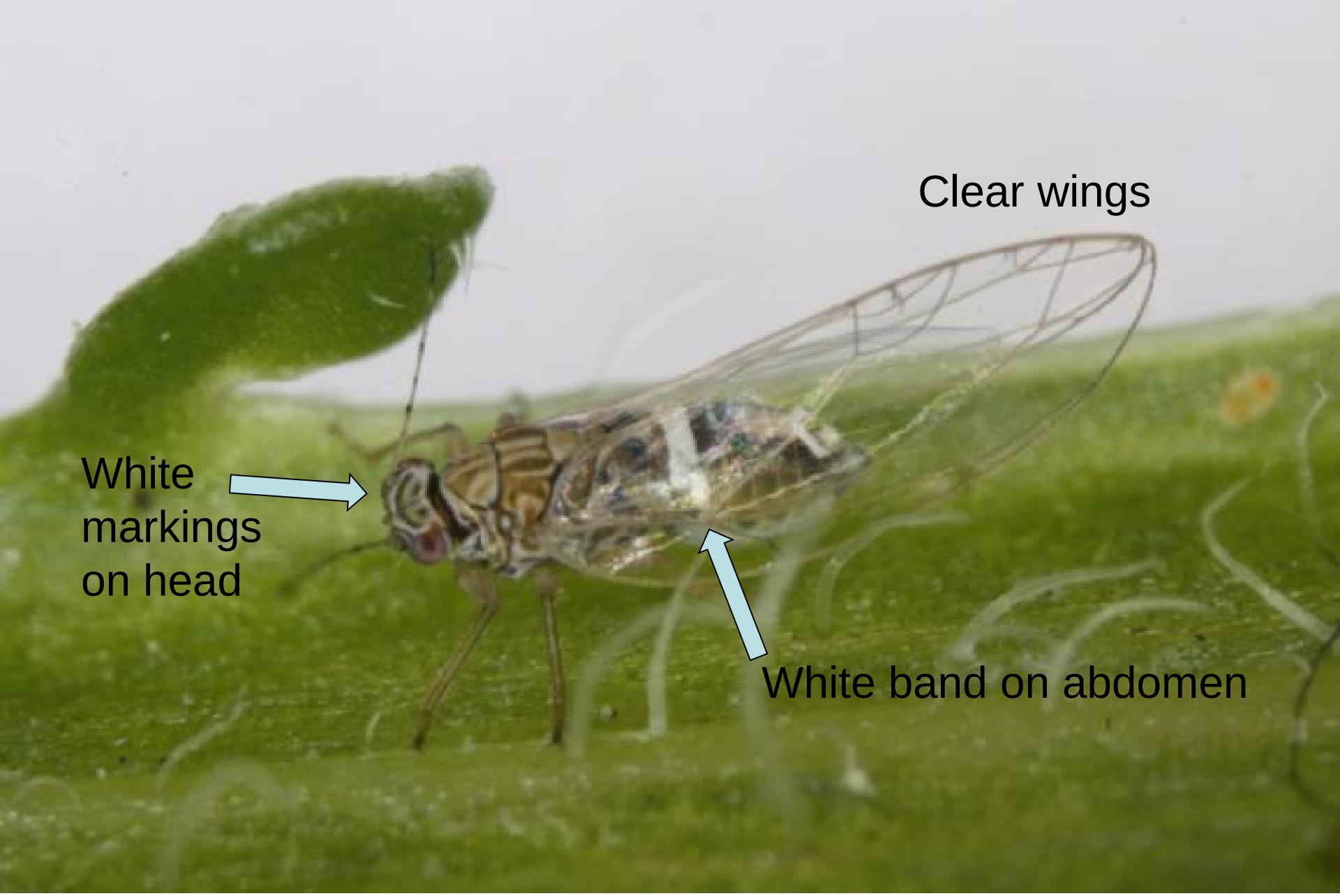
- Disease caused by bacterium (*Candidatus* Liberibacter solanacearum [Lso])
- Bacterium vectored by the potato psyllid (*Bactericera cockerelli*)


8 45 zc
9 48 ESM Curing
4 wt loss



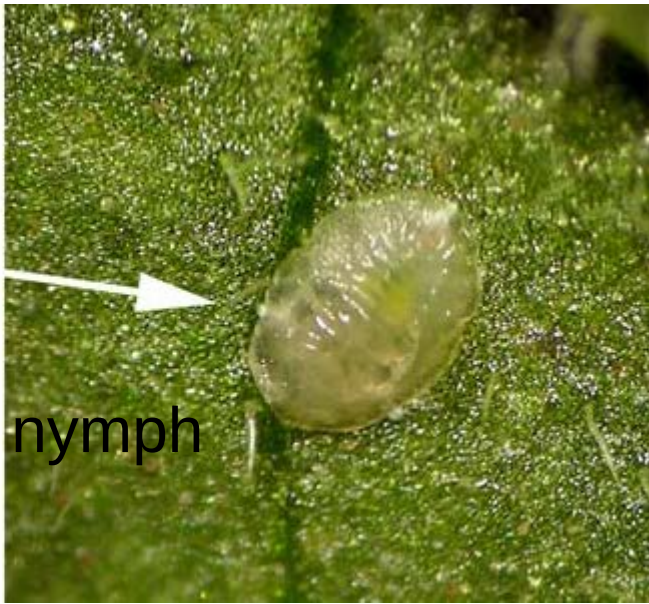
(5 nymphal instars)

- 1 generation = 2-3 wks
- 77-86 F = optimum temp


Clear wings
White markings on head
White band on abdomen

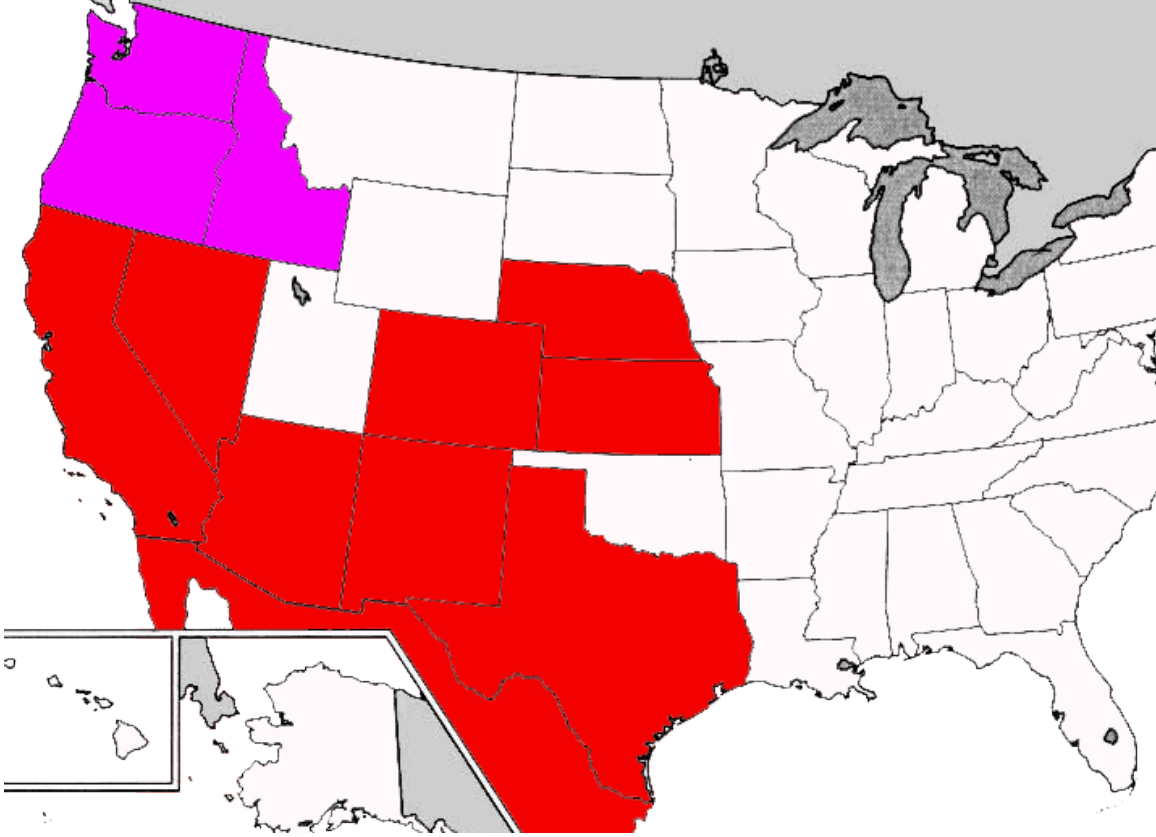
Potato psyllid nymphs

Psyllid nymphs and adults on a penny for size reference.



Whitefly nymph

A brief history of ZC



- 1994 – Mexico
- 2000 – Texas
- 2000… – Southern regions and CA
- 2008 – bacterium identified
- 2011 – PNW
- (Also present in New Zealand and C. America)

A brief history of ZC in Idaho

ZC in ID;
ca. 1% incidence;
mostly Magic Valley

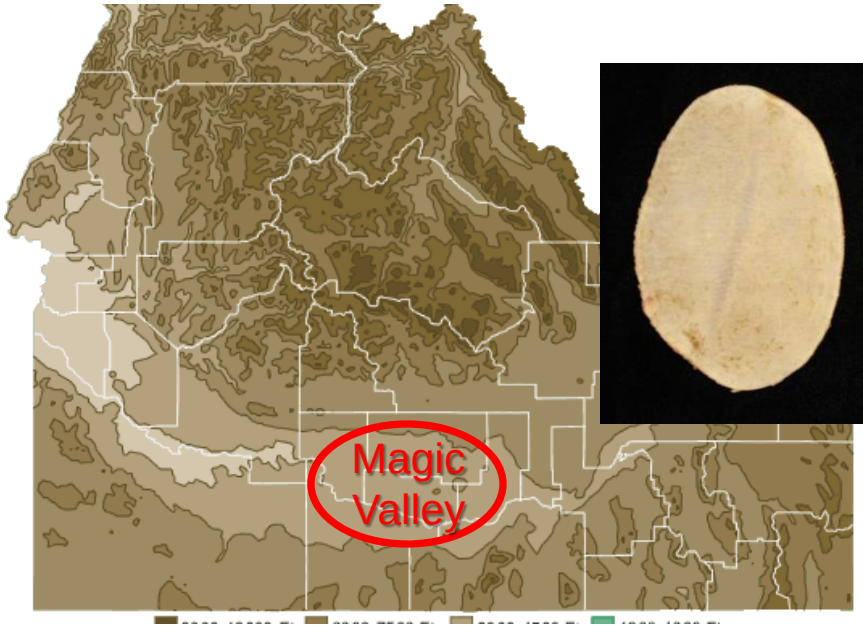
Monitoring program expanded

ZC incidence nil

ZC incidence nil

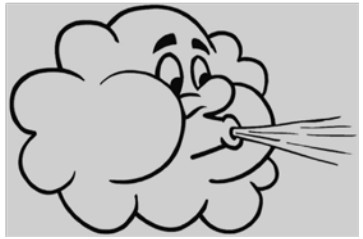
2011	2012	2013	2014	2015

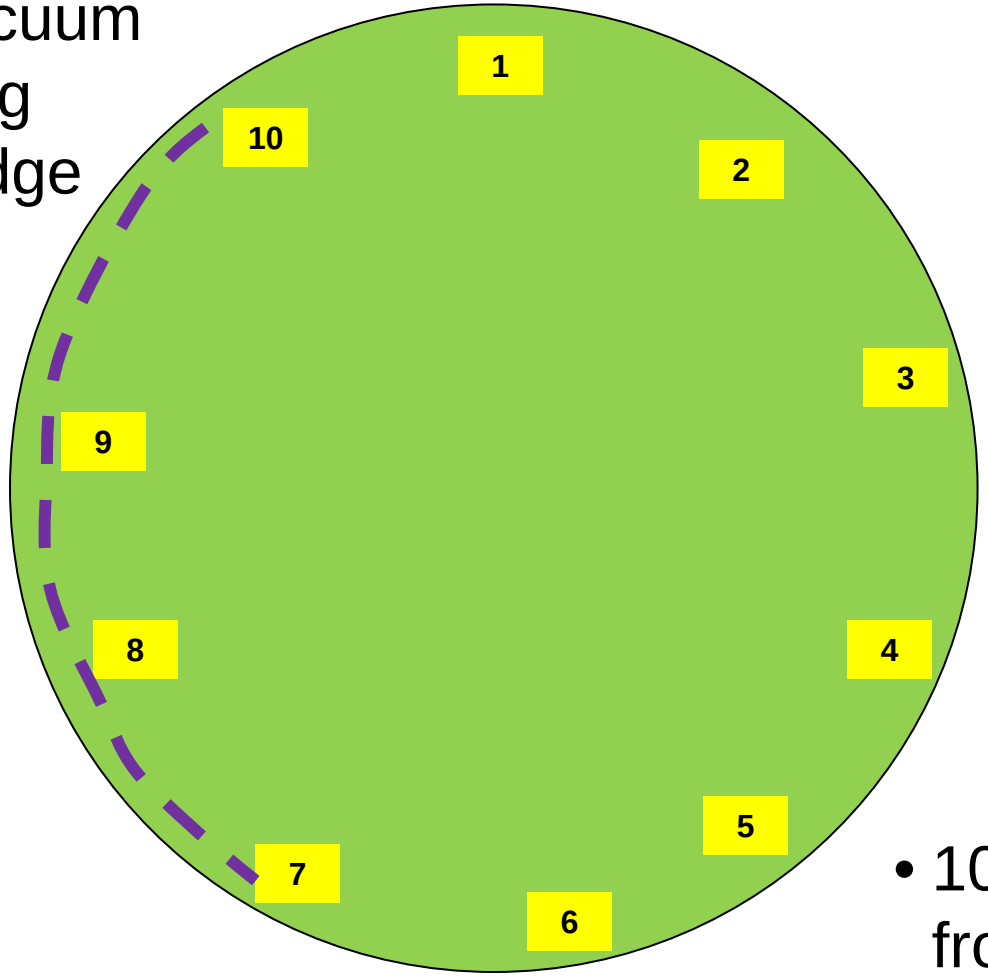
monitoring began;
ca. 1% incidence,
some 3-15+%;
mostly Magic Valley

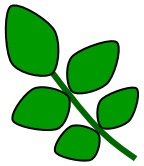


- 10 sticky traps per field arranged around perimeter

- 5-minute vacuum sample along windward edge



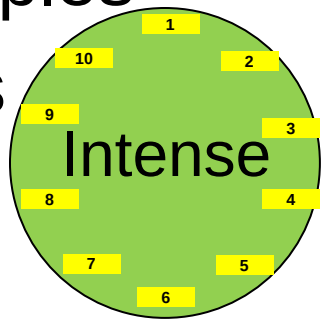


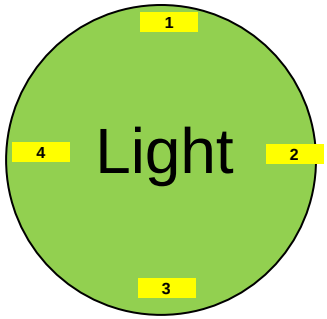


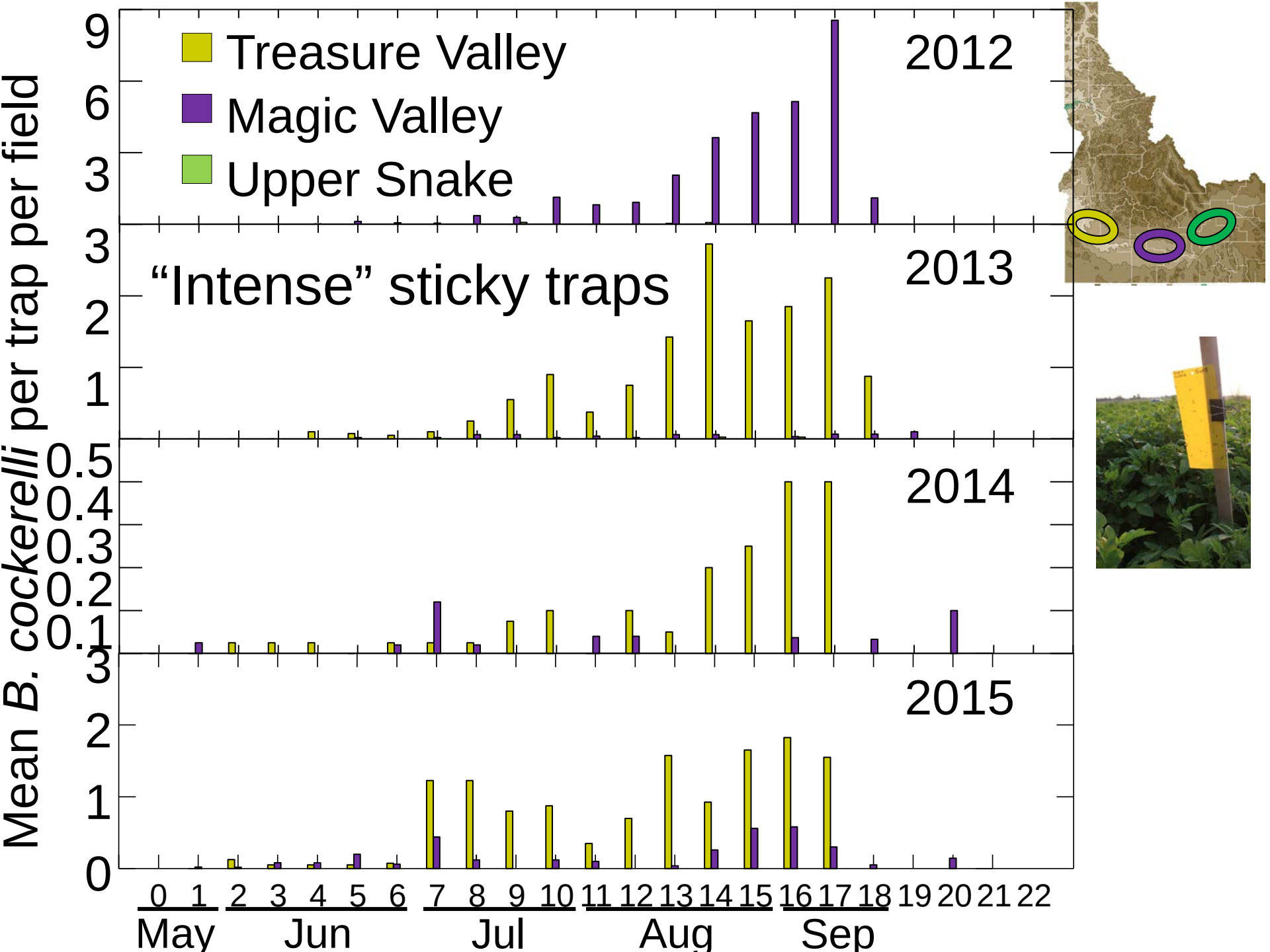
- 10 leaf samples from each sticky card station (100 leaves per field)

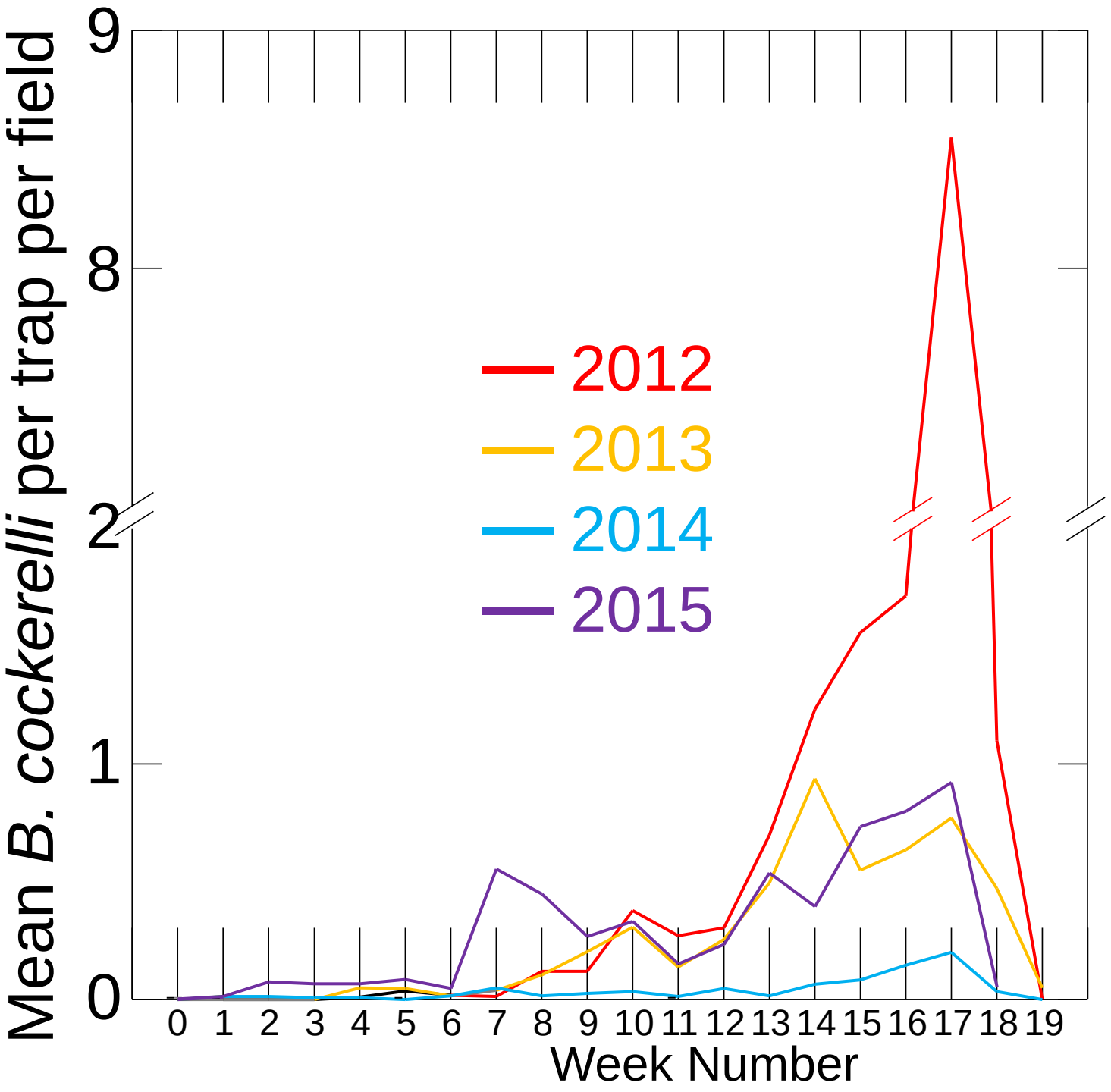
2012-2015 Monitoring programs

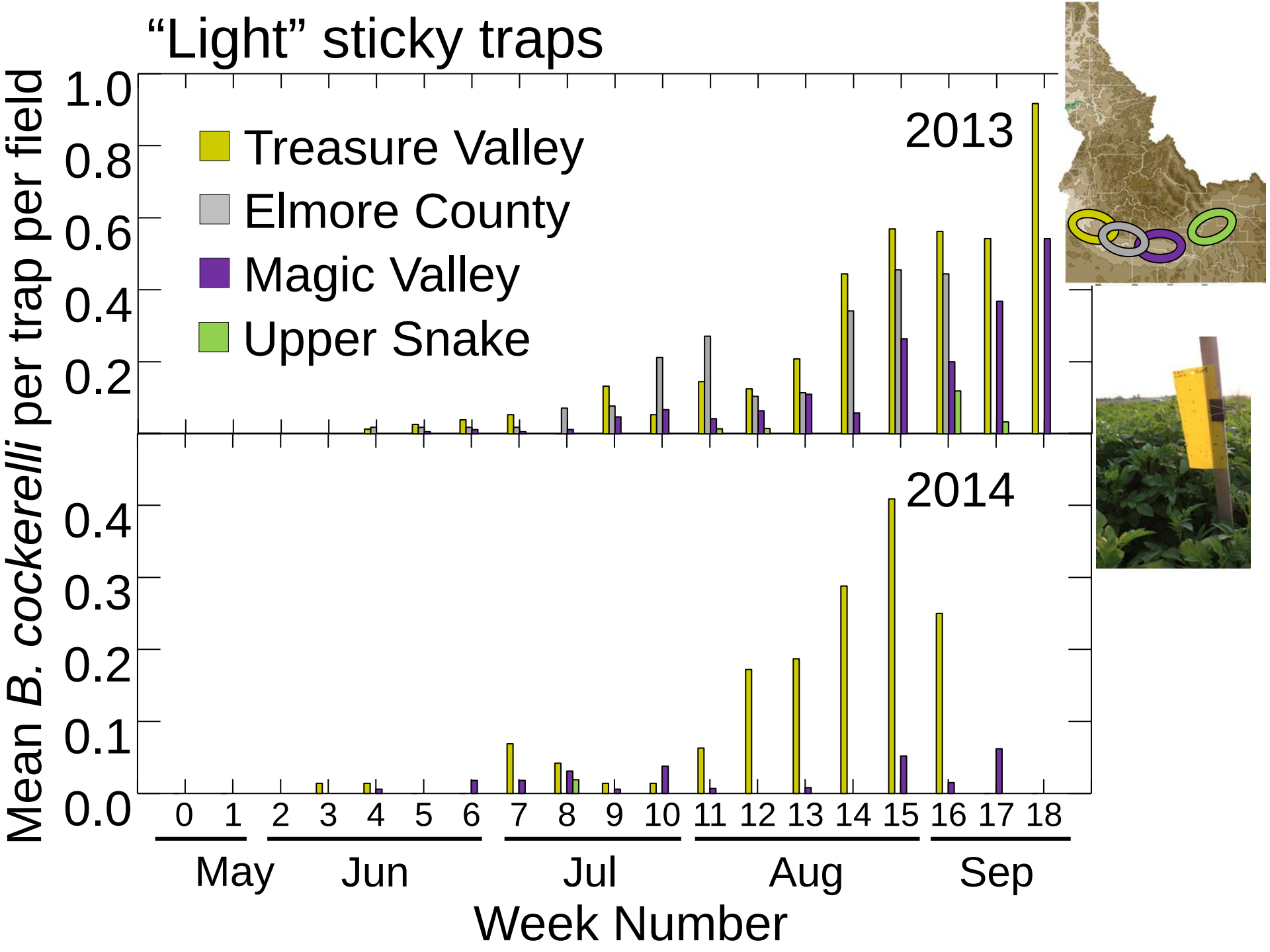
- “Intense” program
  - 13 fields
  - Weekly sampling
  - 10 sticky traps per field
  - Vacuum samples
  - Leaf samples
- “Light” program
  - 71-94 fields
  - Weekly sampling
  - 4 sticky traps per field






Mean B. cockerelli per trap per field
Treasure Valley
Magic Valley
Upper Snake
2012
2013
2014
2015
"Intense" sticky traps
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
May
Jun
Jul
Aug
Sep


Mean B. cockerelli per trap per field
9
8
2
1
0
2012
2013
2014
2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Week Number


"Light" sticky traps
Mean B. cockerelli per trap per field
1.0
0.8
0.6
0.4
0.2
Treasure Valley
Elmore County
Magic Valley
Upper Snake
2013
2014
0.4
0.3
0.2
0.1
0.0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
May
Jun
Jul
Aug
Sep
Week Number

Mean *B. cockerelli* per sample per field

Treasure Valley
Magic Valley
Upper Snake

2012

“Intense” vacuum samples

2013

2014

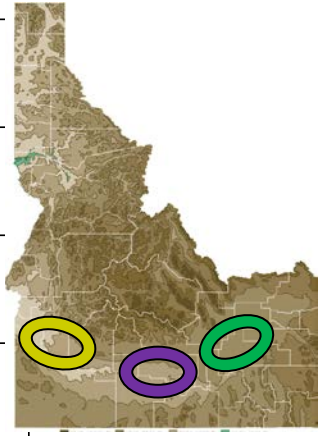
0 1 2 3 4

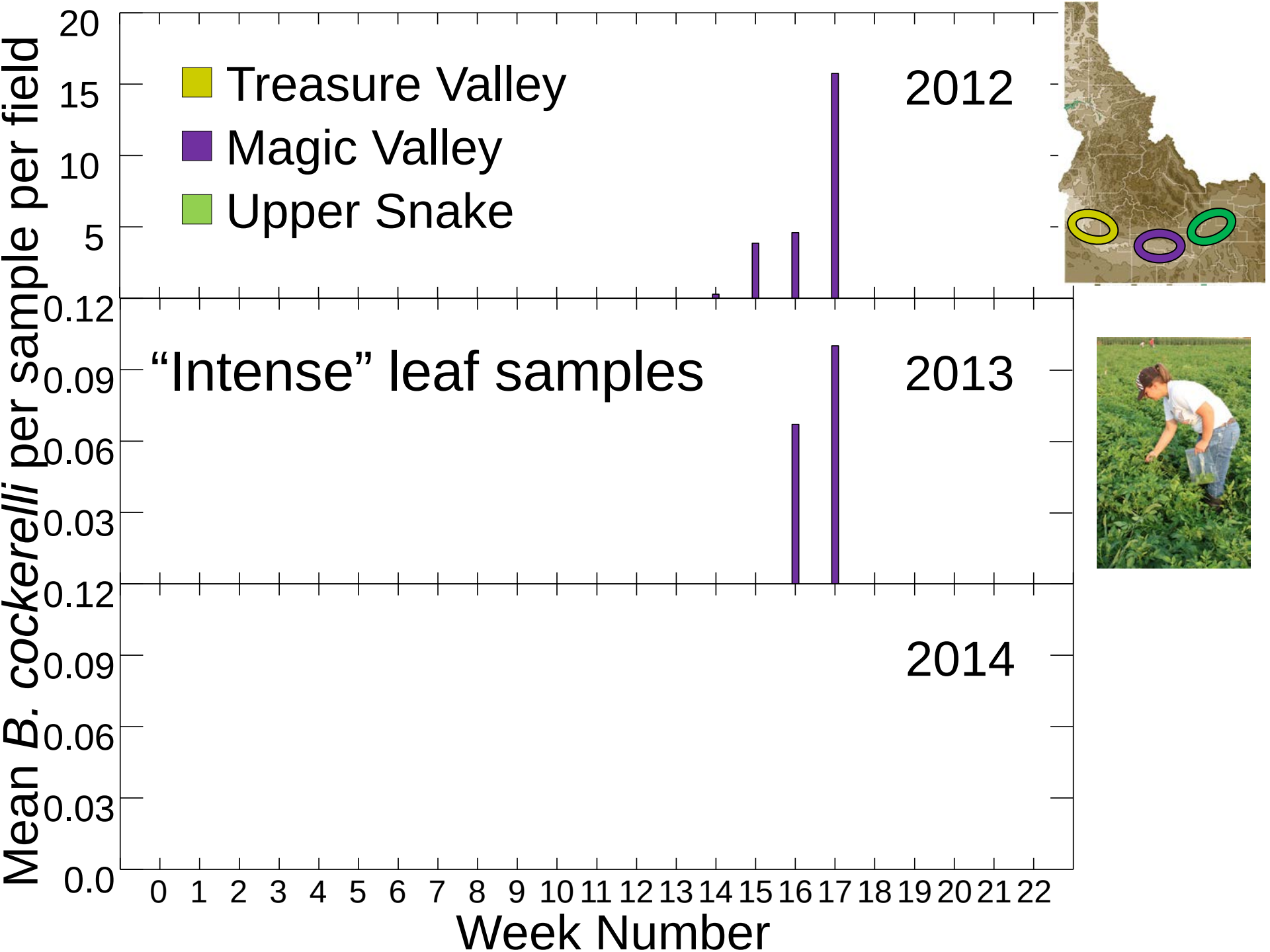
0 1 2 3 4

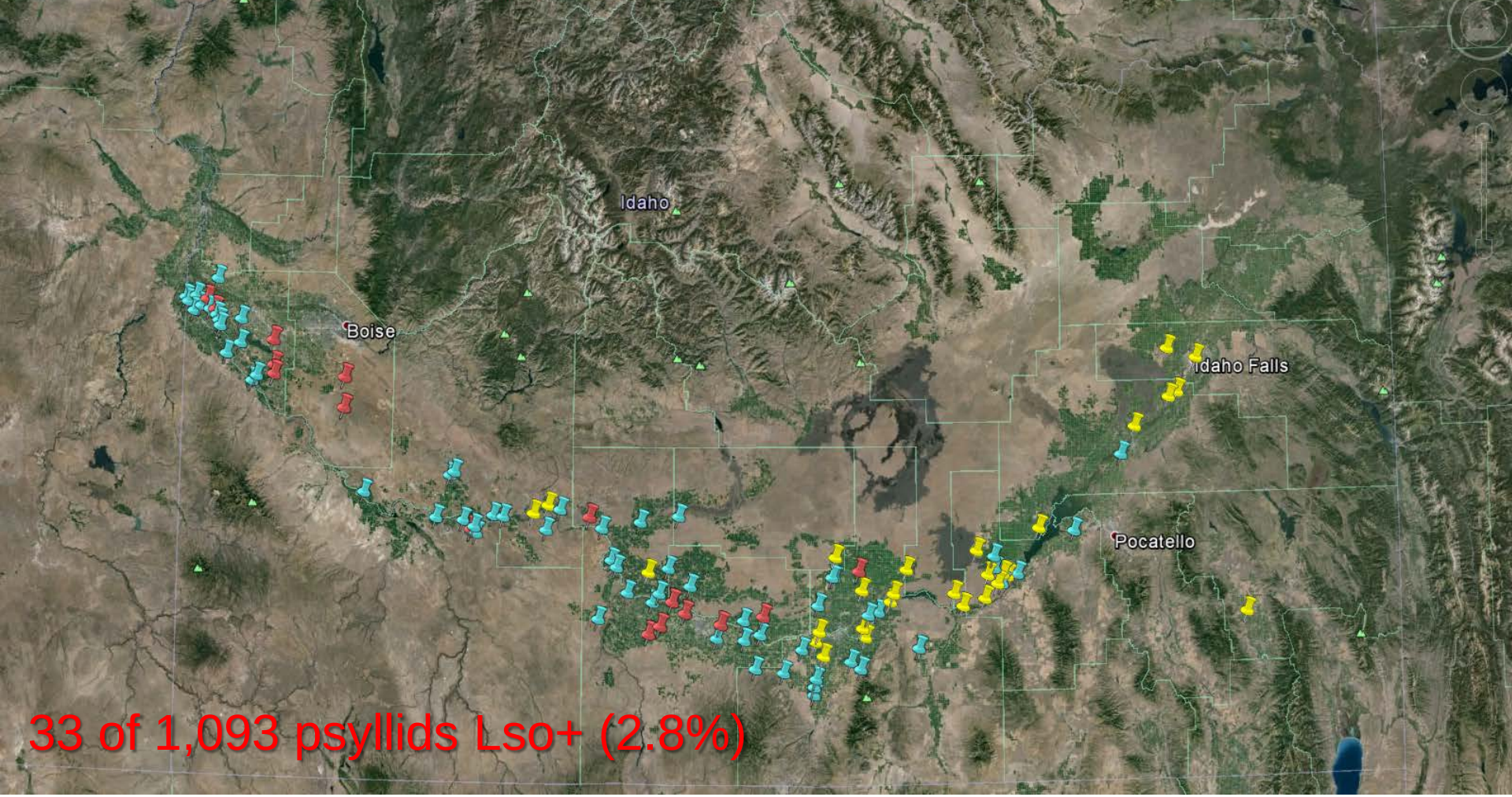
0 1 2 3 4

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Week Number




Mean B. cockerelli per sample per field
20
15
10
5
0.12
0.09
0.06
0.03
0.12
0.09
0.06
0.03
0.0
Treasure Valley
Magic Valley
Upper Snake
2012
"Intense" leaf samples
2013
2014
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Week Number



Full Season, 2013

No psyllids

≥1 cold psyllid

≥1 hot psyllid

	2012	2013	2014	2015
Total sites	15	14 + 94 = 108	13 + 75 = 88	13 + 71 = 84
Traps per week (approx.)	150	516	430	414
Weeks of trapping	19	19	19-22	18-22
Total psyllids on sticky cards	1,603	1,093	170	1,126
Total psyllids tested for Lso	1,073	1,093	170	1,126
Lso positive psyllids	250	33	4	39
% Lso positive	23.3%	2.8%	2.4%	3.5%
Total cards read (approx.)	2,850	9,804	8,560	7,452
Psyllids per card (approx.)	0.56	0.11	0.02	0.15

ca. 8 times higher incidence of Lso in 2012 vs. 2013-2015

ca. 5-fold drop in psyllid abundance each year until 2015

Where do potato psyllids come from?

- Native to North America (west of Mississippi)
  - Overwinter in southern US / northern Mexico and migrate north with high temperatures (?)
  - Greenhouses?
  - Overwinter in PNW
    - feed on plants in >20 plant families

Where do potato psyllids come from?

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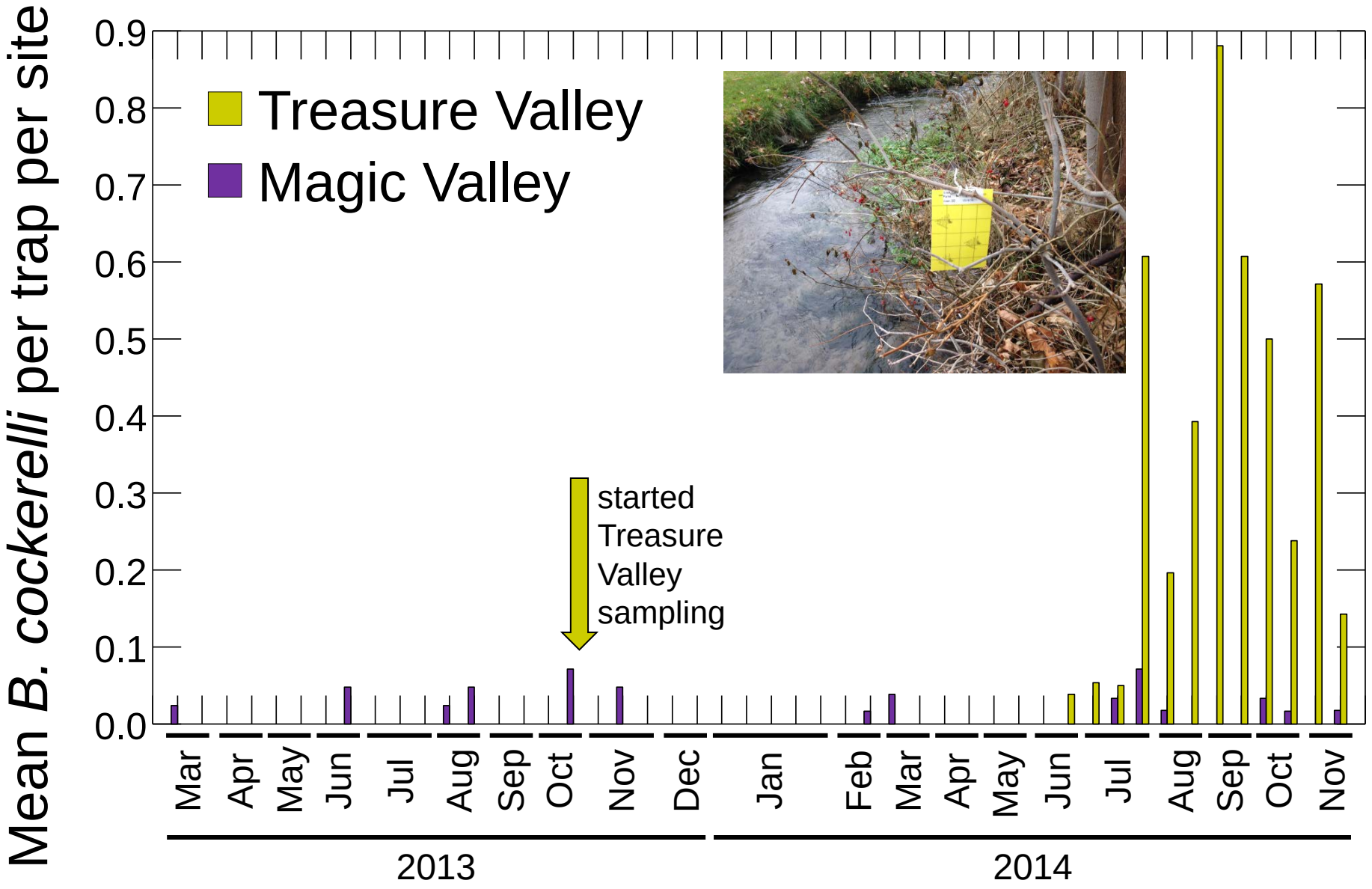
  - Overwinter in southern US / northern Mexico and migrate north with high temperatures (?)
  - Greenhouses?
  - Overwinter in PNW
    - feed on plants in >20 plant families

Adults observed overwintering in PNW on bittersweet nightshade during winters of ‘12, ‘13, ’14, ‘15

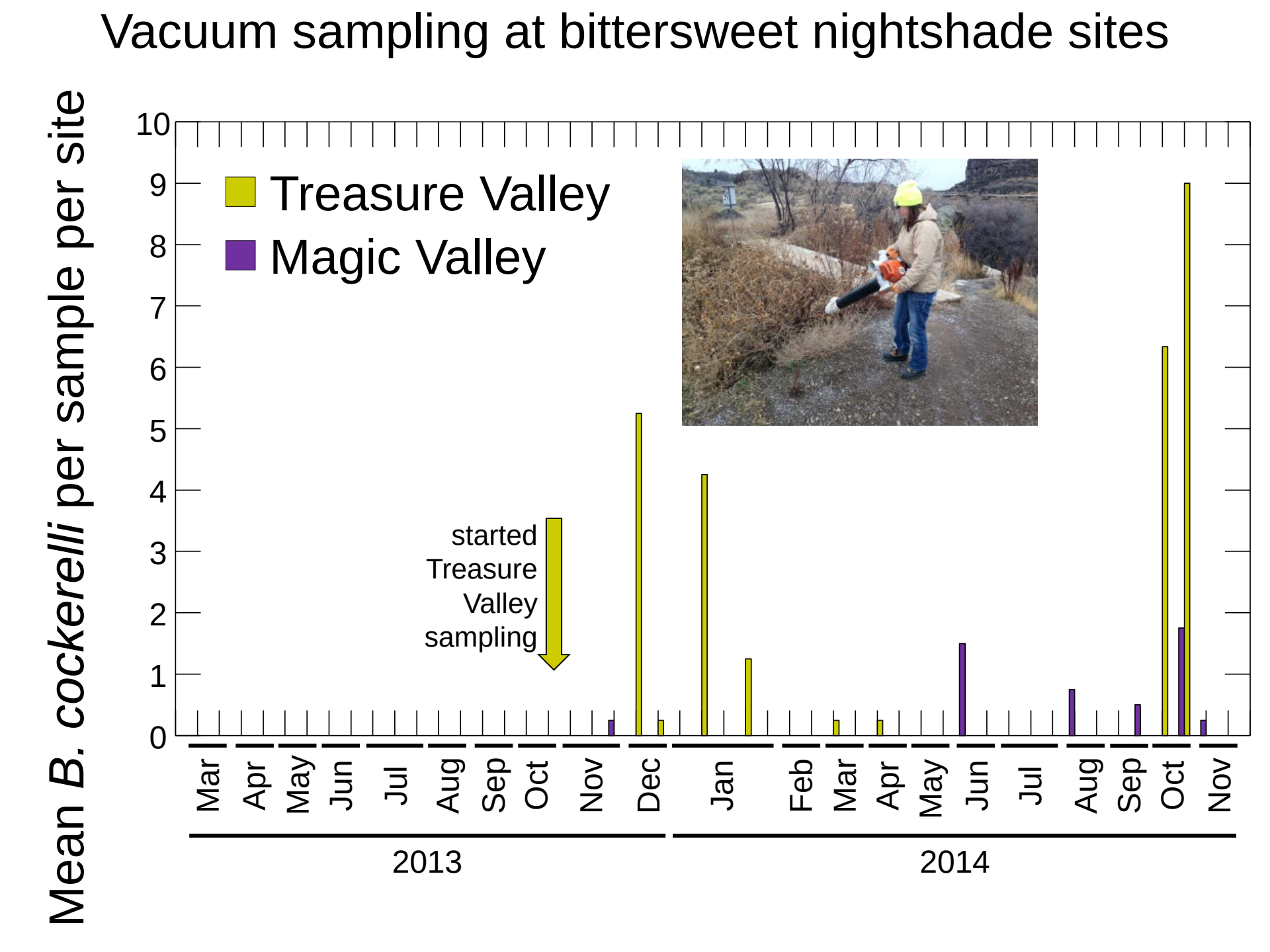
Off-season psyllid monitoring

- Started during Spring 2013
- Magic Valley: 4-5 sites
- Treasure Valley: 4 sites
- Sticky cards and vacuum samples
- Fortnightly sampling

Sticky card sampling at bittersweet nightshade sites



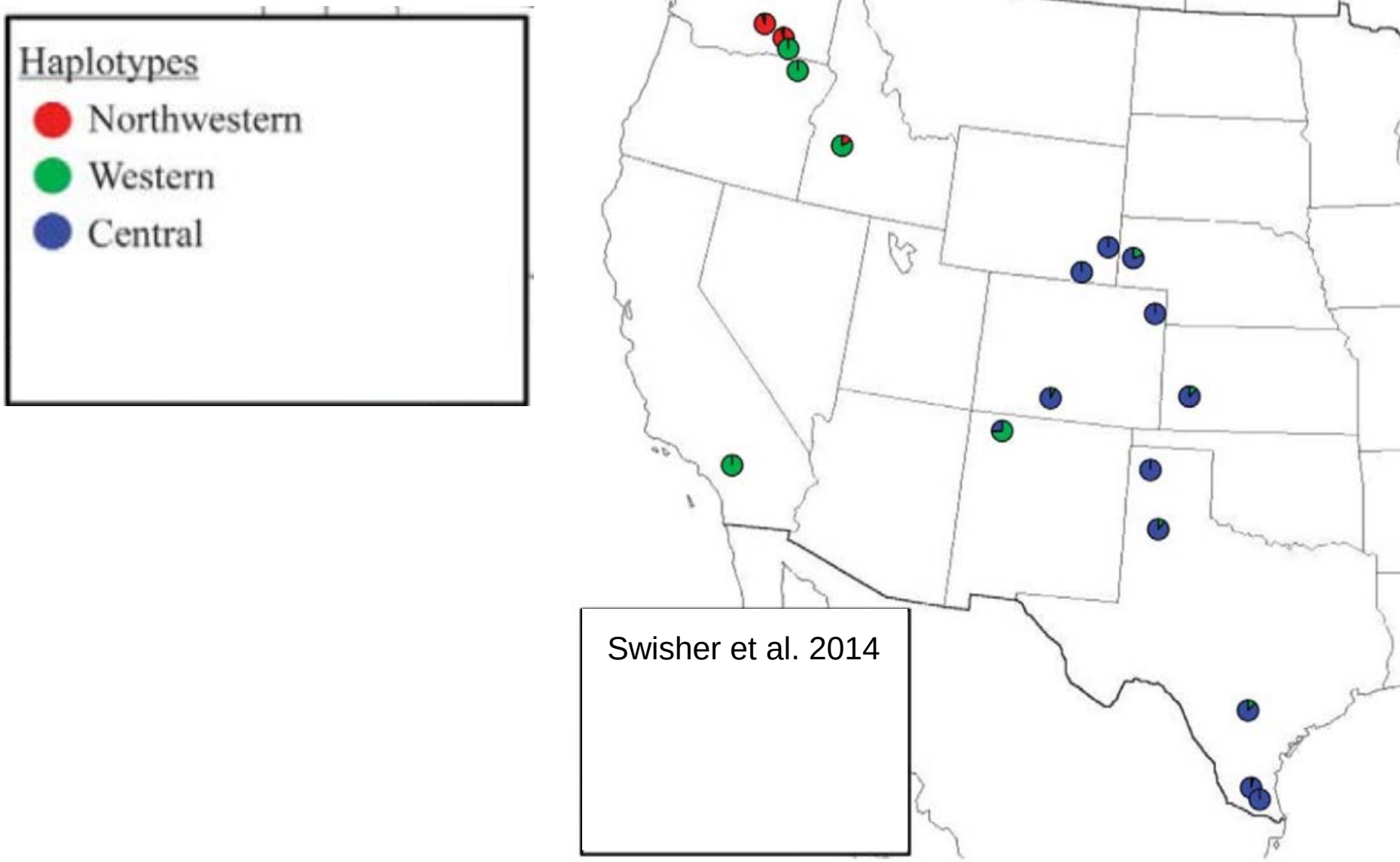
Vacuum sampling at bittersweet nightshade sites



Alternative host plants

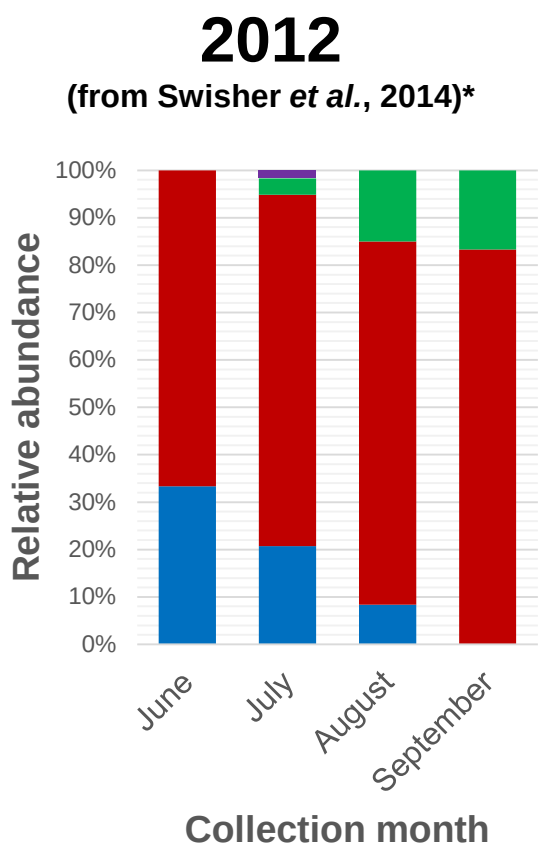
- Greenhouse trials screening various weeds, crops, and native plants for suitability as hosts to potato psyllids

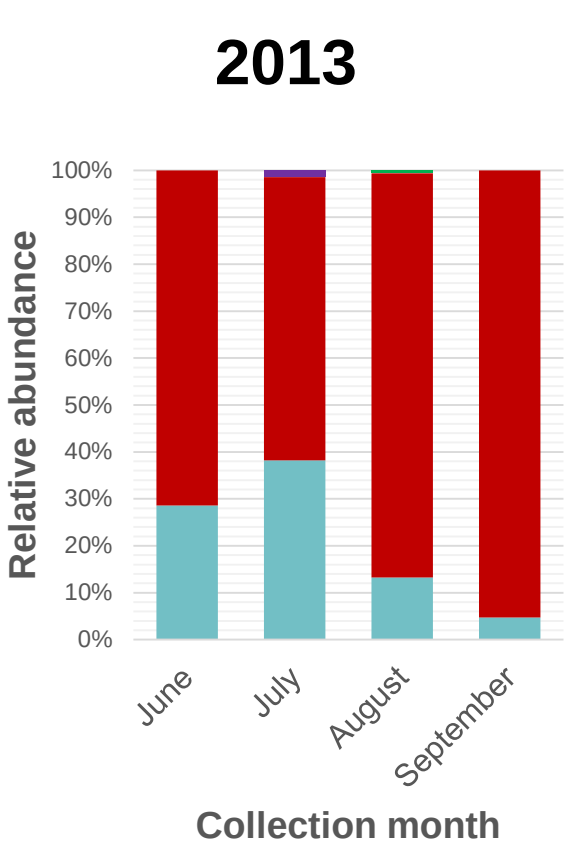
Potato psyllid haplotypes (biotypes)

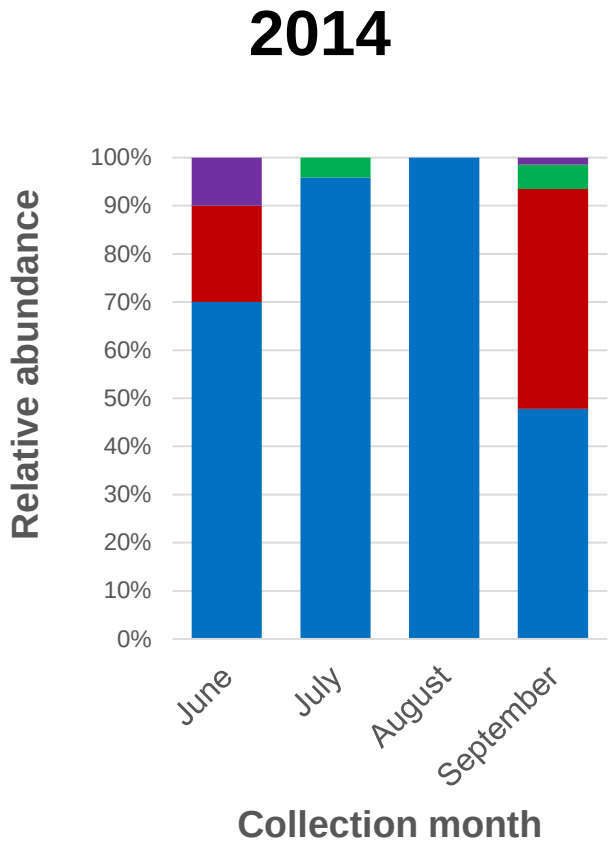


Swisher et al. 2014

Relative abundance of each haplotype





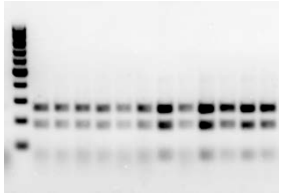


** Swisher et al., Am. J. Potato Res. (March 2014)*

Lso haplotyping : results

2012

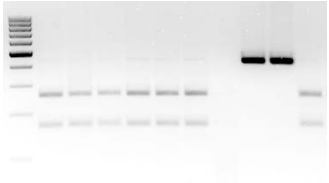
75% of the Lso samples haplotyped



All are **hapA**

2013

50% of the Lso samples haplotyped

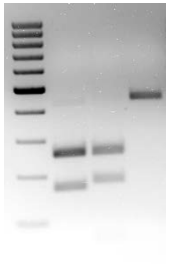


Most are hapA
But **2 are hapB**

First description of Lso hapB in Idaho

2014

4/5 Lso samples haplotyped



2 hapA, 2 hapB

hapB increasing?

Conclusions

- Psyllid phenology related to elevation / temperature gradient across Idaho
- Psyllids: 2012 > 2013 > 2014… 2015
- Lso high in 2012; more "typical" 2013-2015
- ZC nil 2013-2014
- Suggests monitoring program is effective at predicting ZC risk
- Early psyllids in 2015 → ZC?

www.uidaho.edu/extension/news/psyllid-management/2015-updates

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2015 Updates

2015 potato psyllid monitoring detailed results, updated as we receive them:

- "Light" fields, monitored with 4 sticky traps
- "Intense" fields, monitored with 10 sticky traps, vacuum samples, and leaf samples

Weekly s

Octo Mini

Mon

Sept

Sept

Sept Lso p

Augu

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Update of potato psyllid monitoring in Idaho

Potato All Locations
potato psyllids
Posted on: September 18, 2015 by Erik Wenninger

Abundance of potato psyllids in potato fields in Idaho appears to be lower than last week, with 85 total psyllids captured on sticky cards and vacuum samples thus far (versus 139 captured last week). Several of our "Intense" cards from the Treasure Valley will be processed Monday next week and updated results will be posted at the links below. Captures came from the following counties: Canyon, Ada, Owyhee, Gooding, Twin Falls, Jerome, Minidoka, and Cassia.

Many of our sites, including nearly all of the "Light" sites have been vine killed or harvested and will no longer be sampled.

None of the psyllids that were captured last week was positive for liberibacter (Lso), the bacterium that causes zebra chip, though a few psyllids remain to be tested.

Potato psyllid captures from our bittersweet nightshade sites in the Treasure Valley that arrived late last week were markedly lower than the previous fortnightly sample, with only 4 psyllids found (this is in contrast with the 54 psyllids that we reported on capturing in the Magic Valley sites).

A Pacific Northwest Extension Publication

Oregon State University • University of Idaho • Washington State University

PNW 633 • June 2012

Potato Psyllid Vector of Zebra Chip Disease in the Pacific Northwest

Biology, Ecology, and Management

Silvia Rondon[1], Alan Schreiber[2], Andrew Jensen[3], Philip Hamm[1], Joseph Munyaneza[4], Phillip Nolte[5], Nora Olsen[6], Erik Wenninger[7], Don Henne[8], Carrie Wohleb[9], and Tim Waters[10]

Zebra chip (ZC) is a destructive disease of potatoes emerging in North America and other parts of the world. The disease has been very costly to manage in potato crops and has caused millions of dollars in losses to the potato industry in the southwestern United States, particularly Texas.

ZC was first recorded in Idaho and the Columbia Basin of Washington and Oregon late in the 2011 growing season. This area produces more than 50 percent of the potatoes grown in the United States, so the presence of ZC in the region has the potential to be economically devastating.

Rondon's Irrigated Agricultural Entomology Lab (A. Murphy). © Oregon State University.

Figure 1. Potato psyllid adult.

Brief history and distribution of ZC

ZC was first documented in potato fields around Saltillo, Mexico in 1994. In the early 2000s, the disease was reported in southern Texas, and by 2006 ZC had spread to all potato production areas in Texas. Since then, ZC has been found in Arizona, California, Colorado, Kansas, Nebraska, Nevada, New Mexico, Wyoming, Oregon, Washington, and Idaho. ZC is also found in Guatemala, Honduras,

Acknowledgements

- Idaho Potato Commission
- PNW Potato Research Consortium
- Idaho State Department of Agriculture
- Idaho Agricultural Experiment Station
- USDA-TASC
- Chemical industry
- Amy Carroll, Lynn Woodell, Lucy Standley, Jessica Vogt, Tasha Stanzak, Cheryn Clayton, Neyle Perdomo, Vince Adamson, Tucker Daley, Kortni Cox, Aaron Vogt, Carlie Wilkinson, Jesica Lowe, Kyanne Frandsen, Chelsea Stevens, Ethan Whitten, Kevin Robison, and Trent Taysom
- Jennifer Riebe, Tom Salaiz, Drew Glascock, Katherine Long, Megan Williams, Paul Stukenholtz, Janan Claiborn, Dusty Danos