Science Societies

Potato pest monitoring in the Columbia Basin: Data-driven tools for smarter IPM

By Matt Ernst

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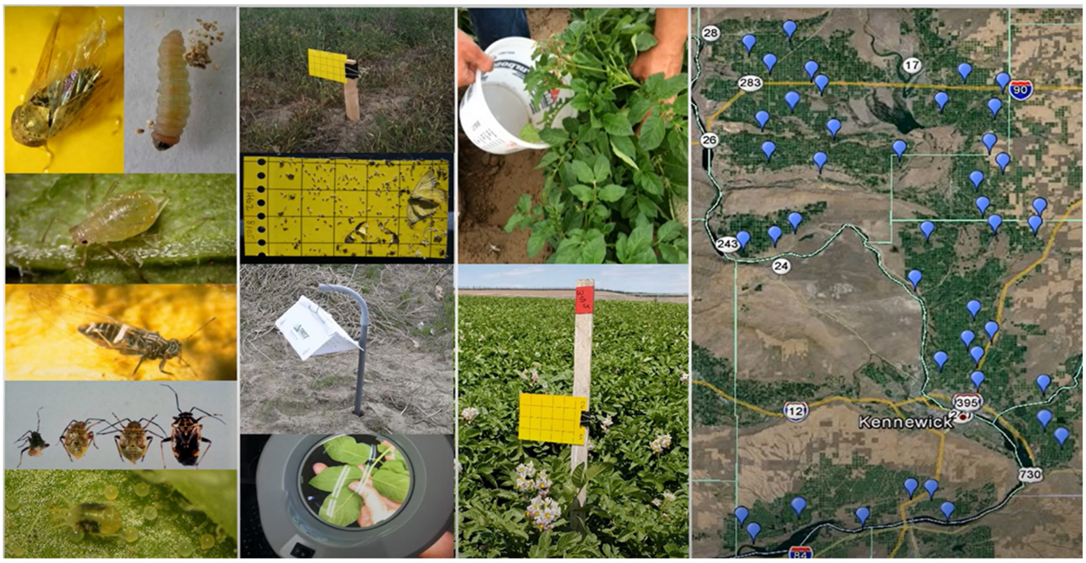


Screenshot from a video (https://www.youtube.com/watch?v=YoITsKe5c1k) about the Washington State University Potato Decision Aid System courtesy of Carrie Wohleb.

A long-established potato pest-monitoring network in the Columbia Basin is providing historical data and in-the-field "truth-testing" for a new internet-based Potato Decision Aid System. These programs can inform efforts to establish and enhance pest monitoring networks in other crops. Earn 0.5 CEUs in Integrated Pest Management by reading the article and taking the quiz.

You've likely eaten part of a potato grown in Washington's Columbia Basin. Second only to Idaho in processing potato area, the Basin's 145,000 potato acres attract myriad insects. In 2009, Washington State University Extension started the potato pest-monitoring network in the Basin. "There were different entomologists monitoring aphids, beet leafhoppers, and potato tuberworms," recalls Carrie Wohleb, Washington State University Extension (WSU) regional vegetable crops specialist. "We thought it would be good to combine monitoring all three insects in the network."

The entomologists had already trialed and compared monitoring techniques, arriving at the best methodology for monitoring each pest. Ensuring sound methodology across a pest-monitoring network is essential to producing decision-worthy data, Wohleb says.

Sound monitoring methods may then be modified or adapted for other species. That happened in the new potato pest network when established aphid-monitoring techniques were found useful to monitor Colorado potato beetles, lygus bugs, and two-spotted spider mites. Those three were soon added with monitoring results of the six species reported in a newsletter emailed to growers and industry.

From l to r, Colorado potato beetle, lygus bug, and two-spotted spider mites. Photos courtesy of Howard F. Schwartz, Colorado State University, Bugwood.org; Susan Ellis, Bugwood.org; and Frank Peairs, Colorado State University, Bugwood.org.

Extension scientists then partnered with WSU researchers to identify best practices for monitoring new pests. “With the zebra chip disease outbreak in 2011, we submitted a research grant for monitoring potato psyllids,” recalls Wohleb. (Psyllids vector zebra chip disease.) The team found the best method for monitoring psyllids combined leaf sample analysis with psyllid counts from yellow sticky traps—the same yellow cards already used to monitor leafhoppers.

Sound methodology also provides useful, high-integrity data. “Because we monitor the same way year after year, we can identify patterns with greater confidence,” Wohleb notes.

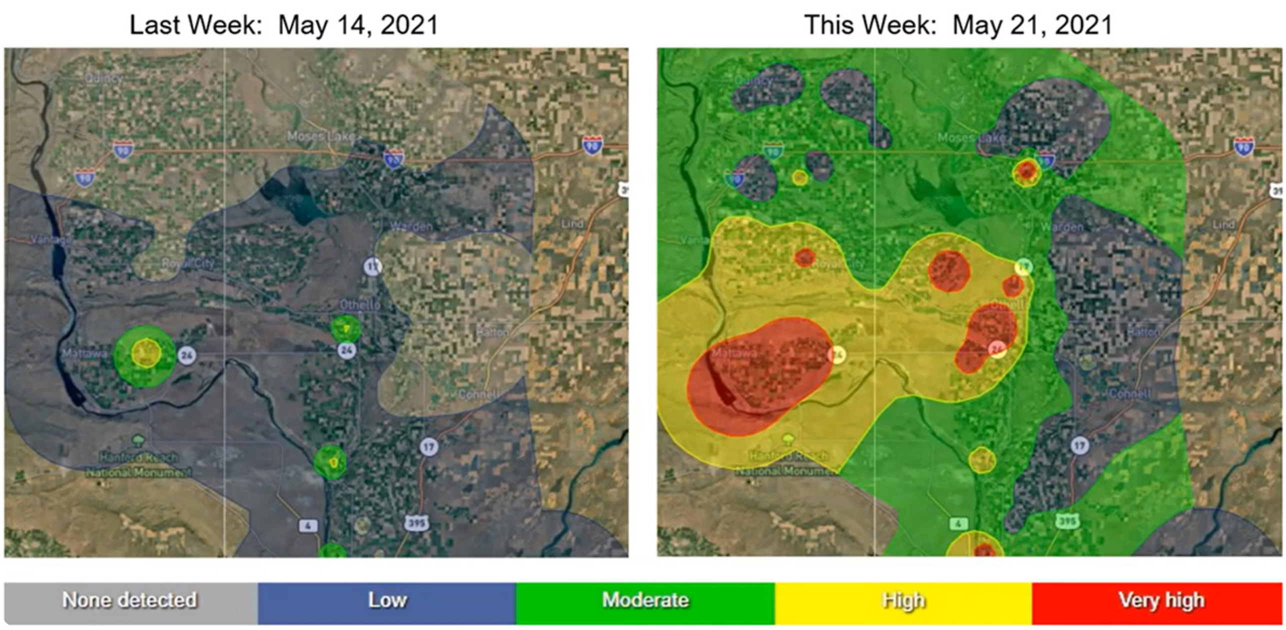
Growing the network

About 10 years ago, data accumulating from the network got the attention of Dave Crowder, a WSU entomologist. By combining insect population data with temperature data from 300 weather stations in Washington State, Crowder and colleagues could produce interpolated "heat maps."

"We take all of the monitoring data about where the bugs are currently and then produce interpolations across the whole landscape about where bug densities are and where areas that have high, medium, and low risk are," Crowder explains.

The weekly *Potato Alerts* report had been showing dots on a map to indicate pest counts. The heat maps that the WSU entomologists developed provided a better visual picture of pest pressure. By eliminating the dots, the heat maps were also less field-specific. That sat well with growers concerned about anonymity.

"You always want to encourage people to share their data without publicly releasing the data about where the bugs are," Crowder says.



Example of interpolated "heat maps" showing the density of a particular pest over a week. Screenshot from an introductory video on the Washington State University Potato Decision Aid system courtesy of Carrie Wohleb, Washington State University.

Funding and industry support

From the network's beginning, Washington's potato industry saw the value of the data collected—and was willing to offer financial support. The Washington State Potato Commission has provided funding every year since the network launched.

Building support from those who most benefit from a pest-monitoring network is essential to a network's longevity. "You should really identify early on how you're going to fund and support these systems," advises Crowder. "Lots of researchers develop useful models for crop pests, but then there can be a gap in making the model useful to growers."

As new pests were identified, research and Extension staff obtained some internal (WSU) grants to identify and improve new monitoring methods. The result: a pest-monitoring network that appears to be now accepted by the industry as an integral part of Basin potato production.

Diverse decision needs, in a relatively concentrated geography, have undoubtedly contributed to the network's perceived benefits. There are no across-the-board economic decision pest thresholds for potatoes grown in the Basin because of the diversity of varieties, harvest date, and different postharvest quality requirements. Early-crop potatoes, to be immediately processed, can tolerate more blemishes and pests. Long-season potatoes, which may be stored for months, have different quality requirements. Different varieties vary in how attractive they are to pests, as well as disease tolerance.

Communication

Since the potato pest-monitoring network began, WSU Extension scientists have adapted to different communication preferences—and changing communication technologies and features. The network first reported pest-monitoring results on a website. Weekly emails the second year developed into *Potato Alerts*. That weekly newsletter became the network's main communication channel, growing to reach more than 900 readers in the Pacific Northwest. More recently, with the beginning of a Potato DAS, growers can receive more specific text and email alerts.

Growers in the Columbia Basin can access up-to-date pest-monitoring information in a variety of formats: website, email, and text alerts. Photo courtesy of Adobe Stock/Sergey.

Successful networks should have a way to gather feedback and evaluation from users. WSU Extension has conducted at least four surveys of network users to evaluate preferences for using the information. "One of the things we learned early on is that readers wanted crop-scouting aids and information about timing for pest management," Wohleb says. "So we began highlighting management recommendations and education in our weekly newsletter and other communications."

Users may prefer to receive the information in different formats. Some people like to read text; others want a more visual representation. "One of the strengths as we've shifted to the Decision Aid System alongside the *Potato Alerts* is that we can offer both text and visual," says Wohleb. "People have different learning styles and preferences for how to receive information."

Adding the Potato Decision Aid System

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"

Even though the heat maps proved popular with growers, there was still room to improve how the monitoring network helped aid decisions. That's because many of the economically important potato pests in the Basin transmit disease—making insect populations just one piece of the puzzle.

"Now, not only are we monitoring the abundance of the insects, we're tracking their movement and development stage across the landscape."

"Another big piece of the pest management puzzle is phenology—the seasonal dynamics of these organisms," says Dave Crowder, the entomologist. "Insects develop faster when it's warmer, and we can build models that tell us when insects are developing in the landscape." Such models are of value because many key potato pests are already present in the Columbia Basin's landscape before the crop emerges in April and early May. "Now, not only are we monitoring the abundance of the insects, we're tracking their movement and development stage across the landscape," explains Crowder.

Using current and past potato pest-monitoring network data, WSU rolled out a new Potato DAS in 2022. The Potato DAS presently offers phenology maps for potato psyllid and Colorado potato beetle, incorporating that information into tools that help growers making pest management decisions.

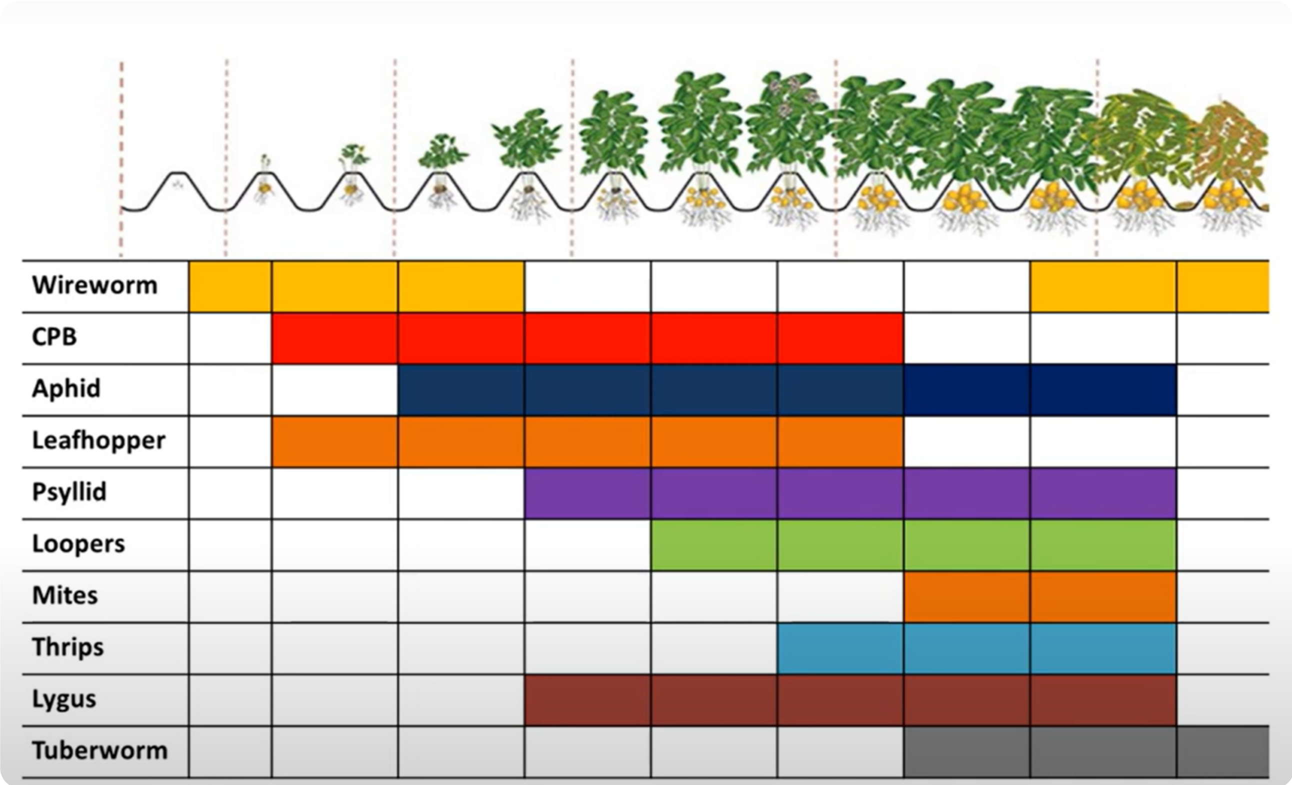
Dave Crowder walks through a scenario for potato beetle to explain how growers benefit from the Potato DAS. “Our Extension scientists often tell growers to time their sprays to when 50 percent of the eggs have hatched,” Crowder explains. Potato beetle larvae take two to three weeks to pupate. “So while they’re pupating, that’s a period of time that the grower should not be using insecticides targeting potato beetles.”

Watch Dave Crowder explain how to use the Colorado potato beetle model on the Potato Decision Aid System.

It is easy to see how the phenology maps further help growers. If you’re going to spray an ovicide, for example, you need to spray when the eggs are there. Growers aren’t going to be sampling every field for eggs, so the DAS’s models can inform not only where the insects are, but what development stage they are in.

One of the main ingredients in a successful DAS is local truth testing. That’s where working with the potato pest-monitoring network has aided the success of the Potato DAS. The Extension scientists and others are able to verify the accuracy of the models. “You have to have local support to verify the models in the DAS,” says Crowder. “The Extension team is monitoring the abundance of these insects, and we use that to truth-test our models.”

Potato growers in the Columbia Basin have appreciated the additional layers of information presented in the user-friendly format of the DAS. “We tend not to recommend broad-spectrum insecticides in the middle of the season because of the impact on beneficial insects. The challenge is that growers are rarely managing for one specific insect," Wohleb says.



Managing insect pests in Columbia Basin potatoes can be challenging because growers are rarely managing for one specific insect, and many pests can overlap. Image courtesy of the Washington State University Potato Decision Aid System.

The Potato DAS is presently available on a free subscription basis for growers in the Basin. Users can set up text and email alerts to be notified when pests reach specific thresholds. The DAS offers heat maps for potato psyllid, potato tuberworm, lygus bug, beet leafhopper, and aphid. There are also disease prevalence maps, like a heat map indicating prevalence of the pathogen causing purple top disease. More tools could be developed; Washington's Tree Fruit Decision Aid System provides tools for about 50 different decision areas. “We’re really just scaling up the potato models,” Crowder says.

In 2024, Potato DAS administrators added a spray selection tool that was well received by growers. It helps determine what approved pesticides can be used when data analysis indicates that pest management is needed. This tool has proven very popular with growers, Wohleb says. “The only thing that the growers didn’t like about it was the color scheme. They said it was hard to pick out on their cell phone screens. But we can make those adjustments as we go.”

Surveys indicate that Potato Decision Aid System users make fewer applications as the result of system use. Photo courtesy of Adobe Stock/Vladimir.

Surveys indicate that Potato Decision Aid System users make fewer applications as the result of system use: about two fewer applications per acre per year. “If you assume saving two applications annually, it's a state-wide savings to growers around $10 million," Crowder says. That doesn't account for other benefits to each grower's IPM program, like impacts on beneficials.

The technology used in the Potato DAS also offers promise for other geographies. A Specialty Crop Research Initiative grant is funding testing of a similar potato decision aid platform in other major production areas with research partners in Colorado, Maine, Michigan, New York, and Wisconsin.

Self-study CEU quiz

Earn 0.5 CEUs in Integrated Pest Management by taking the quiz for the article at https://web.sciencesocieties.org/Learning-Center/Courses. For your convenience, the quiz is printed below. The CEU can be purchased individually, or you can access as part of your Online Classroom Subscription.

1. **In 2009, Washington State University Extension started a potato pest-monitoring network to monitor what three pests?**

   a. Aphids, potato psyllids, and zebra bugs.

   b. Aphids, beet leafhoppers, and potato tuberworms.

   c. Beet leafhoppers, potato psyllids, and potato tuberworms.

d. Potato tuberworms, zebra bugs, and leaf bugs.

2. **What monitoring methods were found to be most effective for tracking potato psyllids during the zebra chip outbreak?**

   a. Leaf sample analysis and yellow sticky traps.

   b. Light traps and pheromone baits.

   c. Soil sampling and aerial imaging.

   d. Sweep nets and vacuum traps.

3. **Why did many growers prefer the heat maps over the original dot maps in the *Potato Alerts*?**

   a. They gave more detailed field-specific information.

   b. They showed soil moisture data alongside pest pressure.

   c. They could be used offline without internet access.

   d. They protected grower anonymity while still showing risk areas.

4. **The Potato Decision Aid System saves growers an estimated ____ state-wide per year.**

   a. $600,000

b. $5 million

c. $10 million

d. $20 million

5. What major feature was added to the Potato Decision Aid System (DAS) in 2024?

a. A pesticide residue calculator.

b. A spray selection tool.

c. A potato yield prediction model.

d. A mobile app for soil moisture tracking.
