

## HISTORY

New Mexico alfalfa growers may wonder why some of their recently planted or replanted alfalfa fields have patchy, sparse stands and poor yields despite their best corrective efforts. The answer may be infestation by whitefringed beetle [Coleoptera, Curculionidae, *Naupactus* sp. (formerly *Graphognathus* sp.)]. Roosevelt (2011) and Quay (2009) have recently joined Lea, Chaves, Eddy, and Doña Ana Counties with confirmed infestations of these difficult-to-detect invasive pests. Some of these recorded infestations date back to the 1980s. The following case history from Quay County is typical.

A grower planted the first alfalfa stand in this particular field in 2003; it produced good yields in 2004 but declined seriously in 2005. The grower replaced the alfalfa with a single crop of cotton in 2006 and replanted to alfalfa that fall. The field produced well in 2007, but again suffered an obvious stand decline in 2008 (Figure 1). Adjacent fields did not appear to be affected, but the problem was definitely spreading and becoming worse in this field. From past experience, the grower had learned that well-managed, vigorous alfalfa stands can be productive for many years. The grower asked for help diagnosing the situation, and Leonard Lauriault, forage agronomist, advised the grower to identify thinning, weedy spots in the field and to dig several weak, spindly alfalfa plants from these areas for further examination. A few of these alfalfa plants had obvious tunneling in their roots while others were missing portions of roots. One damaged root produced a plump, legless, ivory-colored grub nearly half an inch long (Figure 2) that had cut the taproot about eight inches below the surface. Dr. Carol Sutherland, Extension entomologist, identified the grub as whitefringed beetle, a new county record.

A relative of alfalfa weevil and clover root curculio, whitefringed beetle is a native of southern South America. First detected in the southeastern U.S. in the mid 1930s, the pest has been associated with over 385



**Figure 1.** A two-year-old stand of alfalfa destroyed because of root feeding by whitefringed beetle grubs. Note the sparse stand of alfalfa plants and abundant growth of weeds and grasses. The previous stand was also in this condition two years after planting. (Photo credit: Leonard Lauriault, August, 2008).

host plant species, including alfalfa, cotton, peanuts, okra, soybeans, cowpeas, sweet potatoes, beans, peas, and numerous species of weeds, plus woody plants such as willow, peach, pecan, and even pine. Infestations in New Mexico and elsewhere are probably more widespread than presently recognized because the insect is so difficult to detect.

## DESCRIPTION AND BIOLOGY

Like other beetles, whitefringed beetle has the four-part life cycle (adult, egg, larva, pupa) typical of insects with complete metamorphosis. Viewed from the side, the 1/2-inch-long gray-striped adult has a white fringe on the outer edges of its wing covers, from which the name is derived, and the head is elongated into a short, broad snout featuring a pair of elbowed antennae (Figure 3). Viewed from above, the body is broadest across the bases of the wings and tapered somewhat on either end.

<sup>1</sup>Respectively, Extension Entomologist, Department of Extension Plant Sciences, and State Entomologist, New Mexico Department of Agriculture; and Forage Agronomist, Agricultural Science Center at Tucumcari, both of New Mexico State University.



**Figure 2.** Whitefringed beetle larva. Note the well-developed, slightly darker brown head capsule on the right; the chewing jaws; the multi-segmented, ivory-colored body; and the absence of legs. (Photo credit: Edward L. Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org)

Adults live above ground, hide in plant debris, and feed by cutting small notches in the leaf margins of various plants. The flightless adults are transported accidentally from one location to another on hay or other plant material, equipment and vehicles, building or landscaping materials, fence posts, or other miscellanea stored in or near the field—whatever the beetles decide to crawl onto, into, or under for shelter. Over the course of its adult life, a whitefringed beetle may also wander 1/4 to 3/4 mile in pursuit of host plants and places to lay eggs.

A single insect can infest an entire field over time because all whitefringed beetles are highly fertile females; no males have been found. Fertile eggs are produced through a process called parthenogenesis. Each female can produce 600 to 700 eggs or more over an average adult life span of 2 to 5 months. Multiple egg masses of up to 60 eggs each are laid indiscriminately on or just below the soil surface, on living or dead plant material, or on miscellaneous items parked or stored in or near the infested field. Egg masses are camouflaged by a gelatinous coating that likely conserves moisture and helps them adhere to their substrate. Larvae hatch within 10 to 11 days in summer or up to 100 days or more in cooler weather. They complete their development below ground feeding on and inside roots, tubers, underground stems, rhizomes, pods (e.g., peanut pods), etc. The plump, legless larvae are pale pink to off-white grubs up to 1/2 inch long with brown heads (Figure 2). Pupation may occur from late April through late July, usually 2 to 8 inches deep in the soil, although some pupae may be found as deep as 18 inches. One generation per year is the norm where the first whitefringed beetles were found in the southeastern U.S.



**Figure 3.** Adult whitefringed beetle (actual length about 1/2 inch), so named because of the white markings on the edges of the gray-striped wing covers. Also note the elbowed antennae and the short, broad snout. (Photo credit: Pest and Diseases Image Library, Bugwood.org).

Adults emerge from the soil April through October. Flood irrigation may force the beetles to leave alfalfa and take temporary refuge around homes, other buildings, or field margins. However, one cannot automatically associate non-descript beetles found in one area with field damage in another. Instead, collect a few unfamiliar insects in a small container of rubbing alcohol or a small plastic food storage bag and submit them to your County Extension Agent for identification.

## DETECTION

September and October are good times to look for adults in alfalfa, especially after fields have been cut. Scan or rake the short stubble and hay debris looking for these gray-striped beetles; use a hay fork to turn windrows under which beetles may hide by day, being careful to watch for rattlesnakes. The beetles are very wary and feign death when disturbed, which, along with their color and size (Figure 3), makes them easy to overlook.

For fields with some regrowth, look for spots in the field where alfalfa plants are obviously thinning and weeds are increasing (Figure 1). When the soil is soft enough after irrigation to dig at least 6 to 12 inches deep (18 inches is better), carefully dig some alfalfa plants—roots and all—from the edge of the thinning area. Insert the shovel straight down and leverage the shovel, soil, and roots out in one motion without scarring the root. A tarp or large piece of window screen provides a good surface for separating damaged roots and larvae from the soil. Affected alfalfa roots can have external chew marks as well as tunnels and holes where the larvae chewed their way in or out. Some larvae may

still be inside the root; 20 or more larvae have emerged when roots were kept moderately cool and out of the sun in a plastic food storage bag. Grubs of other beetles, such as green June beetle, also feed on alfalfa roots and may be found in a sample. However, green June beetle and other scarab beetle larvae always have 3 pairs of well-developed, easy-to-see jointed legs just back of their heads. Whitefringed beetle larvae are always legless (Figure 2). Submit a sample of the grubs live and fresh or preserved in rubbing alcohol to your County Extension Agent for identification. If grubs are not submitted for identification, dispose of the sample in a way that no living grubs can escape.

## CONTROL STRATEGIES

Since the 1930s, producers have tried a variety of strategies to control invasive whitefringed beetles. Once established, the pests can be managed but not eliminated from a farm. Maintaining detailed production records by field, regularly monitoring plant vigor and trends in pest populations, judiciously using certain labeled insecticides, and rotating crops in infested fields remain the most effective tools for managing these pests over the short and long term. Remember that over time some adult beetles are likely to wander to other fields, non-crop areas, or home landscapes; these can serve as reservoirs for reinfestation of treated areas or fields planted to new crops of alfalfa.

Currently, only certain products containing gamma-cyhalothrin or lambda-cyhalothrin are labeled for control of whitefringed beetles (adults only) in alfalfa in New Mexico (Table 1). All of these products are “Restricted Use” materials and require a current Pesticide Applicator License for purchase or use. No products are labeled for control of whitefringed beetle larvae in alfalfa. Read the labels for these products carefully for additional restrictions on applications.

Presently, it is unknown if or how quickly whitefringed beetles will develop resistance to insecticides containing gamma- or lambda-cyhalothrin, both listed in Mode of Action Classification Category 3 ([www.irac-online.org](http://www.irac-online.org)) for Insecticide Resistance Management (Table 1). As defined by the Insecticide Resistance Action Committee ([www.irac-online.org](http://www.irac-online.org)), insecticide resistance is “a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species.” Ideally, an applicator would tank-mix or rotate insecticide products with different modes of action (i.e., the ways these products affect the physiology of an organism at a biochemical level) to reduce the selection pressure on pest populations, thereby slowing down the development of insecticide resistance.

**Table 1. Examples of Currently Registered (2011) Insecticides for Treatment of Adult (Only) Whitefringed Beetles in New Mexico Alfalfa\***

Active Ingredient(s)	IRM Cat.**	Product Name	Manufacturer
Gamma-cyhalothrin	3	Declare II	Cheminova, Inc.
		Declare Insecticide	Cheminova, Inc.
Gamma-cyhalothrin & Chlorpyrifos	3 & 1	Cobalt	Dow Agrosiences
		Cobalt Advanced	Dow Agrosiences
Lambda-cyhalothrin	3	Crop\$mart	Crop Smart LLC
		Lambda-cy	
		Grizzly Z	Winfield Solutions LLC
		Kaiso 24 WG	Nufarm Americas, Inc.
		Kendo	Helm Agro US, Inc.
		LambdaStar I CS	LG International (America), Inc.
		LambdaStar Insecticide	LG International (America), Inc.
		Lambda-Cy EC Insecticide RUP	United Phosphorus, Inc.
		LambdaStar Plus	LG International (America), Inc.
		Lamcap	Syngenta Crop Protection, Inc.
Nufarm Lambda-Cyhalothrin IC Insecticide		Proaxis Insecticide	Loveland Products, Inc.
		Proaxis Insecticide	Tenkoz, Inc.
		Province Insecticide	Tenkoz, Inc.
		Silencer	Mana, Inc.
		Warrior II with Zeon Technology	Syngenta Crop Protection, Inc.
Lambda-cyhalothrin & chlorantraniliprole	3 & 28	Voliam Xpress Insecticide	Syngenta Crop Protection, Inc.

\* All products are “Restricted Use.” Pesticide labels change frequently; read all pesticide labels carefully.

\*\* Insecticide Resistance Management (IRM) Category. See [www.irac-online.org](http://www.irac-online.org) for an explanation of insecticide resistance, the various IRM categories, and IRM strategies.

Crop rotation can be a reasonably effective strategy to integrate into a whitefringed beetle management plan for not just a field but a whole farm. Alfalfa is a perennial with a fairly thick tap root in mature plants, so select a series of interim annual crops with thin, fibrous roots, such as cereal grains, that can deprive whitefringed beetle larvae of optimal microhabitats as well as the continuous diets afforded by a perennial crop. In addition, some

alternate crops may have insecticides labeled for white-fringed beetle control. Replant alfalfa several years later, and monitor the field for performance and pest problems.

Remember that adult whitefringed beetles may wander season-long beyond field perimeters where they may linger temporarily or become established. These individuals will be the reservoir for reinfestation of the original field and can also be sources for new field infestations. Pest scouting routines, field treatments (if appropriately labeled), and crop rotations should be planned and executed for the entire property, not just the originally infested field.

For more information about alfalfa management, contact your County Cooperative Extension office or visit the NMSU Cooperative Extension Service publications website at <http://aces.nmsu.edu/pubs/>.



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