Weather-tracking tool helps track migrating insects

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Corn earworm larvae can cause great damage to cotton and corn crops. Using the NEXRAD weather monitoring system, ARS scientists have found a way to more accurately track corn earworm moths as they migrate at night. This knowledge can help farmers determine when to treat for the pest. Jack Dykinga

Corn earworms (also known as cotton bollworms) cost cotton producers an estimated $200 million a year in lost crops and control expenses, and they are notoriously hard to track because they migrate at night. Farmers worried about infestations have to make educated guesses about the pest's movements based on reports from other areas and past experience.

Agricultural Research Service scientists in College Station, Texas, have shown that signals routinely collected by the National Weather Service's (NWS) Doppler radar network could serve as an early-warning system to track the migration of corn earworms and other nighttime traveling pests.

John Westbrook and Ritchie Eyster, meteorologists in the ARS Areawide Pest Management Research Unit (and currently assigned to the Insect Control and Cotton Disease Research Unit) in College Station, focused on the surveillance capabilities of Next Generation Weather Radar, or NEXRAD. With more than 150 ground-based installations across the United States, NEXRAD monitors weather conditions by sweeping the atmosphere every 5 to 10 minutes and reading the energy reflected by rain, snow, and other precipitation. For weather assessments, algorithms normally remove energy reflected by flying organisms, but scientists have used NEXRAD and other weather radar signals to track birds, bats, and insects.

Westbrook and Eyster obtained 15 days of NEXRAD data from the NWS installation at Brownsville, Texas, to see if they could use it to detect flights of corn earworm moths during peak migration times from cornfields in the Lower Rio Grande Valley. "We wanted to use it to make aerial counts of corn earworm moths and determine their movement patterns in the atmosphere," Westbrook says.

They acquired archived NEXRAD data associated with aerial concentrations of moths at heights of up to 3,900 feet. The data had

been obtained during a period of peak migration of corn earworms from fruiting corn fields. They compared it with data from the same time period previously collected by Wayne Wolf, a retired ARS agricultural engineer, using a scanning "X-band" radar system, specifically designed to track insects. Unlike NEXRAD, which operates constantly, the X-band system must be set up and monitored each time it is used. The previous research team had also launched weather balloons from a nearby airfield to calculate vertical profiles of prevailing wind speed and direction that influenced long-distance insect flights.

The results showed that NEXRAD was not only capable of tracking insect migration patterns, but it was also superior to the older scanning X-band system in offering a much larger detection range and an ability to determine the direction and speed of insect migration flights without need of weather balloons. Results were published in the *International Journal of Biometeorology* in April 2013.

More work is needed to quantify relationships between radar data and the abundance and patterns of migratory insect flights, but using NEXRAD would offer several advantages, Westbrook says. Because it must be set up each time, the X-band system is costly to operate and maintain. NEXRAD data is publicly available, so it could be used any time without the costs of positioning and monitoring equipment. Recent upgrades implemented in NEXRAD should make it easier to identify potential corn earworm infestations, and with refined algorithms, it should be able to track beet armyworms, grasshoppers, and other large-bodied insects, Westbrook says.

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https://phys.org/news/2014-10-weather-tracking-tool-track-migrating-insects.html