Beet Leafhopper and the Pathogens it Spreads to Crops in the Columbia Basin

Beware if you grow… Bean, Carrot, Pepper, Potato, Tomato, Sugar Beet, Squash or Melon, or Seed Crops

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WSU Extension, Moses Lake, WA



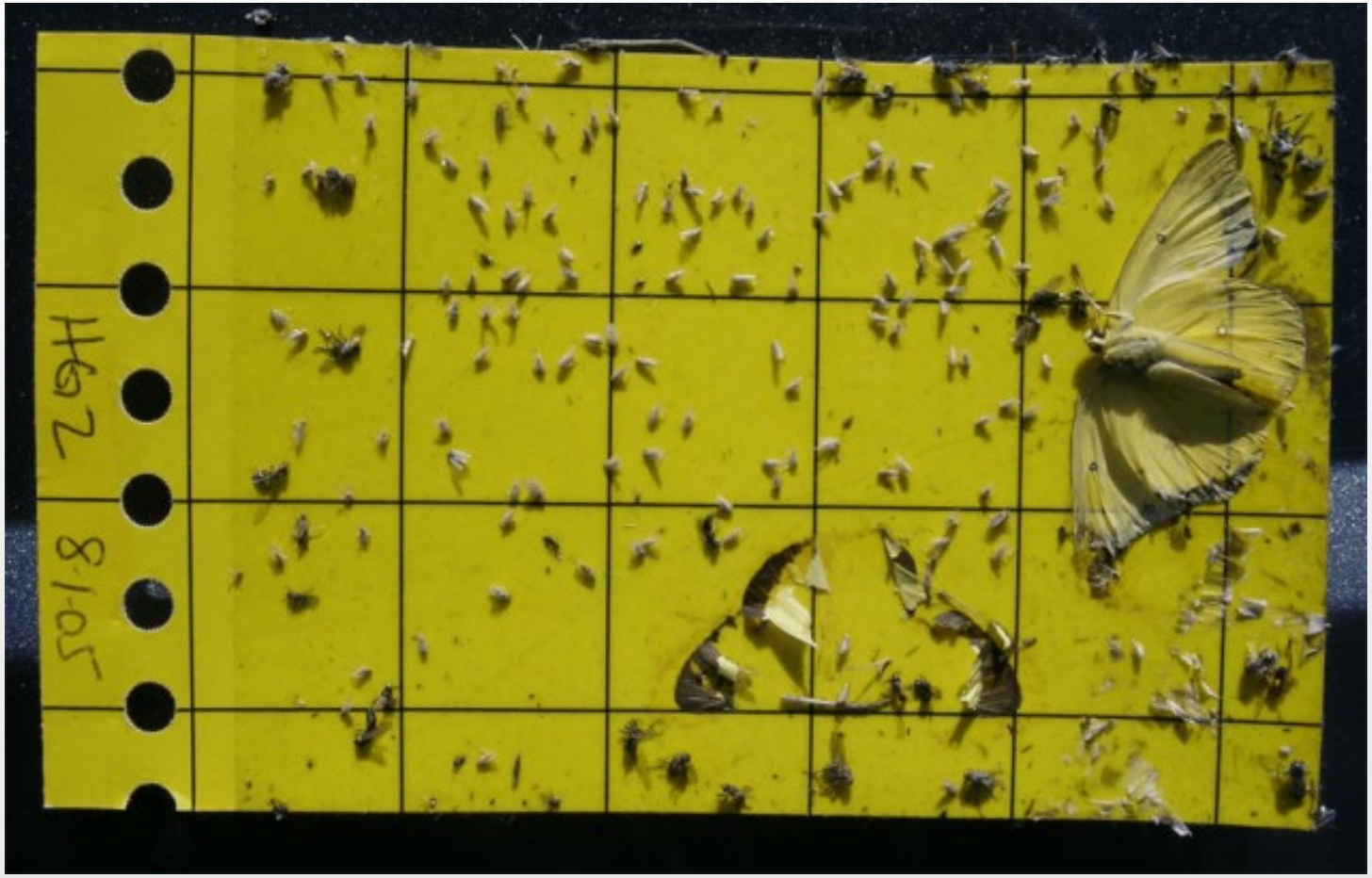




BEET LEAFHOPPER (*Circulifer tenellus*)

Paul Langlois, USDA APHIS, Bugwood.org

BEET LEAFHOPPER (*Circulifer tenellus*)



WHICH ARE THE BEET LEAFHOPPERS?

Andy Jensen, Northwest Potato Research Consortium

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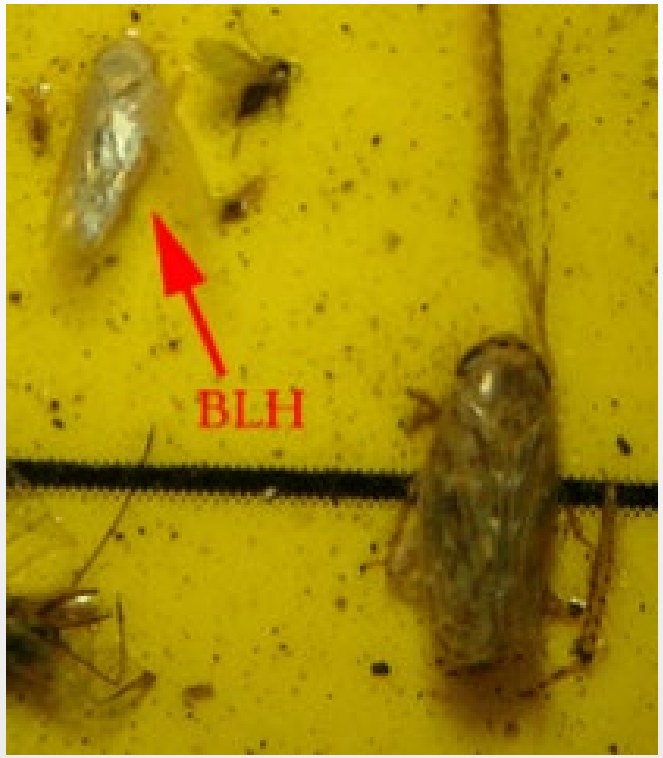
BEET LEAFHOPPER IDENTIFICATION

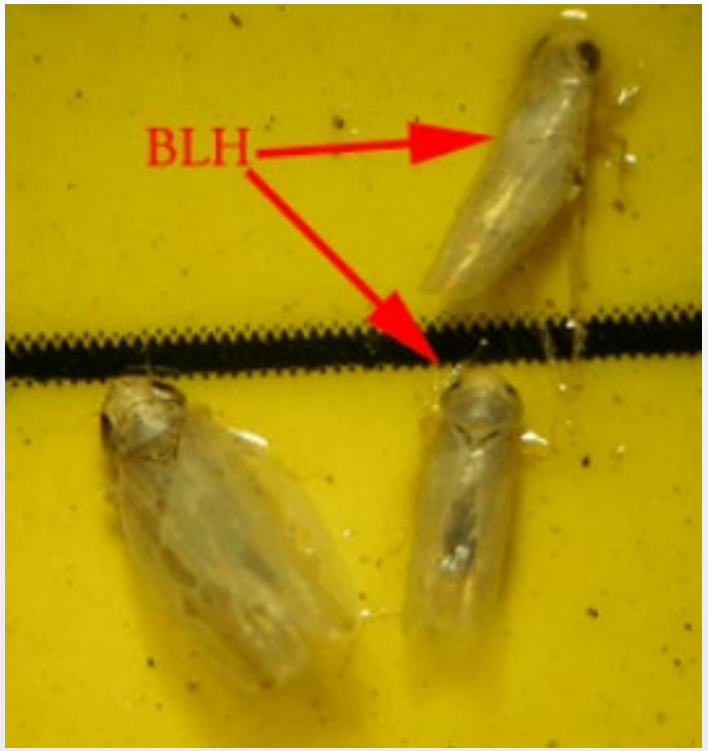
Light BLH

Dark BLH

Dark BLH

BEET LEAFHOPPER IDENTIFICATION





BEET LEAFHOPPER IS AN IMPORTANT PEST

- Primarily a desert species, in the Western U.S. (also in British Columbia, Mexico, South America, Asia, and Mediterranean Europe).

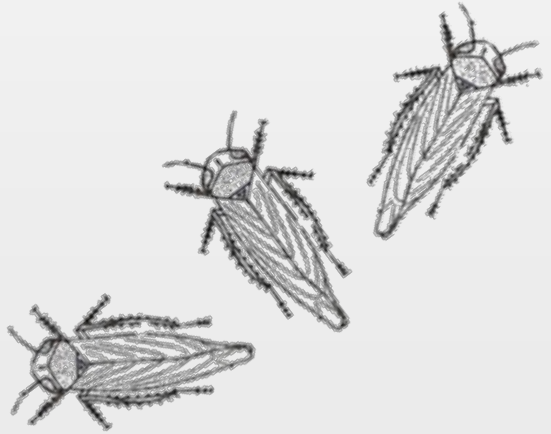
- Beet leafhopper is a pest of several crops grown in the Columbia Basin.
  - dry beans and snap beans
  - radish and other crucifers
  - table beets and sugar beets
  - squash and melons
  - carrot and other parsley family
  - potatoes, tomatoes, peppers and eggplant

- Beet leafhopper is an important pest because it is a disease vector.

The *Beet Curly Top Virus*

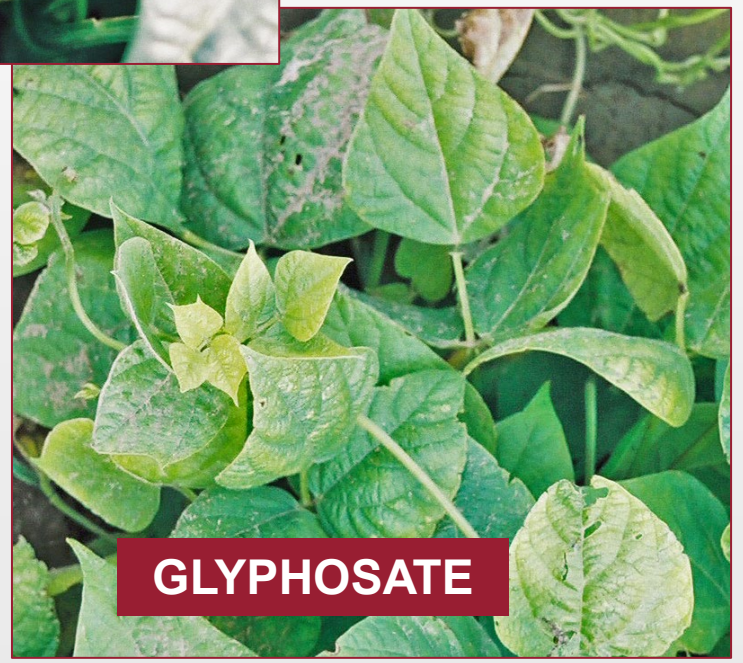
- Transmitted exclusively by beet leafhoppers.

- Sustained on a wide range of crop and weed hosts (over 300 plant species in 44 families) including:
  - Sugar beet
  - Pepper
  - Tomato
  - Bean
  - Melons and squash
  - and numerous weed hosts



***Beet Curly Top Virus* (BCTV):** Curly Top Beans

Beet Curly Top Virus **(BCTV):** Curly Top in Beans



Curly Top or Herbicide Injury?

***Beet Curly Top Virus* (BCTV):** Curly Top in Sugar Beet

Oliver T. Neher, The Amalgamated Sugar Company, Bugwood.org

Beet Curly Top Virus **(BCTV):** Squash

Bob Hammon, Colorado State University, Bugwood.org

***Beet Curly Top Virus* (BCTV):** Tomato

Beet Curly Top Virus (BCTV): Coriander Seed Crop

Photos by Dr. Lindsey du Toit, WSU Mount Vernon, NWREC.

Beet Curly Top Virus **(BCTV):** Coriander Seed Crop

Beet Leafhopper-Transmitted Virescence Agent (BLTVA)

Potato Purple Top Disease

Beet Leafhopper-Transmitted Virescence Agent (BLTVA)

BLTVA in Carrot (Root Crop)

Lindsey du Toit, WSU Plant Pathology

Beet Leafhopper-Transmitted Virescence Agent (BLTVA)

BLTVA in Carrot Seed

NORMAL vs. PHYLLODY

Photos by Dr. Lindsey du Toit, WSU Plant Pathology.

Beet Leafhopper-Transmitted Virescence Agent (BLTVA)

Tomato Big Bud Disease

Photos by Parthasarathy Seethapathy, Amitra School of Agriculture, Bugwood.org

C. Wohleb, WSU (in Fresno, CA)

EARLY VS. LATE INFECTIONS

EARLY VS. LATE INFECTIONS
BLH-TRANSMITTED DISEASES

- Early infections cause stunting, and usually lead to death before seed or fruit production. >> no yield
- Late infections may only produce symptoms on newer growth. No stunting. Death is slower. The plant may still yield seed, fruits, roots, or tubers. >> lower yields and >> lower quality
- “Age-based resistance” – Plants are more susceptible to infection when they are young.

WITHIN FIELD DISPERSAL OF BEET LEAFHOPPERS

- **Preferred Hosts** – BLH disperse readily and feed for extended periods leading to efficient transmission of curly top.
  - Sugar beets and radish

- **Non-preferred Hosts** – BLH movement and feeding is limited, and disease incidence is spotty or on the edges of fields, except in years with very large populations.
  - Beans, carrot, cucurbits, pepper, potato, and tomato

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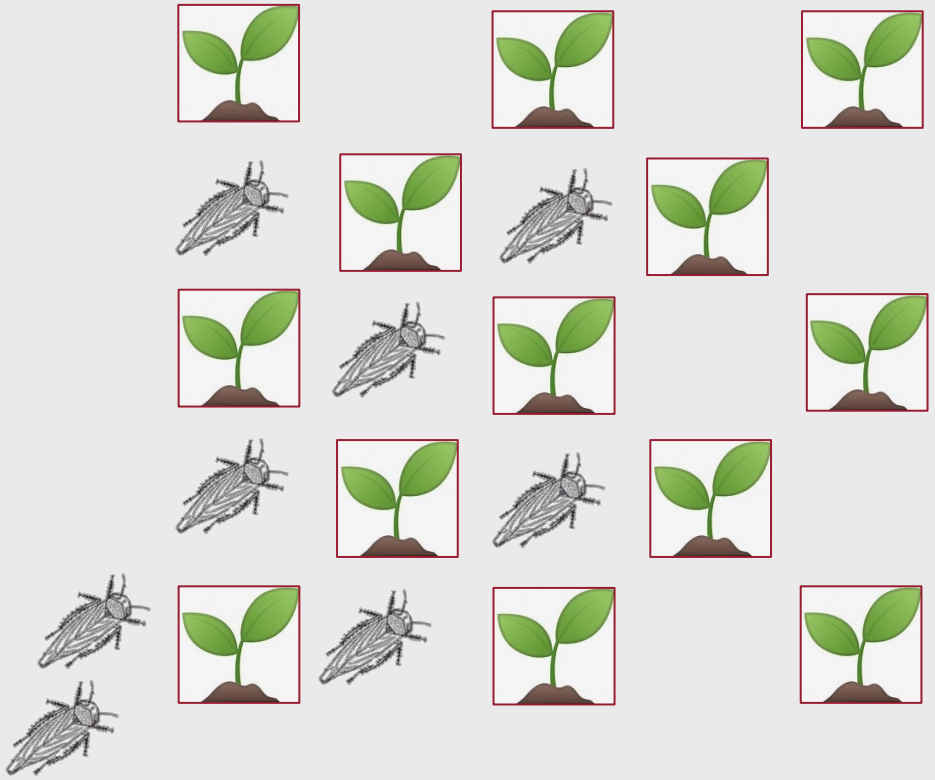
WITHIN FIELD DISPERSAL OF BEET LEAFHOPPERS

HIGHER RISK

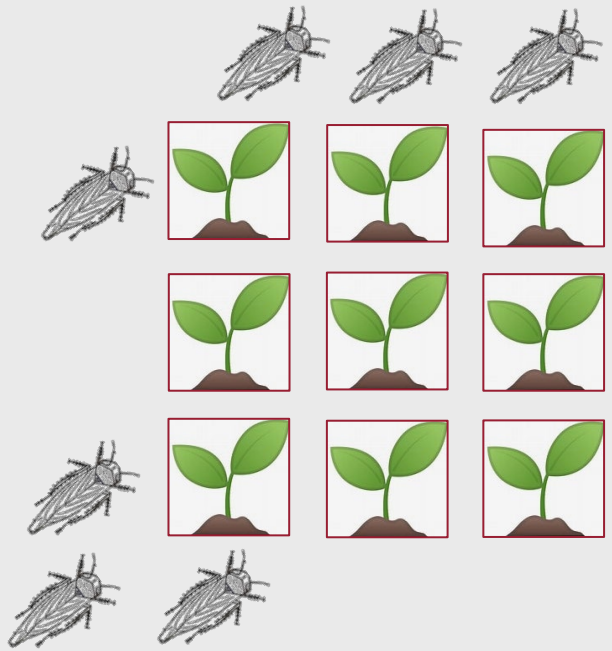


LOWER RISK

More dispersal (and disease spread) in sparsely planted crops vs. densely planted crops.

WITHIN FIELD DISPERSAL OF BEET LEAFHOPPERS

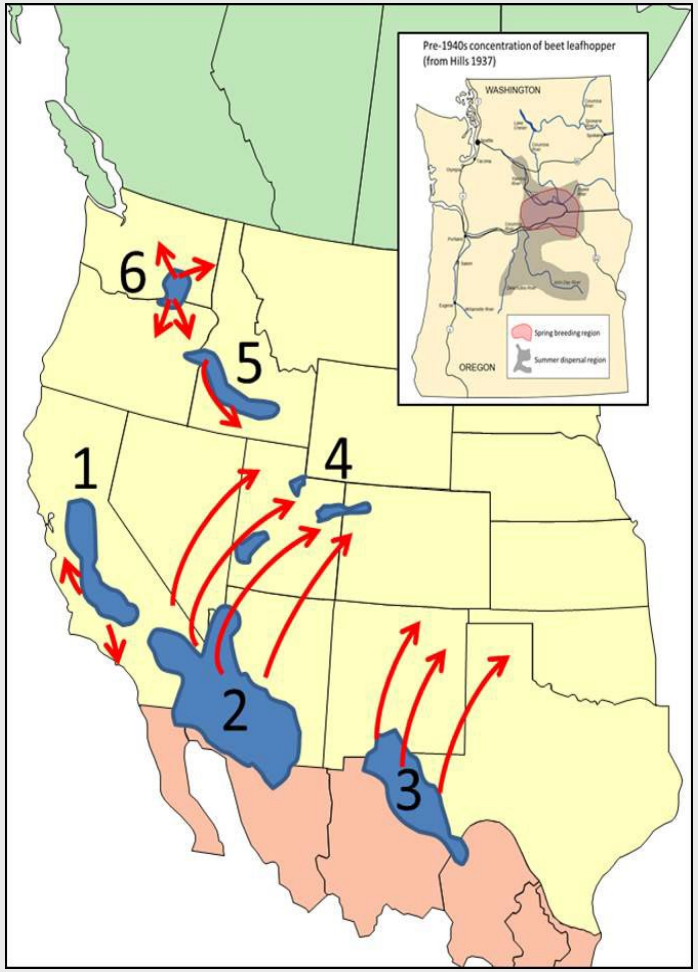
HIGHER RISK



LOWER RISK

More dispersal (and disease spread) in small plots, or small acreages versus large acreages.

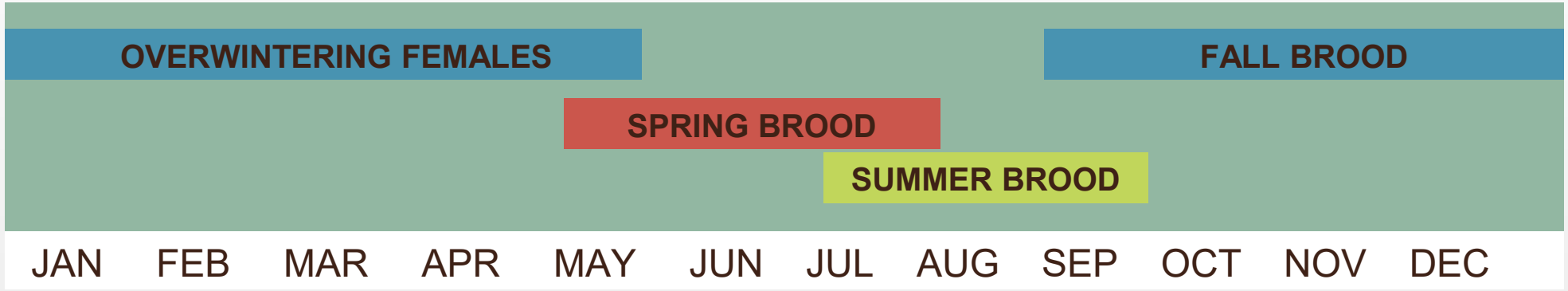
BREEDING GROUNDS & MIGRATION



Modified from Hills (1937) and Douglass and Cook (1954)

BEET LEAFHOPPER LIFE HISTORY

Occurrence of the Different Broods of the Beet Leafhopper in the Central Columbia Breeding Area



O.A. Hills. 1937. The Beet Leafhopper in the Central Columbia River Breeding Area. *Journal of Agricultural Research* 55(1): 21-31.

WINTER SURVIVAL & MIGRATION

Tumble mustard and Filaree

BCTV/BLTVA

Various Crops

BCTV/BLTVA

Russian Thistle

Winter Weed Hosts >>

CROPS >> Summer/Fall Weeds

ENVIRONMENTAL CONDITIONS

The Condition of Weed Hosts >> Affects BLH Population Size and Migration Timing

BLH Population Size

- Fall droughts and cold winters (that kill weed hosts) can reduce the size of the overwintering population and subsequent size of the spring brood.

Migration Timing

- Dry conditions in winter and spring can encourage early migration from overwintering habitat.

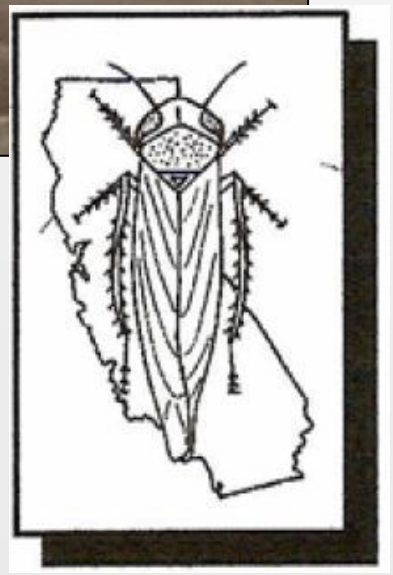
O.A. Hills. 1937. The Beet Leafhopper in the Central Columbia River Breeding Area. *Journal of Agricultural Research* 55(1): 21-31.

COORDINATED REGIONAL CONTROL PROGRAMS

- Spraying of rangeland was used in some areas to control beet leafhopper populations (not in Washington or in Oregon).

Spraying of Russian thistle (Idaho) in the 1950s to control the summer brood of beet leafhopper. From Douglass et al. (1955).

COORDINATED REGIONAL CONTROL PROGRAMS



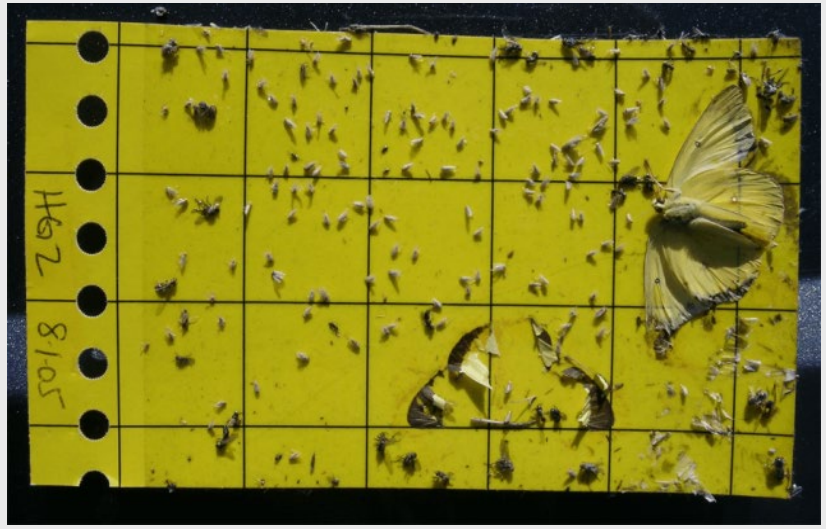
California Curly Top Virus Control Program

- Managed by the California Department of Food and Agriculture with help from a volunteer advisory board.
- Paid for using grower assessments.
- Intensive surveys to monitor BLH populations and habitat.
- Aerial and some ground-based spraying of breeding grounds in the fall, winter, and spring. As much as 100,000 acres are treated annually.
- Exploring the use of biological controls.
- Monthly Reports and a Pest Hotline: 800-491-1899

Monitoring Network for Insect Pests of Potato in the Columbia Basin

- Insect monitoring network in operation since 2009.
- Targets important potato insect pests…
  - Aphid
  - Beet leafhopper
  - Potato tuberworm
  - Potato psyllid
  - And more…
- Provides current information about the regional distribution and prevalence of insect pests.
- Helps potato growers make informed insect pest management decisions.
- Contributes to a better understanding of the movement and biology of these insects in our region.

YELLOW STICKY CARD TRAPS



WASHINGTON STATE UNIVERSITY
EXTENSION

WSU POTATO ALERTS

For best viewing of photos and charts, view this email in your browser.

Hello Potato Alert Subscriber: This is the May 26, 2023 issue of *WSU Potato Alerts*, and the 5th issue for the 2023 growing season. These alerts relate to commercial potato production in the Columbia Basin.

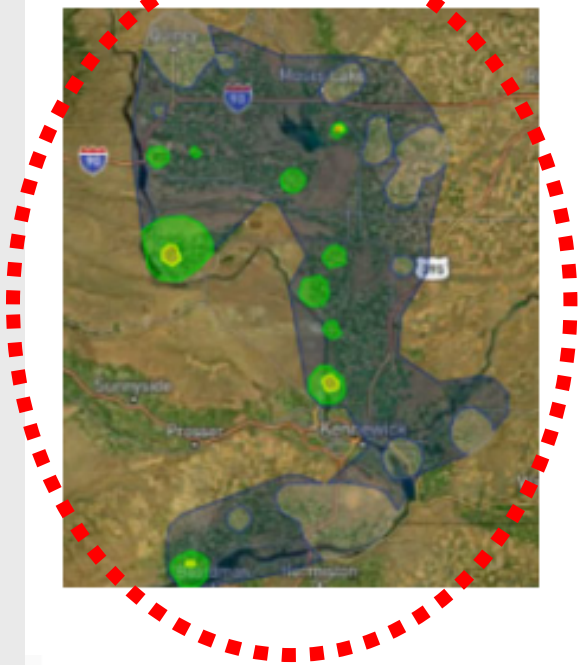
TABLE OF CONTENTS

Click on the links below to fast-forward to the topics that interest you.
This week's issue features beet leafhoppers.

BEET LEAFHOPPERS:

There was a significant increase in BLH counts this week. They were collected around more potato fields, from 59% last week to 77%, and the average trap count increased from 1.5 BLH per card to 6.3.

ALERT: BLHs that overwintered on weeds are migrating now because their weed hosts are starting to dry down. We tend to catch a lot of BLH this time of year on sticky traps deployed around crop fields that are relatively close to large tracts of open rangeland.



If you are concerned about BLH-transmitted diseases, don't wait for populations to peak before controlling them.

Areas of greatest concern are the western edges of the region, especially surrounding the Hanford Reach and along the Columbia River, and the area around the Potholes Reservoir and Seep Lakes.

Contour maps of BLH densities using our trapping network results are available on the Potato Decision Aid System. Scroll through the maps to monitor population development.

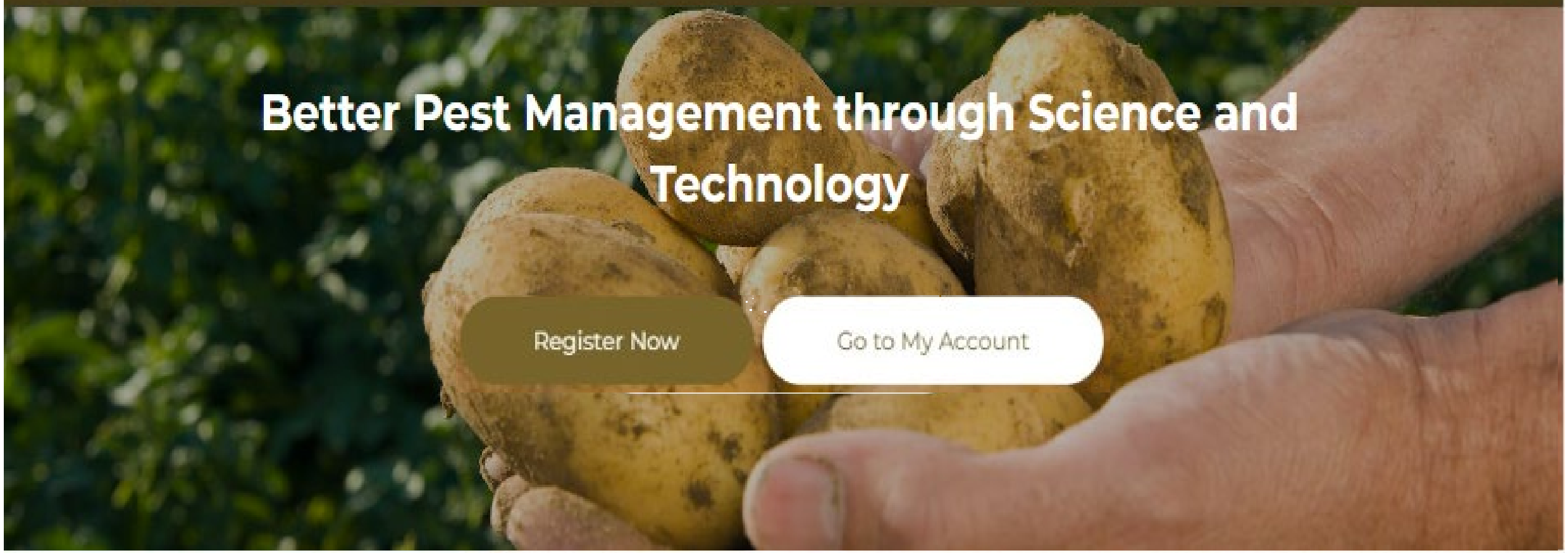
ARE BLH SPREADING PATHOGENS?

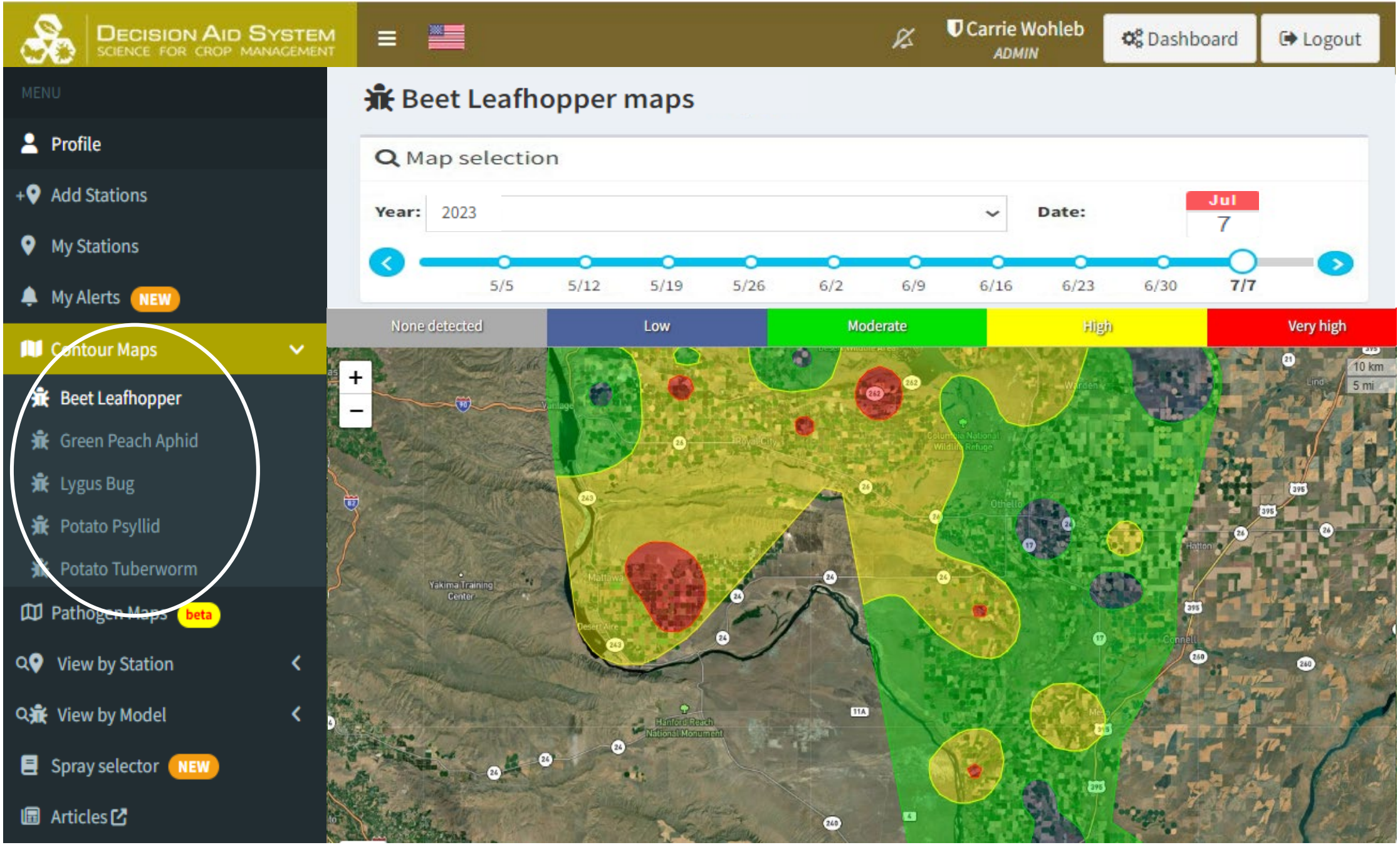
BLHs are important because they spread pathogens, including the BLTVA phytoplasma that causes purple top in potato, *Beet curly top virus* (BCTV) that causes curly top disease in many plants, and *Spiroplasma citri* that affects carrot.

potatoes.decisionaid.systems

DECISION AID SYSTEM
SCIENCE FOR CROP MANAGEMENT

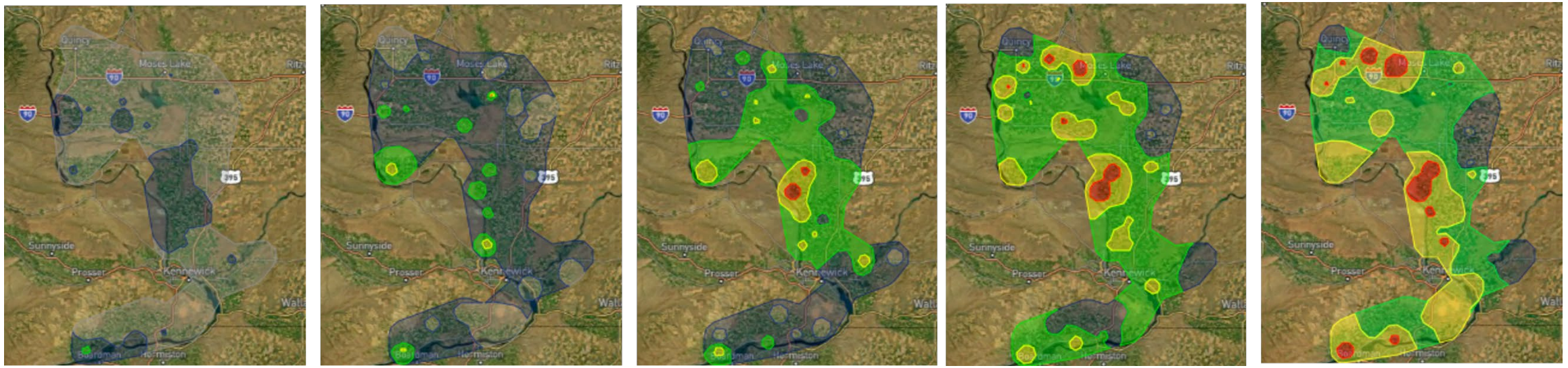
HOME ARTICLES PEST INFO ABOUT CONTACT LOG IN REGISTER



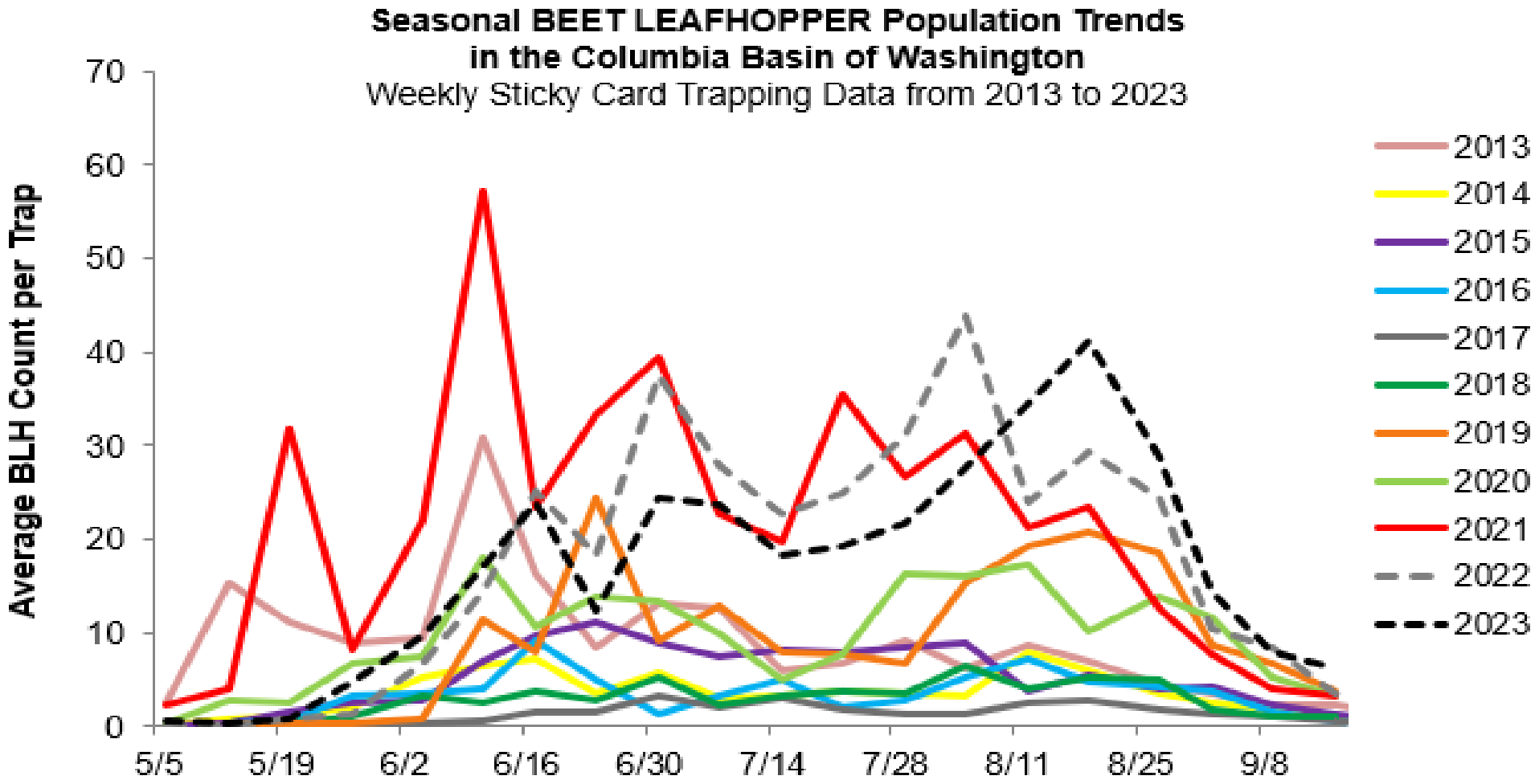

DECISION AID SYSTEM
SCIENCE FOR CROP MANAGEMENT
Carrie Wohleb
ADMIN
Dashboard
Logout
MENU
Profile
Add Stations
My Stations
My Alerts NEW
Contour Maps
Beet Leafhopper
Green Peach Aphid
Lygus Bug
Potato Psyllid
Potato Tuberworm
Pathogen Maps beta
View by Station
View by Model
Spray selector NEW
Articles
Beet Leafhopper maps
Map selection
Year: 2023
Date: Jul 7
5/5 5/12 5/19 5/26 6/2 6/9 6/16 6/23 6/30 7/7
None detected
Low
Moderate
High
Very high
10 km
5 mi
Yakima Training Center
Hanford Reach National Monument
Columbia National Wildlife Refuge
Othello
Connell
Lind

KNOW HOW TO INTERPRET THE MAPS

- The color ranges ARE NOT pest management action thresholds.
- DON'T wait for peak populations (yellow or red) to act. It may be too late!
- If the numbers are building quickly from week to week, then the risk of BLH-transmitted diseases is higher. Scroll through the maps each week to monitor the rate of population buildup.



POPULATION SIZE VARIES SEASONALLY



Profile
Add Stations
My Stations
My Alerts NEW
Contour Maps
Pathogen Maps beta
View by Station
View by Model
Spray selection tool NEW
Articles
Help

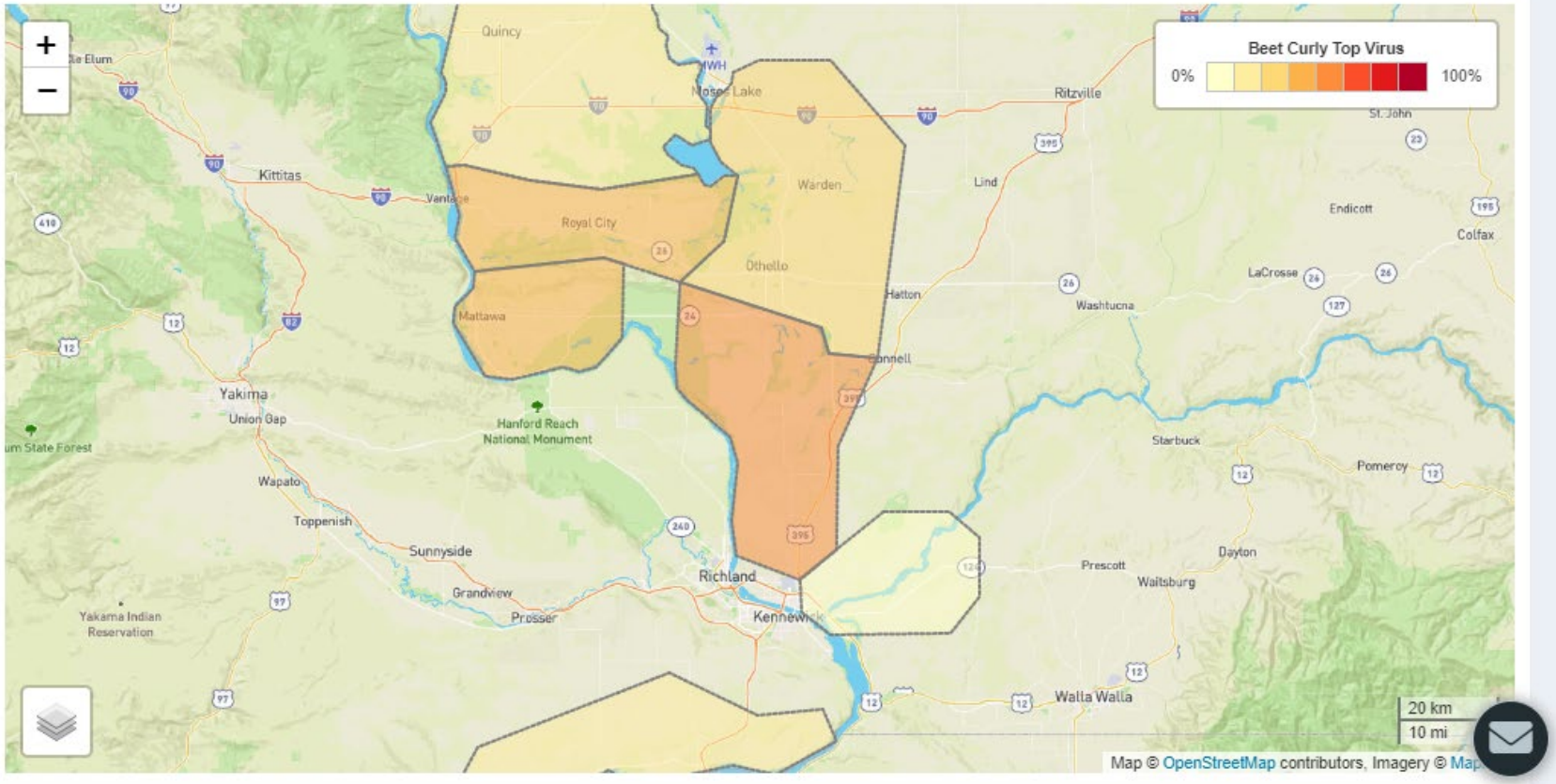
Pathogen prevalence maps beta

Map selection

2023

BCTV (Beet Curly

5/12 **5/19** 5/26 6/2 6/9 6/16 6/23 6/30 7/7 7/14 7/21 7/28 8/4 8/11



CULTURAL CONTROLS

- Plant resistant varieties.
  - Sugar beet and dry beans, but no commercial tomato varieties resistant to curly top yet.

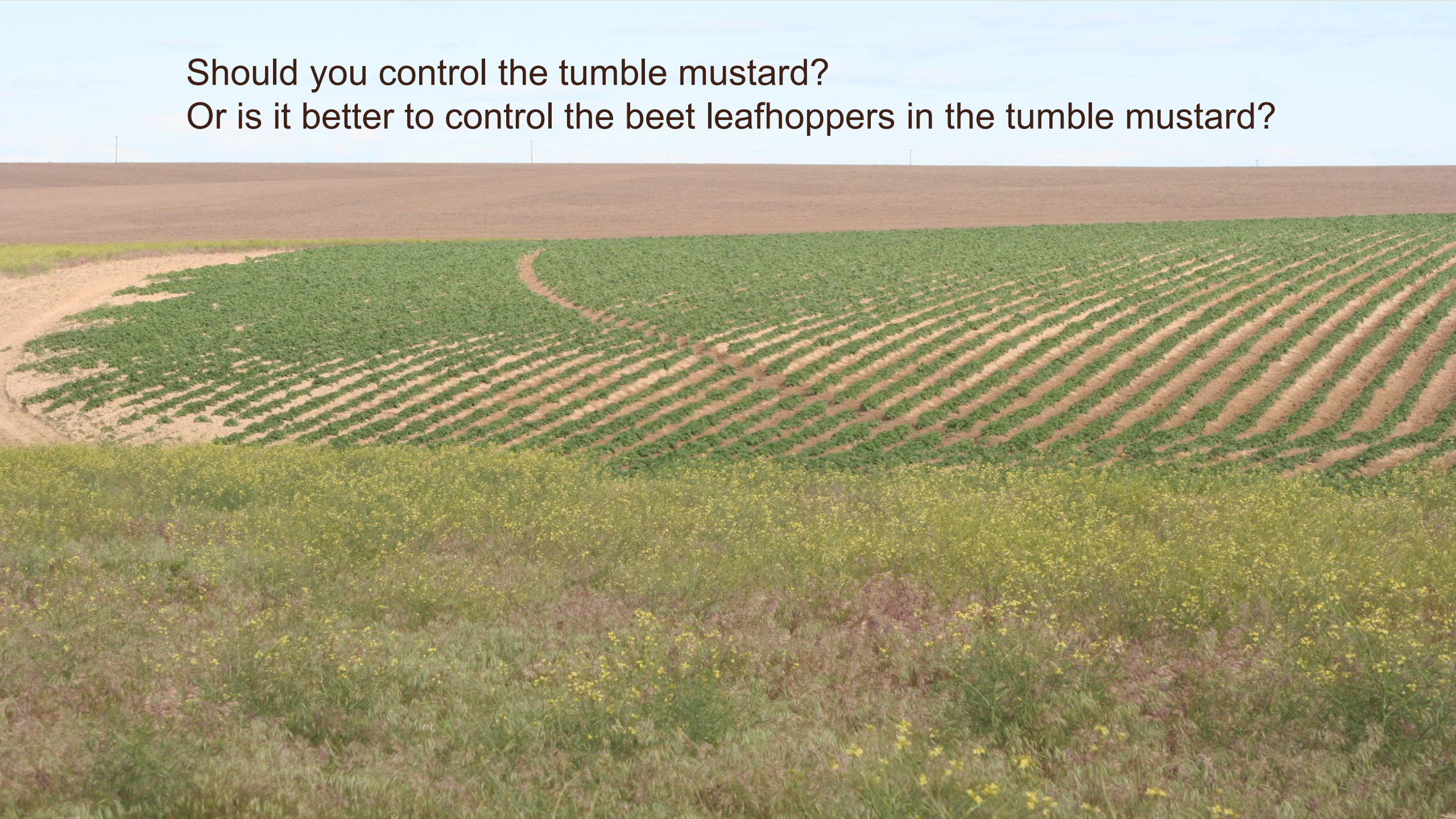
Oliver T. Neher, The Amalgamated Sugar Company, Bugwood.org

Lindsey du Toit, WSU

CULTURAL CONTROLS

- Prevent or eliminate large tracts of weeds, especially near fields of susceptible crops.
  - Many weeds are reproductive hosts for beet leafhoppers.
  - Weeds may serve as reservoirs for the virus or phytoplasma.
  - It is best to remove weeds before the crop is present, otherwise you may just flush leafhoppers out of weeds and into the crop.

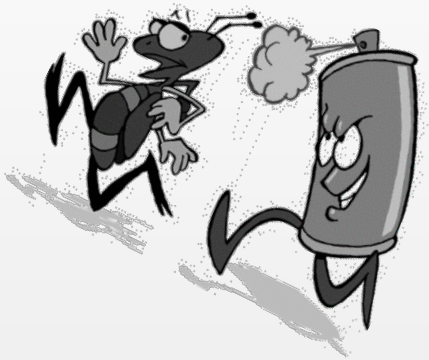
Should you control the tumble mustard?
Or is it better to control the beet leafhoppers in the tumble mustard?



CHEMICAL CONTROLS

What you do will depend on risk-aversion or your risk assessment…

1. Apply a systemic insecticide to crops at planting or at transplanting (neonicotinoid). And/or…



2. Apply a foliar insecticide to crops when beet leafhoppers are present.

- Choose insecticides with long residual activity (e.g., pyrethroids, neonicotinoids) to protect plants while beet leafhoppers are on the move.
- Re-apply as needed to maintain control through the migratory period.

Thanks

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WASHINGTON STATE UNIVERSITY EXTENSION

2023 PNVA Annual Conference – Kennewick, WA
November 14, 2023