Grasshoppers and Their Control

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Grasshoppers are among the most widespread and damaging pests in Texas. There are about 150 species of grasshoppers in the state, but >90 percent of grasshopper damage to crops, gardens, trees, and shrubs is caused by just a few species.

Differential grasshopper
Melanoplus differentialis

Black chevron markings on the hind femur help identify this species. Adults are 1⅛ to 1¾ inches long. They move into fields from weedy borders and can be very destructive to crops. They are seldom found in grasslands.

Red-legged grasshopper
Melanoplus femurrubrum

Adults are ⅞ to 1¼ inches long with red hind legs. This species is especially damaging to alfalfa and other legumes but can be a problem in other crops, too. They are not a problem in grasslands.

Migratory grasshopper
Melanoplus sanguinipes

This species is very destructive to both grasslands and cultivated crops. Adults are ⅞ to 1⅛ inches long. These grasshoppers are strong fliers and may swarm over long distances.

Two-striped grasshopper
Melanoplus bivittatus

Adults are 1¾ inches long with two light stripes that extend from the eyes to the wing tips. They eat mostly weeds but will also move into cultivated crops.

Packard grasshopper
Melanoplus packardii

This species prefers sandy soils with light grass cover. They are the least damaging of the five *Melanoplus* species, but large numbers of them can be a problem in both grasslands and cultivated crops.

Lubber grasshopper
Brachystola magna

The lubber grasshopper prefers weedy areas but can be a problem in crops also, especially cotton. It is seldom a problem in grasslands. Adults are 1¾ to 2 inches long. These grasshoppers are flightless, and their limited mobility makes them less damaging than the top five species. Lubber grasshoppers will feed on dead insects, even their own kind, in certain situations.

American bird grasshopper
Schistocerca americana

This species feeds on a very wide range of plants. It is usually not an economically damaging pest of grasslands but occasionally damages crops, vegetables, citrus, and ornamentals. Adults are 1½ to 2⅛ inches long.

Grasshoppers may cause isolated damage every year, but they become very destructive during outbreaks. The main factor affecting grasshopper populations is weather. Outbreaks, or exceptionally large populations, are usually preceded by several years of hot, dry summers and warm autumns. Dry weather favors the survival of nymphs and adults. Warm autumns allow grasshoppers more time to feed and lay eggs. Grasshoppers have a high reproductive capacity. The female lays an average of 200 eggs per season and sometimes as many as 400 eggs. If favorable weather increases the number of eggs, nymphs, and adults that survive, the grasshopper population may be dramatically larger the following year.

Biology

Grasshoppers deposit their eggs ½ to 2 inches below the soil surface in pod-like structures. Each egg pod consists of 20 to 120 elongated eggs cemented together. The whole mass is somewhat egg-shaped. Eggs are laid in the summer and fall, and warm, dry falls favor larger grasshopper populations the following spring.

Egg pods are very resistant to moisture and cold and easily survive the winter if the soil is not disturbed. Grasshoppers deposit eggs in fallow fields, ditches, fencerows, shelter belts, and other weedy areas, as well as in crop fields, hay fields, and alfalfa. Eggs begin hatching in late April or early May. Hatching peaks about mid-June and usually ends by late June. If spring weather is cool and extremely dry, hatching may be delayed and continue into July. It requires 40 to 60 days to complete a generation. Most grasshopper species produce up to three generations per year.

Immature grasshoppers are called nymphs. They look like adults but are smaller and have wing pads instead of fully developed wings. Nymphs go through five or six instars. Heavy spring rains reduce grasshopper populations by drowning the small nymphs. Cool, wet springs favor insect diseases, which also help reduce populations.

The adults of grasshopper species that damage crops become numerous beginning in mid-July. Damaging populations in row crops and forage crops often develop during droughts when natural vegetation in the landscape dries down and grasshoppers move into green crop areas to feed.

Damage

Grasshoppers damage plants by chewing on and consuming the plant tissues. Partially fed-on leaves will have a ragged appearance, while heavy feeding may result in near to complete defoliation. Grasshoppers primarily feed on leaves, blooms, and to a lesser extent, fruit. They are most damaging to young plants, and heavy infestations can reduce plant stand drastically. In general, drought-stressed plants suffer greater damage from defoliation relative to well-watered plants.

In pasture, 13 grasshoppers per square yard can consume as much forage as a cow, and they will eat the grass closer to the soil surface than a cow. To gauge general grasshopper infestation severity, refer to Table 1.

Table 1. General guide to assessing grasshopper population severity

Infestation severity	Adults per square-yard	
	Field margin	Within field
Non-threatening	5 to 10	0 to 2
Light	11 to 20	3 to 7
Threatening	21 to 40	8 to 14
Severe	41 to 80	15 to 28
Very severe	>80	>28

Cotton field with severe defoliation caused by grasshoppers

Monitoring Populations

Farmers and ranchers should start watching for grasshoppers early in the season and begin control measures while grasshoppers are still nymphs and still within the hatching sites (e.g., roadsides, fencerows, etc.). Treating grasshoppers early means

1) having to treat fewer acres and use less insecticide; 2) killing grasshoppers before they cause extensive crop damage; and 3) killing grasshoppers before they can fly, migrate, and lay eggs. Also, smaller grasshoppers are more susceptible to insecticides than larger ones.

Estimate the size of a grasshopper infestation by surveying nymphs or adults with the "square-foot method." Count the number of grasshoppers that hop or move within a square-foot area. Then, take 15 to 20 paces and sample another square-foot area. After performing 15 to 20 samples, add the numbers from each sample to get a total, and then divide the total by nine to obtain the number of grasshoppers per square yard. If most grasshoppers you see are first to third instar (wingless and generally less than ½ inch long), divide the number per square yard by 3 to give the adult equivalent. Count fourth instar and older nymphs as adults.

Action Thresholds

Action thresholds and tolerance for a grasshopper population are dependent on the crop at risk. For example, grass and row crops can tolerate much larger populations and damage than vegetable and ornamental crops. Some thresholds will be based on grasshopper density, typically the number of grasshoppers per square yard, and others may be based on the percentage of plant defoliation. Many crops do not have action thresholds for grasshoppers, and taking action must be based on subjective risk for economic damage. Some thresholds are presented in Table 2, but refer to Extension information for details on specific crop. These action thresholds are general thresholds and should be adjusted based on the crop stage and susceptibility. For example, seedling cotton can be quickly destroyed by grasshoppers relative to a mature plant that can withstand significant defoliation.

Table 2. General action thresholds for select crops

Crop	Action threshold
Bermuda and alfalfa hay	≥21 per sq. yd. on field margin or ≥8 per sq. yd. in field
Corn	≥10 per sq. yd.
Cotton	≥30% defoliation
Small grains	≥21 per sq. yd. on field margin or ≥8 per sq. yd. in field
Sorghum	≥30% defoliation
Sunflower	≥10 per sq. yd.

Management

Biological

Grasshoppers have many natural enemies that help control their populations. A fungus, *Entomophthora grylli*, often kills many grasshoppers when the weather is warm and humid. Infected grasshoppers strike a characteristic pose at the top of a plant or other object. The grasshopper grasps the plant in a death embrace with the front and middle legs, while the hind legs are extended. It dies in this position. Fungal spores develop in and on the grasshopper's body and then become airborne and infect other grasshoppers.

Another natural enemy that may naturally occur is a protozoan, *Nosema locustae*. This biocontrol agent may be purchased.

Other natural enemies of grasshoppers include nematodes, which are tiny roundworms that feed inside the grasshopper body, and there are many insect predators such as the larvae of blister beetles, bee flies, robber flies, ground beetles, flesh flies, spiders, and tangle-veined flies. Birds (e.g., quail, turkey, larks, etc.) and mammals also eat grasshoppers but have little effect on large populations.

Mechanical

One way to control grasshopper populations is to eliminate sites where they might deposit eggs. Grasshoppers prefer undisturbed areas for egg laying, so tilling cropland in mid to late summer discourages females. Tilling may reduce soil moisture and contribute to erosion, but those disadvantages must be weighed against potential grasshopper damage to the next crop. Mowing infested areas of pasture is not effective for reducing grasshopper infestation, and re-growth will be more susceptible to feeding.

Cultural

Controlling summer weeds in fallow fields has two benefits:

1. If grasshopper eggs are already in the field, there will be nothing for nymphs to feed on when eggs hatch.
2. Fields will not be attractive to egg-laying adults because there is nothing on which to feed.

Also eliminate tall grass and weeds from around any plants needing protection (e.g., crops, trees, and gardens). This makes the area less attractive to grasshoppers and makes it easier for birds to prey on grasshoppers.

Insecticidal

When possible, the most effective tactic to manage threatening grasshopper populations is to manage them in the landscape before they infest the field. This can be achieved by treating pastures, ditches, and field margins.

In rangeland, an effective technique for managing grasshopper outbreaks is to use Reduced Agent and Area Treatments (RAATs). This method promotes treating in swaths for 50 percent coverage, which will reduce insecticide costs and, unless the grasshopper population is extraordinarily high, reduce its population to below economically damaging levels.

In crops, it is usually recommended to broadcast treat the entire field unless infestations are relegated to the field margins.

For vegetables and ornamentals where damage cannot be tolerated, broadcast treatment of the entire crop is recommended.

The insecticide choice to manage a grasshopper infestation will vary greatly depending upon the crop, product efficacy and length of control, predominant life stage of the grasshopper, rainfastness (i.e., how well the insecticide withstands being washed off by water), and the potential for reinfestation.

Tables 3a and 3b depict insecticides that may be used for grasshopper management and some of their characteristics for a variety of crops, vegetables, ornamentals, and home landscapes. Some may be restricted-use pesticides, and not all active ingredients may be used in every crop or situation. **Thus, consult the insecticide label before using.** Because there are many trade or brand names for most of these active ingredients, and because trade names change, only the active ingredient names are provided.

Table 3a. Conventional insecticides utilized for grasshopper management

Insecticide class	Active ingredients	Notes
Pyrethroids	Alpha-cypermethrin Bifenthrin Beta-cyfluthrin Cyfluthrin Cypermethrin Deltamethrin Esfenvalerate Zeta-cypermethrin	• Commonly used in a variety of field, vegetable, and ornamental crops, and in home gardens. • Nerve toxicant. • Synthetic versions of pyrethrin. • Provide fast activity but will offer only a few days of control. • Not rainfast. • Subject to rapid reinfestation. • Broad spectrum and will kill beneficial insects. • Relatively low mammalian toxicity.
Benzoylureas	Diflubenzuron Novaluron	• Commonly used in rangeland, pasture, and hay fields. • Insect growth regulator. • Has no adult activity; kills only the nymphs. • Often mixed with a pyrethroid for adult activity. • Slow activity and will offer up to 12 days of control. • Diflubenzuron is not rainfast, while Novaluron is. • Subject to moderate reinfestation. • Fairly safe to beneficial insects. • Very low mammalian toxicity.
Carbamates	Carbaryl Methomyl	• Most commonly used in rangeland, pasture, hay fields, and home gardens. • Nerve toxicant. • Provide fast activity but will offer only a few days of control. • Not rainfast. • Subject to rapid reinfestation. • Broad spectrum and will kill beneficial insects. • Some carbaryl is sold as grasshopper baits. • Carbaryl has relatively low mammalian toxicity. • Methomyl is highly toxic to mammals.
Diamides	Chlorantraniliprole	• Commonly used in hay, row crops, vegetables, and ornamentals. • Nerve/muscle interface toxicant. • Fairly fast activity and will offer up to 21 days of control. • Highly rainfast. • Effectively controls reinfestation. • Fairly safe to beneficial insects. • Very low mammalian toxicity.

Table 3a. Conventional insecticides utilized for grasshopper management		
Insecticide class	**Active ingredients**	**Notes**
Neonicotinoids	Dinotefuran Imidacloprid Thiamethoxam	• Not commonly recommended for grasshoppers. • Nerve toxicant. • Fairly fast activity but offers short control durations. • Rainfast. • Subject to fairly rapid reinfestation. • Fairly safe to beneficial insects but toxic if sprayed directly on honeybees. • Very low mammalian toxicity.
Organophosphates	Acephate Chlorpyrifos Dimethoate Dicrotophos Malathion	• Sometimes used in hay and row crops, and some are used in ornamentals and home gardens. • Nerve toxicant. • Provide fast activity but will offer only a few days of control. • Not highly rainfast. • Subject to rapid reinfestation. • Broad spectrum and will kill beneficial insects. • Acephate, chlorpyrifos, dimethoate, and malathion have relatively low to moderate mammalian toxicity. • Dicrotophos is highly toxic to mammals.
Oxadiazines	Indoxacarb	• Nerve toxicant. • Fast activity and provides up to 14 days of control. • Rainfast. • Fairly safe to beneficial insects but toxic if sprayed directly on honeybees. • Relatively low toxicity to mammals and birds when used in accordance with the label.
Spinosyn	Spinetoram Spinosad	• Not commonly used for grasshoppers. • Nerve toxicant. • Fairly fast activity and will offer up to 7 days of control. • Rainfast. • Subject to moderate reinfestation. • Safe to most beneficial insects. • Very low mammalian toxicity.

Some insecticides will consist of a mixture of active ingredients. These insecticides are not listed, but they should contain at least one of the active ingredients listed above.

Table 3b. Biological and organic insecticides utilized for grasshopper management		
Type	**Active ingredients**	**Notes**
Azadirachtin	Azadirachtin	• Commonly used in home gardens. • Insect growth regulator and antifeedant. • Is more active on nymphs. • Marginally effective. • Slow activity and will offer very little length of control. • Not rainfast. • Subject to rapid reinfestation. • Fairly safe to beneficial insects. • Very low mammalian toxicity.
Fungi	*Isaria fumosorosea* strain FE 9901	• Not commonly recommended for grasshoppers. • Primarily used for fly management. • Offers suppression. • Infectious agent. • Very slow acting and duration of control is environmentally dependent. • Not rainfast. • Subject to rapid reinfestation. • Fairly safe to beneficial insects but may infect species other than the target. • Very low mammalian toxicity.

Table 3b. Biological and organic insecticides utilized for grasshopper management		
Type	Active ingredients	Notes
Protozoans	*Nosema locustae*	• Sometimes used in home landscapes. • Offers suppression. • Infectious agent. • Very slow acting and duration of control is environmentally dependent. • Not rainfast. • Subject to rapid reinfestation. • Fairly safe to beneficial insects but may infect species other than the target. • Very low mammalian toxicity.
Pyrethrins	Pyrethrins	• Commonly used in home gardens. • Nerve toxicant. • Provide fast activity but will offer only hours to a day of control. • Not rainfast. • Subject to rapid reinfestation. • Broad spectrum and will kill beneficial insects. • Very low mammalian toxicity.
Spinosyn	Spinosad	• Sometimes used in home gardens and for organic production. • Entrust is an organic version of other spinosad formulations. • Nerve toxicant. • Fairly fast activity and will offer up to 7 days of control. • Rainfast. • Subject to moderate reinfestation. • Safe to most beneficial insects. • Very low mammalian toxicity.
Some insecticides will consist of a mixture of active ingredients. These insecticides are not listed, but they should contain at least one of the active ingredients listed above.		

Policy statement for pest management suggestions

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The users are always responsible for the effects of pesticide residues on their livestock and crops, as well as for problems that could arise from drift or movement of the pesticide from their property to that of others. Always read and carefully follow the instructions on the container label.

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