

# Managing Insect Pests in Corn Crops

Field corn—grown for livestock feed, ethanol, corn syrup, and other products—and sweet corn—grown for food—are major crops in the U.S. Farmers across the nation grow more than 91.5 million acres of corn worth about \$66 billion dollars each year.

Insect pests, such as the European corn borer, western corn rootworm, and corn earworm, cause billions of dollars in yield and quality losses each year, and management costs are high. Insecticides, seed treatments, and transgenic corn varieties like Bt corn can help manage insect pests, but many pest populations have developed resistance. There is growing concern that resistant pests and new invasive insects could increase use of chemicals, which could raise the cost of growing corn and pose risks to people and the environment.

**To support sustainable pest management and profitable corn production, researchers from land-grant universities are working together to better understand corn insect pests, develop management tools and strategies, and share science-based information with farmers, industry, policymakers, and the public.**

Bringing together researchers from multiple disciplines and states is key to developing tools and programs that work for various kinds of pests and environments. Coordination and collaboration facilitate efficient research and development as well as long-term projects, which are essential for monitoring and forecasting.

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Corn earworm larvae feed on every part of the corn plant, including kernels. Photo by Silvana Paula-Moraes, University of Nebraska-Lincoln.



# Project Highlights

**Compiling data from 27 states and 4 Canadian provinces, project members estimated [total annual damage to corn from insect pests](#), providing a reliable baseline to guide pest management programs.**

**Project members developed tools and strategies to monitor insect pests in corn. For example, researchers:**

- Developed **audio-based insect monitoring** to improve early detection and timing of chemical control applications (University of Wisconsin).
- Produced an **educational module** that uses 3D models based on scans of real specimens to train users to identify insects in corn and soybean fields.
- Developed a **machine learning tool** that could be built into applications to help even novice users quickly and accurately identify insect species from field-collected digital photos.
- Developed a tool that simultaneously analyzes large numbers of corn pest DNA samples so researchers can more rapidly and cost-effectively monitor for resistance to pesticides.
- Documented year-round **corn earworm** migration patterns on a continental scale for the first time, which will help predict outbreaks. The study's innovative biogeochemical marker could be used to study other migratory moth species (University of Florida).
- Coordinate a sentinel network for **corn earworm**, which now includes 28 states and 5 Canadian provinces. Project members facilitate real-time sharing and archive historical data in the Southern IPM Center's database, [EDDMaps/AgPestMonitor](#) (University of Maryland).
- Coordinate a **corn rootworm** monitoring network, which now includes 12 states and 5 Canadian provinces. The [website](#) has had 18,000 views and 500 report downloads since 2021. In Iowa, producers estimate this information has an annual value of \$5 to \$20 per acre--potentially \$40 to \$160 million in total annual savings statewide (Iowa State University and Ontario Ministry of Agriculture, Food, and Rural Affairs).
- Conducted annual sampling for **western corn rootworm** in Illinois, showing low abundance and low damage to corn. After seeing the data, some local farmers have planted less Bt corn. Avoiding unnecessary use of Bt corn cuts costs for growers and slows the development of Bt resistance (University of Illinois).

**As part of the project's objective to develop new tools and strategies to manage insect pests in corn, researchers:**

- Tested new **gene silencing technology** developed by industry (multiple states).
- Showed that naturally occurring **parasitic microscopic worms** that cause disease in insects (entomopathogenic nematodes) could help control soilborne insect pests of corn (Cornell University, Texas A&M AgriLife Research; Iowa State University, University of Illinois, and University of Nebraska-Lincoln with support from Persistent BioControl™ and Corteva™).
- Developed regional recommendations for emerging pests, including **stink bugs, Asiatic garden beetle, and slugs**. The [IPM factsheet for stink bugs](#) has nearly 2,000 views (Ohio State University, Michigan State University, North Carolina State University).

**This project has been instrumental in detecting and monitoring Bt-resistant pest populations.**

- University of Tennessee researchers produced and distributed **insecticidal proteins** for use in research on pest resistance.
- Researchers in 24 states and 4 Canadian provinces worked together to identify **genetic sources** and **biomarkers** of Bt resistance.
- Project members facilitated multistate and international **monitoring networks** that have provided early warning of Bt-resistant populations of many different corn insect pests. For example, after data from a 12-year period showed that some Bt toxins are no longer very effective against corn earworm, particularly in southeastern and mid-Atlantic locations, some farmers began planting less Bt corn, which not only lowers their costs but also slows the development of Bt-resistance (Clemson University, North Carolina State University, and University of Georgia).
- Project members developed the **Handy Bt Trait Table**, which provides unbiased information about the performance of commercial Bt corn traits for producers, crop consultants, scientists, and regulators. The website has an average of 3,000 visitors per year (Michigan State University, Texas A&M AgriLife Extension).
- When the U.S. Environmental Protection Agency released a proposal in 2020 to modify **regulation of Bt crops**, project members provided research-based advice that led to a revised proposal that better reflects real world field conditions, improves risk assessments, and prioritizes independent lab results.

**Project members led trainings and produced numerous Extension materials to help farmers better manage insect pests in corn. For example:**

- University of Nebraska-Lincoln project members led trainings for corn growers who represent millions of acres. Among attendees who responded to a survey, the majority reported increased knowledge of pest management and had planned changes to their practices.
- Texas A&M AgriLife Extension expanded their text message-based pest reports to the entire state of Texas. Users estimated the information was worth about \$42 per acre to producers and \$80 per acre to crop consultants.

**Project members produced more than 300 peer-reviewed publications, including many large collaborations in high-impact journals.**



A variety of insect pests damage corn plant leaves, including the western corn rootworm (top left), stink bug (bottom left; Dominic Reisig, North Carolina State University), and fall army worm (right; Silvana Paula-Moraes, University of Nebraska-Lincoln).