

# New explorations of wheat stem sawfly management

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Montana State University professor Dave Weaver examines a wheat stem sample at a study plot near Amsterdam, Montana. Credit: MSU photo by Adrian Sanchez-Gonzalez

Two graduate students in Montana State University's College of Agriculture have published new research on two aspects of management for one of the region's most damaging agricultural pests.

Wheat stem sawflies cost agricultural producers millions of dollars in losses each year, according to the Montana Wheat and Barley Committee. Surveys conducted by the National Agricultural Statistics Service found that nearly a quarter of respondents in Montana had lost up to 10% of their yield to the pest, and total losses statewide for 2024 were estimated at \$66 million.

Doctoral student Jackson Strand and master's student Lochlin Ermatinger in the Department of Land Resources and Environmental Sciences worked alongside MSU professor David Weaver to explore two aspects of sawfly management. Their novel approaches help better understand the pest's impact and vulnerabilities.

Strand's research has examined the impact of smooth brome, a common grass in Montana, on sawfly populations in [wheat](#). Ermatinger applied [remote sensing](#) techniques to develop a model predicting sawfly infestation. Both students published their findings this fall, [Strand](#) in the *Journal of Economic Entomology* and [Ermatinger](#) in *Remote Sensing*.

"There's a strong demand for solutions other than pesticides—which don't work for wheat stem sawfly—and finding a solution that's sustainable for growers who may not have a lot of time or resources to do things like plant different crops," said Strand of his research. "We're trying to figure out if smooth brome is beneficial and if we can help promote populations of parasitoids that otherwise sometimes fluctuate across seasons and regions."

[Parasitoids are insects that act as biocontrols, in this case against wheat stem sawflies](#). Parasitoids can go about this in different ways, but the

ones Ermatinger focused on operate by paralyzing and then eating the sawfly larvae that feed inside wheat stems. Because parasitoids are native insects, they show potential as a natural management tool to mitigate damage, Strand said. He found that if smooth brome is present near wheat fields, both the sawflies and the parasitoids may gravitate to it.

Through greenhouse experiments and laboratory analysis, Strand sought to identify why that might be by measuring and comparing the volatiles released by smooth brome and wheat. Volatiles are naturally occurring chemicals released by plants, increasing in intensity when they are under stress.

"The plants that were exposed to sawflies expressed different compounds than the ones that weren't," said Strand, who completed his undergraduate degree at the University of Minnesota before arriving at MSU in 2021 to begin graduate studies. "Smooth brome produces the same compounds as the wheat, but in higher quantities. The sawflies are triggering a stress response in the plant, and then the parasitoids are keying in on those compounds and finding their hosts."

Smooth brome is not a [native plant](#), Strand said, but is widespread around Montana, particularly near roadways, where it was once used to mitigate erosion. While intentionally planting brome isn't recommended, he noted that fostering what already exists could provide an appealing alternative for sawflies, consequentially protecting nearby wheat crops.

"By not mowing it or by occasionally fertilizing it to maintain stands, you can make brome more valuable to sawflies, and also valuable to the parasitoids that help control them," said Strand, who completed his master's degree in entomology this fall and will continue at MSU to begin his doctoral studies later this month.

While Strand's research focused on managing known infestations of sawfly, Ermatinger explored new ways to identify and predict infestation in the first place.

Ermatinger, who is originally from Missoula, arrived at MSU in 2016 and completed a bachelor's degree in environmental science with a focus in geospatial and environmental analysis. He found himself drawn to remote sensing and GIS, or geographic information systems, which uses data from satellites, drones and other technology to create advanced mapping programs.

True to the many complications with their management, wheat stem sawflies spend most of their life cycle within the stem of a wheat plant, Ermatinger said. That means that seeing their damage from the outside is much more difficult than with other pests.

"Truly understanding what infestation looks like requires a lot of stem dissection," he said. "We started exploring the use of remote sensing with [satellite images](#) and combining that with stem dissection to try and produce a map."

Ermatinger collected data on three scales: spatial, spectral and temporal. By measuring the spectrum of light reflected by wheat fields across a large area and over time, then comparing that data with where sawfly infestation was confirmed through physical analysis of wheat stems, he built a model that could use small variations in reflected light to estimate infestation across an entire field.

"You can't manage something that you can't measure. Our hope is that we can use this to objectively make better estimates," Ermatinger said. "We're able to estimate now, to a degree of statistical significance, what the infestation rate is. It really showed us that capturing images across the life of these plants is important."

Both Ermatinger and Strand worked on-farm with Montana agricultural producers while conducting their research, noting that those relationships helped them to gain a deeper perspective of the direct applicability of the work they were doing.

They have also both progressed to more advanced degrees than they initially planned at MSU: Strand from a master's degree on to a doctorate, and Ermatinger from his undergraduate studies to a master's. They credited the collaborative and supportive environment of the Department of Land Resources and Environmental Sciences for encouraging their continued exploration.

"I never saw myself as someone who'd go on to get a graduate degree. I thought that was out of reach. But MSU has been a great community," said Ermatinger. "It's shown me that you can explore anything you want to, it's all about who you have around you and what you're interested in. It's made me understand my home state in a new way."

**More information:** Jackson R Strand et al, Agroecological importance of smooth brome in managing wheat stem sawfly (Hymenoptera: Cephidae) via associated braconid parasitoids, *Journal of Economic Entomology* (2024). [DOI: 10.1093/jee/toae246](https://doi.org/10.1093/jee/toae246) Lochlin S.

Ermatinger et al, Multitemporal Hyperspectral Characterization of Wheat Infested by Wheat Stem Sawfly, *Cephus cinctus* Norton, *Remote Sensing* (2024). [DOI: 10.3390/rs16183505](https://doi.org/10.3390/rs16183505)

Provided by Montana State University

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