

# The by Norman Martin 100 YEARS War



Just as deliverance from the boll weevil is at hand, watchful cotton growers and NMSU researchers stand ready for the next pest problem...and the next.

**I**n 1894, the cotton boll weevil, or technically *Anthonomus grandis*, began a 100-year trek. Migrating from Mexico to the United States, the bug spread rapidly, infesting more than 85 percent of the Cotton Belt from central Texas to the Atlantic Coast in less than 30 years. Experts say that charge ultimately cost America's cotton producers more than \$15 billion from yield losses and costs to control the pest.

NMSU first entered battle with the pointy-snouted insect more than a century ago, when C. H. Tyler Townsend came to what was then called the New Mexico College of Agriculture and Mechanic Arts. He was one of the first entomologists to study the boll weevil's habits, to describe it as an injurious cotton pest and to recommend control methods. Townsend later moved to South Texas—closer to the front line fight against the flying beetles.

Hot weather, widely scattered cotton fields and limited food apparently sent the boll weevils east. Since the turn of the last century, they have made a few intermittent trips into New Mexico. But 15 years ago, the weevils began crossing the rugged Texas High Plains in large numbers, and their slow, subtle assault on New Mexico cotton fields began in earnest. Scientists trapped the first boll weevils in the late 1980s in eastern New Mexico's Lea County. Then, five mild winters in a row may have opened the door for a population explosion beginning in 1995.

"The threat to the survival of the cotton industry in New Mexico was very real," recalls Jane Pierce, an entomologist with NMSU's Agricultural Science Center in Artesia, who early on championed the state's suppression efforts and authored a series of guides based on

her research on boll weevil control.

Boll weevil eggs, larvae and pupae are well protected from most natural enemies by host plant tissues, since all are inside the cotton boll. As overwintering adults, they're even tougher adversaries. In the fall, these flying, fattened beetles have a cruising range of more than 50 miles. Pierce found that delaying planting, harvesting early and clear-



**Sharp eye:** Eradicating exotic insect pests could one day open the door to native pests, warns Carol Sutherland, an entomologist with NMSU's Cooperative Extension Service. Vigilance is critical.

ing nearby fencerows of weeds made life and survival over the winter more difficult for boll weevils. Where boll weevils did get established, these management techniques helped reduce yield losses and delayed or interfered with pest population increases.

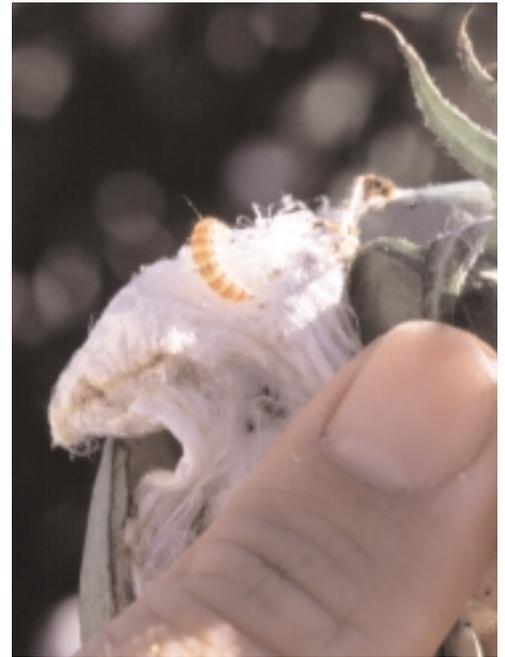
Ten years of scientific effort to eradicate the notorious pest moved from simple monitoring to all-out eradication in the late 1990s. Led by scientists with NMSU, the New

Mexico Department of Agriculture and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, farmers in south-central New Mexico formed eradication districts, elected leadership and hired eradication specialists with boll weevil program experience. They put a surcharge on each bale of cotton produced in the district to fund a mandatory eradication program, based on extensive trapping and rapid response to signs of boll weevil activity.

Under a battle cry of "Deliver Us From Weevil," farmers and researchers launched a multifaceted assault. "We'd be out of the cotton business if it wasn't for that (eradication) program," says Gary Jackson, who farms more than 2,000 acres of cotton in Lea County and across the border in Texas. "When you've got that much boll weevil pressure, there are two options: spray yourself out of business or the boll weevil is going to eat you out of business. Either way, the boll weevil is going to get in your pocket."

Producers were urged to control weeds, delay planting, orient rows east to west to take advantage of direct sun to kill weevil larvae in fallen bolls and delay planting fields near good overwintering habitat.

Pierce found a great time to attack the weevil was when it was at its weakest—the winter hibernation stage. As the pests emerge from weedy or urban areas during May and June, they ordinarily home in on cotton fields close to their overwintering sites, generally not flying more than two miles. NMSU researchers discovered that the longer they could deprive weevils of critical cotton pollen, the adult weevil's principal food, at the end of this overwintering cycle, the fewer would survive to infest young cotton fields.



**In the pink:** Scott Bundy, second from left, leads students from NMSU's entomology, plant pathology and weed science department in a search for pink bollworms at the Leyendecker Plant Science Research Center near Las Cruces. The tiny caterpillars are considered one of New Mexico's rising pest threats. Among the tools aimed at halting the spread of pink bollworms are producer plow-down programs, pheromone-baited traps and new genetically engineered cotton varieties.

"Do the right steps in the right order, and you're going to get it eradicated," says Bob Mayberry, who farms more than 500 acres of cotton near Artesia. "There's really no guesswork about whether it will be successful."

Carol Sutherland, an entomologist with NMSU's Cooperative Extension Service, says that in the last four years, the bug battle has turned around in the south-central eradication district, which includes the Mesilla and Hatch valleys. "After some very good management, we're just about at the end of that fight, at least in the south-central part of the state," she says.

Now, just as the boll weevil is calling a truce, the pink bollworm, another exotic cotton pest, is starting to pose a threat again in growers' fields. "This creature has been in the Southwest since about World War I," Sutherland says. "Pinkies were espe-

cially damaging here in the 1960s."

The origin of the pink bollworm is likely in the hot, dry regions of south Asia or perhaps northeastern Africa. Classified as a caterpillar pest, the worm enters immature bolls and cuts and fouls the forming fibers with a bright pink color. As the caterpillar nears maturity, the pest targets the cotton boll's seeds. "Ultimately, there's nothing left of value inside the boll," Sutherland says.

The pink bollworm overwinters in field trash, especially immature bolls and seeds in strung out lint, which is why NMSU researchers have heavily promoted producer plow-down programs in the fall. "Field debris allows them to survive our mild winters and come back in the spring," she says.

Today, the Mesilla Valley is leading efforts to eradicate the pest in New Mexico. Unlike the trap and treat boll weevil program, eradica-

tion of the pink bollworm will employ some unusual and innovative tools. Again pheromone-baited pink bollworm moth traps provide indications of pest movement and distribution. Commercially formulated pheromones also are used to confuse the male moths, which are functionally overpowered by all the smells.

Meanwhile, geneticists were perfecting another method for caterpillar control: transgenic cotton. According to the U.S. Department of Agriculture's Market News, 77 percent of the U.S. upland cotton crop was planted in genetically engineered varieties in 2002, a stunning shift over the past decade. One of these genetically engineered cotton varieties receiving attention in New Mexico is resistant to pink bollworms and to cotton bollworms, says Joe Ellington, an NMSU research entomologist.

These cottons contain the toxin from the bacteria *Bacillus thuringiensis* or Bt for short. Pests feeding on Bt cotton only have to ingest a small amount before they stop feeding and die, Ellington explains. These newer transgenic cotton varieties have reduced insecticide applications, increased beneficial insect populations and reduced input and labor costs. Bt cottons are an important management tool for producers to use with crop rotation, he says.

“We’re going to keep applying more and more pressure to the pink bollworm, until eradication succeeds,” Sutherland adds.

“Eliminating these cotton pests translates into more money for farmers. They get more quality lint and seed without having to spend limited cash on repeated and expensive pesticide control measures.”

Another troublemaker, the southern root-knot nematode, can

cut yields by as much as 25 percent when fields are heavily infested. The microscopic worm, which attacks the plant’s roots, acts as a plant parasite and infests about half of New Mexico’s cotton acreage.

least 100 years, is tough.

“Except for pesticides, success has been slow in coming,” Thomas admits. “Unlike diseases, nematode parasites steal the plant’s energy for their own use without killing the

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The particular species found here is “the No. 1 most widely distributed nematode pest in the world,” says Stephen Thomas, a nematologist who leads an NMSU team that identifies and works to reduce nematode-related crop damage in New Mexico. Between 2,000 and 3,000 different plant species are hosts for this particular nematode. “It’s in basically every crop that we grow in the Mesilla Valley, with the possible exception of pecans,” he says.

New Mexico growers’ dependence on furrow irrigation and the lack of locally adapted root-knot nematode resistant cotton varieties or rotation crops translates into fairly constant pest pressure from one year to the next. Root-knot nematodes, which survive in the soil, attack the cotton roots, live and reproduce in them and may eventually form a knot or gall on the root itself.

“Root-knot nematodes are spread by moving soil, and farming practices have pretty much spread this worm throughout the state,” Thomas says.

To control nematodes in cotton, New Mexico growers primarily use soil-applied systemic pesticides to halt both nematodes and insect pests. Fumigating fields with stronger products called nematicides is more effective, but too expensive for cotton, he says. Battling the microscopic pest, which also has squirmed across New Mexico for at

host. Then in place of more bolls, plants grow more nematodes.”

In addition to bugs, New Mexico growers have to fight weeds. Lately, weed management in cotton has taken a new twist with the introduction of transgenic cottons that have been genetically altered to make them tolerant to a particular herbicide, says Jill Schroeder, an NMSU weed scientist. One cotton-herbicide system is built around Roundup Ultra Max and is called the Roundup Ready System.

“These systems give growers the option to reduce preplant herbicide treatments because they can treat emerged weeds over the top of growing cotton,” Schroeder says. “The key to success with these transgenic cotton varieties is timing the application correctly.”

Looking ahead, Sutherland points out that eradicating these major exotic pests could one day open the door to native pests. “By knocking off their competition, we could have problems with insects and other things that haven’t been a problem here in many years,” she says. “Vigilance is key here to any kind of crop production. It’s part of integrated pest management after all, watching your crop and anything that happens to be on it.” **R**



**No escape:** NMSU scientists trapped their first cotton boll weevils in the late 1980s in eastern New Mexico’s Lea County. The pointy-snouted pests soon became the centerpiece of an all-out eradication program.