Overwintering Habitat Impact on Boll Weevil Control and Eradication in New Mexico

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Overwintering habitat has a dramatic impact on boll weevil populations in New Mexico. As in the High Plains of Texas, the location and amount of good overwintering habitat has been critical in the establishment of boll weevil at economically damaging levels. When populations are low, yield losses are largely restricted to fields near good overwintering habitat.

Identifying favorable boll weevil overwintering habitats is particularly important in eradication and suppression programs. When such habitats can be identified, scarce resources can be allocated more efficiently, with monitoring and control efforts concentrated in the areas at highest risk. This knowledge also allows farmers to identify and modify these habitats. For example, farmers can avoid planting cotton near these habitats, plant those fields last, or manage their crop with the knowledge that such fields are more susceptible to boll weevil damage.

Boll weevil survival in an overwintering habitat determines, in part, the level of infestation in nearby fields the following spring. Time of emergence also is critical. Early or suicidal emergence occurs when boll weevils emerge before the crop is susceptible and does not affect a crop. Boll weevils can reproduce only in cotton and only when flower buds are large enough to support full development. These are generally the size of a pencil eraser and are referred to as "hostable squares." The effective emergence, emergence shortly before hostable squares are available, most accurately predicts subsequent damage and, thus, the relative impact of a particular habitat.

Boll weevil has demonstrated its ability to overwinter successfully in New Mexico. While some counties, such as Curry, Roosevelt and Quay, may have high overwintering mortality, southern counties are least likely to experience high overwintering mortality. Very low temperatures for extended periods are needed to produce high overwintering mortality. Temperatures in the low 20s^{o} F for 24-48 hours in the overwintering habitat will result in high mortality, but southern New Mexico rarely has such conditions. While temperatures in the low 20s^{o} are not uncommon, temperatures typically are higher during the day and are not low enough for long enough to reduce temperatures in insulating overwintering habitats. Tests at New Mexico State University's Agricultural Science Center at Artesia indicated that 63% of boll weevils survived the 1997-1998 winter. Survival traps indicated 68% survival in mid-February during a relatively cold winter in 2000 near Seminole, Texas, which borders Hobbs, N.M.

In southern New Mexico, hot, dry springs generally will produce higher mortality than cold winter temperatures. During an extended drought in spring 1998, boll weevil survival was lower and emergence was earlier compared to other years in southern New Mexico.

In the Mesilla and Pecos valleys, urban areas provided the best overwintering habitats. This is not surprising since vegetation in urban areas, deciduous trees and perennial borders, most closely mimics the best overwintering habitats in other parts of the Cotton Belt. There also has been much speculation about whether or not boll weevils are overwintering in and around buildings. However, studies indicated that urban vegetation rather than structures are responsible for the higher numbers of weevils in urban areas. In rural New Mexico, weedy borders and ditch banks or riverbanks are important overwintering habitats. In some ways, this is fortunate since weed control reduces these populations. In both urban and rural areas, vegetation insulates boll weevil from cold but, perhaps more importantly, protects it from low relative humidity and direct sunlight.

In New Mexico's eastern High Plains, shinnery oak may produce more overwintered boll weevils than urban habitats. In two of three years, shinnery oak overwintering habitats produced higher initial boll weevil emergence. However, effective emergence was higher in urban areas in one of those two years, despite lower emergence overall. Grassland and clean border traps

consistently collected the lowest numbers of overwintered boll weevils. In two of three years, shinnery oak produced the highest numbers of overwintered weevils.

In both monitoring and eradication programs, the influence of urban habitats on boll weevil establishment has become evident. In both the Pecos and Mesilla valleys, initial infestations were not in urban areas. However, as numbers increased, the highest populations were found in Carlsbad and Las Cruces.

In southern New Mexico, the majority of boll weevils emerge between May 10 and June 10. Peak emergence in the best habitats (urban, Conservation Reserve Program grasses weedy borders/ditchbanks and shinnery oak) is generally late May to early June. After this, trapping rates may decline precipitously. Overwintered boll weevil emergence in poorer habitats may be finished as much as a month earlier than in the better habitats. Poorer habitats produce not only fewer emerging weevils but also earlier emergence, which results in lower survival due to lack of hostable squares during early emergence. Hostable squares generally are not available until at least mid-June in southern New Mexico and later farther north.

Control by desiccation during long, dry springs is very important in reducing the overwintered and first generation population. Desiccation and/or heat shock under New Mexico conditions can produce very high mortality. In two 1999 studies 0 and 20% of boll weevils survived in infested squares placed in furrow. Weevils in squares maintained under ideal conditions in the lab at 77° F and 50% relative humidity had a survival rate greater than 80%.

An understanding of boll weevil biology and the impact of both overwintering habitat and environment on boll weevil survival can be used to make decisions to reduce boll weevil populations both during or prior to implementing an eradication program. The following recommendations have been proven to reduce boll weevil populations, in-season damage and the cost of eradication programs.

1. ***Control weeds.*** While weed control in the winter/early spring is preferable, weed control until late May still will be effective in reducing boll weevil survival and encouraging early suicidal emergence.

2. ***Avoid early planting:*** Fields planted very early act as trap crops attracting boll weevils from a 1-mile radius. These fields will be the hardest hit. Some very early fields in areas without eradication programs have had 67-100% yield losses. Ten years of data collected in the Pecos Valley indicated no yield advantage in planting upland cotton early. Of course, you must allow time for planting all acreage. But, if possible, plant no earlier than the optimal date for your area.

3. ***Identify fields with good overwintering habitat nearby.*** Use one of the following techniques to reduce the chances that high numbers of weevils will infest those fields:

   a. Avoid planting cotton in high-risk fields: The cost of eradicating boll weevil from fields near good overwintering habitat that also cannot be treated aerially is extremely high. It would be far more effective to plant such fields in alternate crops.

   b. ***Delay planting until April 25-May 5 if possible.*** This only represents a delay in southern New Mexico. For many areas, early May is the normal planting period, and a narrow season will not allow further delays. Where possible, a delay in planting of just a few days can make the difference between having a boll weevil infested field and one that is weevil free until mid-August, when the crop is essentially finished.

   c. Plant high-risk fields last. The best overwintering habitats cause boll weevils to emerge late when cotton is most likely to be available. Boll weevils do not move far from overwintering habitat in spring, so fields closest to good overwintering habitat will be exposed to higher populations. Planting these fields last allows time for many of the weevils to starve, reducing the size of the critically important first generation.

Farmers in southern Eddy County who implemented these techniques saved more than $50 per acre in reduced insecticide applications and yield losses in 1998 alone. This doesn't include savings the following year or in nearby areas resulting from the suppressed populations.

Boll weevil can be eradicated without considering these suppression techniques. However, boll weevil eradication is expensive, and the cost is primarily borne by the farmers. Using these techniques will save the program and, ultimately, all participating farmers money, particularly during the first two years or later in areas that still have active weevil populations.