Grasshopper
IDENTIFICATION & CONTROL METHODS
TO PROTECT CROPS AND THE ENVIRONMENT




Agriculture and Agri-Food Canada
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Saskatchewan Pulse Growers

Contents







Introduction

There are more than 80 species of grasshoppers in the Canadian Prairies. Not all of them are pest species. In fact, only about 10 grasshopper species cause problems for agricultural producers. Most of the damage to crops and forages is caused by only six of these species. Even among the pest species, some will attack certain crops but not others. For example, only a few kinds of grasshoppers will attack pulse crops.

Identification of insect species is an important component of integrated pest management techniques (IPM). IPM relies on use of a variety of control techniques to achieve cost-effective and sustainable reduction of damage by pests, with a minimum of environmental impact. IPM also depends on knowledge of the pest identity and life cycle, reliable monitoring and consideration of alternative control methods (such as biological control, currently under development).

Being able to identify which species of grasshoppers need to be controlled and which do not will make pest control decisions clearer and reduce costs of pest management, and will protect the environment by reducing the total amount of pesticide used. It will also avoid needless destruction of non-pest grasshoppers – some of which provide a food resource for wildlife in grassland ecosystems. Reduction and refinement of pesticide use can also serve to reduce future infestations, by conserving biodiversity and the natural enemies of pests.

Grasshopper species that are pest problems have two characteristics that earned them status as 'pests'; (a) they typically feed on a wide range of green plants (including crops and forage plants), and (b) they are capable of laying many eggs – considerably more than other non-pest grasshopper species.

The pest species tend to increase rapidly during years of warm, dry weather. Warm, dry weather improves their hatching and survival rates in the spring. It also speeds up development in early summer and it allows successful reproduction in late summer and fall. Several warm years in a row can magnify the numbers of pest grasshoppers. The result can be widespread destruction of field crops and greatly reduced forage for livestock. Although certain forage crops are relatively resistant to grasshoppers, more sensitive crops such as lentils and young cereals can suffer rapid damage.

Grasshoppers have only one generation per year in Canada and the northern U.S. In some years the progress of hatching may be turned on and off by periods of warmer or cooler weather, so that there may appear to be multiples hatches. Some types of grasshoppers hatch earlier than others even when weather is not variable, and knowing the sequence can aid in identification. The first grasshoppers to appear in the early spring (April and May, on the Prairies) are typically not pests. Some non-pest species actually do hatch later in the summer, but can be recognized and ignored.







How to use this guide

This booklet will allow growers, agronomists and other interested field workers to identify the kinds of grasshoppers they encounter over the seasons. Some grasshoppers cause damage, but other kinds present no risk to agriculture, and therefore do not require control. Use of this booklet will save time and reduce the use for pesticides by directing them only where they are needed.

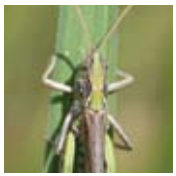
This book will help you recognize and distinguish grasshoppers that are pest problems and those that are not. It can also give you some pointers on what to expect under changing weather conditions and cropping practices. The information is meant primarily for growers interested in efficient and sustainable crop protection, but it is also of use to those who want to learn about the non-pest grasshoppers in the grassland environment.

The first section presents photographs of grasshoppers that are found in Alberta, Saskatchewan, and Manitoba (most of these species are also found in eastern British Columbia, western Ontario, and the northern U.S.). You can compare the grasshoppers you see with the photographs and descriptions, and determine the potential pest status. No previous expertise in entomology is required, although a few terms and names are given for those who would like to learn the basics. You may find that it is useful to use a net to capture grasshoppers for closer examination, or you can take this book to the field. Hints regarding timing and appearance will allow you to understand and predict grasshopper cycles, anticipate the need for control in advance, and avoid taking control actions when mainly non-pest grasshoppers are found.

Use the second section to review your integrated pest management options in general. By doing this, you may be able to reduce pesticide applications. Pest control action should not be taken unless the pest species are present and actually causing damage. This book also gives rules of thumb regarding timing for best results. Conditions change from year to year, so an understanding of how weather affects these insects is more valuable than a general calendar with advice on when to survey and take action. Provincial and state agriculture agencies provide the latest recommendations regarding restrictions on use of pesticides, and current insect forecasts.






Grasshopper identification

Like other insects, grasshopper species have two names: a common name, and a Latin name that is used as an internationally recognized standard. In Canada, many insect species have two common names: one in English and one in French, and a list is available from the Entomological Society of Canada. Effective monitoring is based on knowledgeable identification, because each species has particular preferences, timing, responses to weather, and susceptibility to control agents. Grasshopper species are fixed from one generation to the next, and never interbreed, hybridize or change into a new species on the time scales that normally concern us.

On the Canadian Prairies and Northern Great Plains, grasshopper species fall mainly into four main groups. The first step in learning to identify grasshoppers is to learn these four groups.

The first three groups are subfamilies of grasshoppers (Family Acrididae, in the Order Orthoptera, Class Insecta).

1. Spur-throated grasshoppers (Melanoplinae) have a spine below the head, in the "throat" area. This group is sometimes called "spine-breasted". Many of these species are harmless, or restricted to certain native plants such as range grass and sage. But a few, like the two-striped grasshopper and lesser migratory grasshopper, are major pests that can cause devastating damage to a wide range of plants.

2. Band-winged grasshoppers (Oedipodinae) make a crackling or clacking noise when they fly, and this can help in identification. They have red, yellow or black hind wings that are visible when they fly.

One exception to this is the clear-winged grasshopper. The clear-winged grasshopper is the only major pest in this group. It is a brown and yellow grasshopper (black when it first hatches) that has clear hind wings which are used in long-distance flying. They are called "clear-winged" because having clear wings is unusual in this group. Do not use this as an identification feature, because the wings of grasshoppers in the other three groups are typically clear. There is a similar subfamily called the bird-winged grasshoppers, Cyrtacanthacridinae, that are not currently found in Canada, but which may eventually become established if warm conditions prevail.

3. Slant-faced grasshoppers (Gomphocerinae) are slim and pointed, and may have lengthwise stripes on the side of the body. The slant-faced grasshoppers feed mainly on native grasses on rangeland, but many will accept introduced grasses in pastures or roadsides. These grasshoppers lay too few eggs to reach pest proportions, and rarely eat enough to be noticed. Some "call" by making scratching sounds with the legs while sitting in the grass. These are not pests. There is also a group called the silent slant-faced grasshoppers (Acridinae), but they do not occur in Canada, except for two species of bog grasshopper, mentioned near the end of this book.

4. Katydids and crickets are recognized by their very long antennae. Katydids and their close relatives are sometimes called "long-horned grasshoppers". Most are flightless. Some sing loudly by rubbing the wings together. This group contains no serious pests in Canada, although one, the Mormon cricket, causes significant damage in the US, and is controlled with organized spray programs in some years. The females of this group look like they have a stinger, but it is a harmless egg-laying device. Tree crickets and field crickets are somewhat similar but can easily be recognized.







How to tell if a grasshopper is a pest or not – basic rules of thumb

- Any grasshopper flying before June is **not a pest**.
- Crop pest grasshoppers hatch in late May and early June, are brown or black, and always have tiny triangular wing buds, not large wings that can be folded back when examined closely.
- Any grasshopper with hind wings highly visible in flight (red, yellow, orange or black) is **not a pest**. Grasshoppers have four wings; the hind wings are the flying wings, folded under the leathery forewings when not in use.
- Any grasshopper that sings, calls, clacks, clatters or makes other similar sounds, either in flight or on the ground, is **not a pest**. The pest species (and some non-pest species) are silent.
- Any grasshopper that inhabits a crop on a warm day without feeding on the vegetation may be a temporary resident that is moving to more preferred vegetation.
- Grasshoppers that remain in rangeland, headlands, or other grassland without moving into crops are likely to be species that do not damage crops (monitoring during warm weather will allow this to be determined), and do not require control actions.
- Grasshoppers that appear lethargic and hang on vegetation in mid- or late summer may be infected with naturally occurring pathogens that will help reduce their numbers.

Grasshopper control – how to identify damaging species, and how to control them

Grasshoppers are a major pest of cultivated crops in drier climates around the world. In Canada, the majority of highly visible damage has been in cereal grains in the Prairies. In some years, losses to pastures, hay and rangeland may be extreme as well. Losses on rangeland are less common in Canada than in the U. S. but, this could change if climate warms. Some pulse crops and oilseed crops can be seriously affected as well. Certain species of grasshoppers can seriously damage lentils, flax, canola, alfalfa and other crops.

The type and extent of crop damage will depend upon the type, condition and stage of the crop, and on the numbers, activity, and typical stage of the grasshoppers that are present. In some cases, changes in cropping practice, cultivation or timing may reduce damage. In general, fewer than 8 grasshoppers per square meter will not cause enough damage to warrant control, but this figure depends on weather (warmer weather speeds feeding, cool weather stops it), grasshopper species, and crop type (lentils and young seedlings of most susceptible plants can be damaged by even a few per square meter).

In this publication, you will have a resource that will let you determine if the grasshopper species you see are likely to cause damage to lentils and other crops that may be in rotation with pulse crops. The grasshopper species are categorized into three groups:

- **Significant pest status** (need to be watched)
- **Low pest status** (in part depending on crop type)
- **Neutral or beneficial**

Recognizing grasshopper ages and stages

Timely recognition of potential pest species requires identification of the immature stages that occur in spring and early summer, and not just knowledge of the adult forms that are seen later in the season. Most grasshoppers have five immature stages that can be used as an indicator of progress of spring hatching. The immature hopper is called an instar, for example the middle stage at which control is often advised is when they appear as "third instars", also called "third-instar grasshoppers".

When most of the grasshoppers at a site are first instars, it is too soon to take control action, because this young average age would indicate that many eggs have not yet hatched. Eggs are not controlled by pesticide, and most pesticides persist long enough only to kill hoppers hatching in the few days following application. When many of the hoppers seen on the soil surface or vegetation are third instars, the hatch is over the peak, or almost completed. Fluctuating temperatures may extend the hatch, because hatching only occurs in soil with adequate heat.

The basic methods for recognizing the eggs and immature stages are similar for all species discussed below.

Eggpods

Eggs are laid in pods, usually about 2-3 cm (1 inch) deep in workable soil, or against objects such as stones, posts or plant roots. The pest species typically have 30 to 60 eggs per pod. The eggs look a bit like brown rice, and are protected with a small foam plug. They hatch in mid-May if soil is warm, or as late as early to mid-June. The newly hatched hopper climbs up to the surface and sheds the first temporary skin. Hatching does not occur all at once in a field or roadside, but may be spread out over a period of up to 2 weeks or more.

Fig. 1: Eggs are the size and appearance of brown rice.

Fig. 2: You can try to find egg pods by sifting soil with a coarse screen.

First instar

Grasshoppers hatch in the soil (typically in late May, on the Canadian Prairies, and earlier in the U.S.). The larvae move to the surface, shed the first thin skin, and appear as a tiny first-instar nymph. After the brief larva stage, they are called nymphs. The first instar is typically 3 mm (1/8th inch) in length. The back of the first-instar hopper is smooth, without apparent wingbuds. Older immature stages have wingbuds instead of wings, and the size of the wingbuds indicates their age since emerging from the soil.

Fig. 3: A first-instar lesser migratory grasshopper, one day old, sitting on a penny. First instars of any species have no trace of any growing wingbud (sometimes called the wingpad).

Fig. 4a: When hoppers first emerge from the soil, they are pale and only about 3 mm in length.

Fig. 4b: Within a day, they darken and begin growth (two-striped grasshopper).

Fig. 5: A first-instar two-striped grasshopper, one day old.

Fig. 6: Two first-instar clear-winged grasshoppers, sitting in front of older hoppers of the same species. This species feeds on grass, wheat and barley.

Second instar

The first-instar hopper feeds, grows and molts within several days. The resulting second instar has a longer body, but still has very little wingbud showing, only two small flaps.

Fig. 7: This Packard's grasshopper is about to molt to the third instar, in which the wingbuds will have slightly ridged veins. Note the "black pepper" spots on the back of this species.

Third instar

After a few days of warm temperatures, the second-instar hoppers molt their skin and emerge with slightly longer body length, and a more visible wingbud with slight venation. These are the third instars that indicate the hatch has progressed and that warm weather has allowed rapid development. This typically occurs in early to mid-June, on the Canadian Prairies. Unless a large part of the crop is already being lost because of overwhelming numbers, control should not be attempted before this stage has become common. If grasshoppers found at a site are younger than the third instar, it is better to wait and allow as many grasshoppers to hatch as possible.

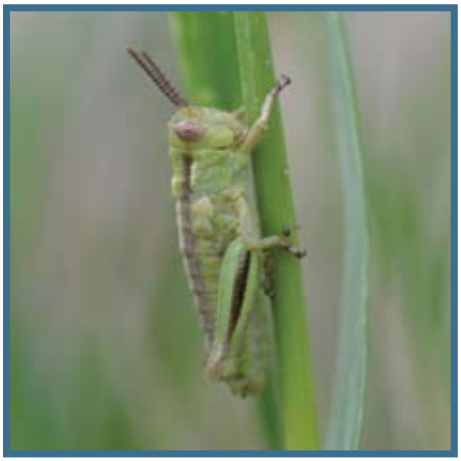
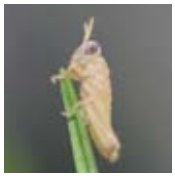
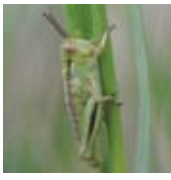


Fig. 8: The third instar (two-striped grasshopper, in this case) has a more apparent double-row wingbud on the back, with clear venation.

Fig. 9: A third-instar clear-winged grasshopper. The first instar of this species is black and white, and the second to the fifth instars are brown, with angular ridges visible on the pronotum (the back, or upper thorax).



Fourth instar

This larger stage has small triangular wingbuds that extend over the first segment of the abdomen, and a heavier body. The wingbuds have clear ridges (veins), and in many species the wingbud has a white dot at this stage and later. Feeding activity reaches a peak in this stage.

Fig. 10: A fourth-instar two-striped grasshopper. Immatures of this species have a solid stripe on the hind leg, in addition to the two stripes on the thorax.

Fig. 11: Fourth-instar clear-winged grasshopper. The wingbuds are well-developed, but do not extend past the first segment of the abdomen (if they did extend further down the back, it would be a fifth instar).







Fifth instar

This stage indicates that the hopper is nearly mature. The wingbud is longer and now looks like a wing. Within about a week, the hopper molts and extends full-size wings. The wings dry within hours. Breeding begins about a week after wings are formed.

Fig. 12: A recently molted fifth-instar Packard's grasshopper (note spots, which indicate this species).

Fig. 13a: Species: two-striped grasshopper. Nymphs of this species can be brown, tan, green, or yellow-orange.

Fig: 13b: Species: two-striped grasshopper. Nymphs of this species can be brown, tan, green, or yellow-orange.

After feeding under warm conditions, the integument (skin) is shed for the final time, and soft wings are filled with blood. Wings dry within a day. The whole sequence of hatching to adulthood takes around one month, if weather is warm enough.

Fig. 14: A new adult female two-striped grasshopper emerging from the fifth-instar skin, just before inflating the wings. The hindwings are clear and used for flying, and the forewings (called tegmina, singular tegmen) are dark and leathery, serving as covers for the more delicate hindwings.

Fig. 15: After another week, mating may begin. The males of most grasshopper species are smaller than the females (the two-striped grasshopper is shown here).

Identifying grasshoppers

First group: Significant Pest Status

The three species below are common pests of a wide range of crops on the Prairies and Northern Great Plains. They are known to feed on a wide range of crops, including lentils, and can damage other pulses, such as chick peas when the plants are in early stages. They can rapidly damage cereal and forage crops, in warm weather.

Melanoplus bivittatus, two-striped grasshopper

On the Canadian Prairies, the two-striped grasshopper is the pest grasshopper with the heaviest body weight. It rarely flies far, but can walk well into a crop as it feeds along a band.

Fig. 16: Damage to rotation crop margins caused by two-striped grasshoppers feeding as they move.

It feeds on a wide range of grass, cereal crops, and broad-leafed crops, including pulse crops, canola and even safflower. Populations that infest cereal crops may lay eggs that threaten crops the following year. This species can heavily damage lentils when they are most susceptible, during early growth and in flowering. Young hoppers of this species can feed on flower and buds, and slow or even kill young plants. Older hoppers may clip pods later in the season, when other food is lacking. Figure 17 shows the size and appearance of two-striped grasshoppers when they would threaten crops in June.

Fig. 17: The threat to crops in early June would typically come from third-instar two-striped grasshoppers, which may be green or brown.

Fig. 18: Adults may vary from green to yellow. In most years, egg-laying begins in late July and August, or earlier in warmer weather.

Fig. 19: Adult female

As noted in the section on recognizing the immature stages grasshoppers, the coloration of the immature stages of this important pest is variable. Even when immature, the two-striped grasshopper can be recognized by the scattered stripes made up of spots, running along the back. The longitudinal stripes on the adult two-striped are dark and obvious, but the damage is done long before adults appear. The hind tibiae of the two-striped grasshopper are yellow or dull blue-green in the West, and rose or red in eastern Canada and the eastern U.S. (a fact that confuses people who use taxonomic keys that were made based on specimens from only one region or the other). Manitoba has both forms.

The two-striped grasshopper is one of the earliest pest species to hatch, typically appearing on the Prairies in late May. Some non-pests emerge earlier, either as new hatchlings or as overwintering nymphs, as described in a special section later in this book. The life cycle of the two-striped grasshopper is similar to the typical pattern for most pest species. The newly hatched hoppers are small when they hatch in late May to early June, and appear tan in the earliest stages. By early June, they are brown, and by late June can be brown or light green. In July and August, adults lay eggs that hatch the following spring.

The two-striped grasshopper is capable of feeding on some plants, such as certain pulse crops, that have defenses against other insects. It was recently discovered that this grasshopper has unique mechanisms that allow it to feed on toxic plants such as timber milkvetch *(Astragalus miser)*, but unfortunately it does not control this range weed.







Melanoplus packardii, **Packard's grasshopper**

This species looks like the two-striped grasshopper, but the stripes are duller and less defined. It readily feeds on broadleaf crops, including pulses, cereals, alfalfa and grass. This species is less common than the two-striped grasshopper, and typically a more moderate threat, but it increases in numbers in areas with sandier soil and generally dry conditions.

Immature Packard's grasshoppers are always green, even lime-green. The adults may be dark (Fig. 20), or salmon-hued (Fig. 21). They can be distinguished from the two-striped by the reduced clarity of the stripes, because they have blue hind tibiae (long, thin lower section of leg, Fig. 22), usually light blue in Canada (sometimes red in the U.S.).

Fig. 20

Fig. 21

Fig. 22

Melanoplus sanguinipes, lesser migratory grasshopper (sometimes called "migratory grasshopper")

This is one of the main grasshoppers that is famous for causing extensive damage in the 1930's, when it flew into parts of the Canadian Prairies in large swarms. The lesser migratory grasshopper is smaller than the two-striped and Packard's, and typically dark grey. It has a prominent stripe on the head, like a mask. The tegmina (forewings) have rows of small dark rectangular spots reminiscent of windows on an aircraft. Like the two-striped and Packard's grasshoppers, the lesser migratory has a broad diet that has resulted in damage to a wide range of cereal crops and broadleaf crops, including lentils. In the fall, it may damage pods in lentils and canola, but if the crop is very mature or if the weather is cool, this damage is much reduced. This species is common in grass pastures, although often outnumbered by rangeland species.

It should be mentioned that although the swarms of lesser migratory grasshoppers in the 1930's presented a crisis, they were dwarfed by the massive outbreaks of the Rocky Mountain locust, *Melanoplus spretus*, in the 1800's. The Rocky Mountain locust is now extinct, for reasons that remain a biological mystery. Several extant grasshoppers are close relatives of the Rocky Mountain locust, notably the less migratory grasshopper, which continues to cause crop damage on grassland, and Bruner's spur-throated grasshopper *(Melanoplus bruneri)*, which was relatively rare until recent decades of warm weather resulted in lasting infestations in west-central Alberta and interior British Columbia. Bruner's spur-throated grasshopper looks like the lesser migratory grasshopper, but is slightly larger and darker.

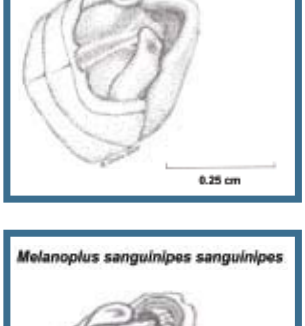
Fig. 23: A third-instar lesser migratory grasshopper, the age and size that would be typical in crops in Canada and the northern US in mid-June.

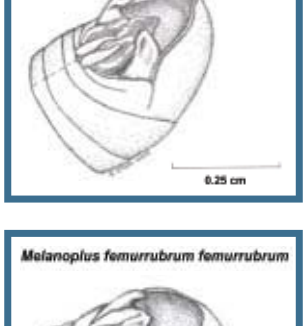
Fig. 24: A fifth-instar lesser migratory grasshopper, typical in July. Note the stripes on the head and thorax, and the bars on the legs.

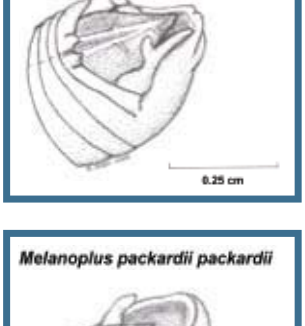
Fig. 25: An adult lesser migratory grasshopper

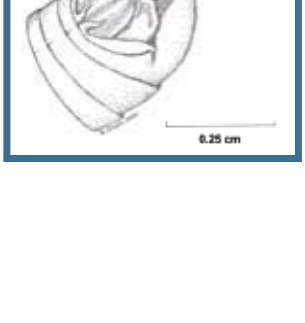
Advanced identification tips for spur-throated grasshoppers

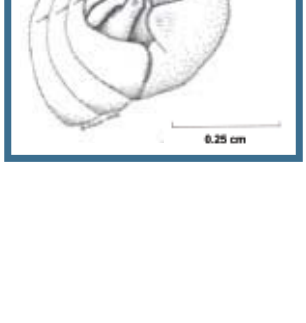
Species can be separated and confirmed based on the precise anatomical differences of the tip of the abdomen of male grasshoppers. Male grasshoppers have a smooth, spoon-shaped lower side on the tip of the abdomen, and female grasshoppers have four pointed structures that can be seen protruding from the tip of the abdomen when the insect is lightly squeezed. This is part of the egg-laying structure (ovipositor), which is short on the Acrididae family of grasshoppers (which includes all of the species discussed above, except for katydids and crickets, which have longer antennae and long ovipositors). The figures below show the differences in the male anatomy for some species that are found on the Canadian Prairies.

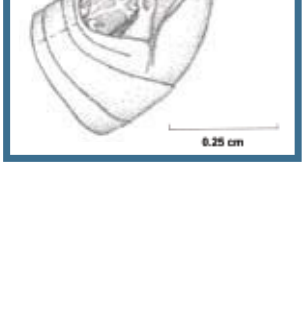












Low pest status

Camnula pellucida, clear-winged grasshopper

The clear-winged grasshopper is a very serious pest of grasses and cereal crops, but not of pulses. Densities greater than about 15 per square meter cause significant damage quickly. Field densities of hundreds of new hatchlings per square metre occurred during 2002-2003, peak years in a recent outbreak of the clear-winged grasshopper. When other food is not available, it may chew stem tissue and cause some damage to broadleaf crops in rare cases, but normally this species moves out of pulse crops quickly. It is important to recognize this species, because it can be ignored in crops such as canola or lentils, but when it is numerous, it can cause serious damage to growing barley and wheat. It will not invade pulse crops.

The two-striped, Packard's, and migratory grasshoppers all have a pointed structure (the "spine" or "spur") on the throat area of all stages, but the clear-winged grasshopper does not (it is in the band-winged subfamily, and not the spur-throated subfamily).

For this particular case, you can use the spur as an indication of wide crop preference. The lack of the spur on the throat indicates it eats grasses only.

The first instar of the clear-winged grasshopper is very small, dark brown (almost black), with a clearly visible white stripe (Fig. 6). The older immatures are brown and somewhat angular in appearance compared to other grasshoppers (Figs. 9, 11). The adults (Fig. 26) may at first appear to have two stripes on the back, but you will not confuse it with the two-striped if you note the brown blotches on the forewings (Fig. 27), the absence of a spur on the throat, and the yellow-orange hind tibiae (lower hindlegs).

Fig. 26: Adult female (left, larger) and male (right, smaller) clear-winged grasshoppers. The female is brown and the male is yellow-brown.

Fig. 27. Adult clear-winged. Note "blotched" appearance.

Dissosteira carolina, **Carolina grasshopper, black-winged grasshopper**

This large grasshopper will feed on pulse crops, but is usually low in number and not active. It is found mainly in areas with fine-textured soil.

Fig. 28: Carolina grasshopper, black-winged grasshopper, or road-duster

Fig. 29: The dark wings of the Carolina grasshopper make it highly visible in flight.

Melanoplus dawsoni, **Dawson's grasshopper**

This small melanopline (meaning spur-throated) grasshopper is common in fescue grasslands, and in some years is found on mixed grass. It may accidentally invade crops but causes no problems. It has short, flightless wings that may mislead the observer into thinking it is immature. In some years, a very small fraction of the population can have long wings, but this is very rare.

Fig. 30: Dawson's grasshopper can be recognized by its small size (even in late summer), short wings, and bright yellow underside.

Melanoplus femurrubrum, **red-legged grasshopper**

This species is found in moist situations, the opposite of most other grasshoppers. It will feed on broadleaf crops as well as grass and forbs, but is rarely a pest in the west. Numbers and activity are higher in eastern Canada and the northeastern U.S. This species comes in a form similar to the lesser migratory grasshopper (but with redder legs), and also in a rare blue form.

Fig. 32: The blue form of the red-legged grasshopper.

Fig. 31: The common form of the red-legged grasshopper. It looks like the lesser migratory grasshopper, but it has red tibiae, and has a more yellow underside.

Fig. 33: Lesser migratory grasshopper (pest, larger, left) and the little spur-throated grasshopper (non-pest, smaller, right).

Melanoplus infantilis, **little spur-throated grasshopper**

This species is similar to the lesser migratory, but smaller in size, and will not damage pulse crops. It is the most common grasshopper on the Prairies, yet it is often not noticed, because although it may build up to high numbers on rangeland, it does not move into crops or most pastures. It can be recognized by the distinctive antler-shaped male organs (cerci) on the end of the abdomen (see page 21).

Fig. 34: Kennicott's grasshopper is less than half the size of pest Melanoplus species, but larger than the little spur-throated grasshopper.

Melanoplus kennicottii, **Kennicott's grasshopper**

This small grasshopper is rare, and confined to river valleys or more northern farmland near forests. It looks like a small, silvery version of the lesser migratory grasshopper. It rarely occurs in large numbers, and can be ignored in agricultural situations.

Phoetaliotes nebrascensis, **large-headed grasshopper**

This species feeds mainly on pasture grasses. Field observations indicate that it benefits from spring rains, and can increase from less than 1% of the pasture and range grasshopper community, to over 20%. Females usually have very short wings (like Dawson's grasshopper), and even males do not often fly. When it moves into pulse crops, it quickly moves out again, and it is usually only found on grassy borders.

Fig. 35: Large-headed grasshopper.

Neutral or beneficial grasshopper species

Aeoloplides turnbulli, Turnbull's grasshopper, or Russian thistle grasshopper

This species actually prefers kochia, tumbleweed (also known as Russian thistle) and other related plants in the Chenopodiaceae. This choice of food plant is interesting, because related pest species, such as the lesser migratory grasshopper, will not feed on kochia, resulting in pure stands of young kochia plants in drought-stricken pastures in some years (this was common in Alberta in the mid-1980's).

You can recognize the Russian thistle grasshopper by the squat appearance, dull green hue, robust pronotum (the shield covering the thorax), three bands on the hind femur, and orange antennae. The tegmina (hindwings) are usually shorter than the abdomen, and it usually does not fly.

Fig. 36: Turnbull's grasshopper, or Russian thistle grasshopper.

Hesperotettix viridis pratensis, **meadow purple-striped grasshopper**

The meadow purple-striped grasshopper (in the US, also called the snakeweed grasshopper and the green-striped grasshopper) is never abundant, but when found it is usually near its preferred food plants, including some classed as weeds: ragweed, snakeweed, goldenrod, and sage. It is generally beneficial, but rarely reaches larger numbers.

Fig. 37: Meadow purple-striped grasshopper.

Acrolophitus hirtipes, **green fool grasshopper**

This grasshopper does look comical when it flies, and does no harm to crops despite its large size. It has light yellow hindwings, and tends to be found in grassland areas with broadleaf native plants.

Fig. 38: Green fool grasshopper.

Aeropedellus clavatus, **club-horned grasshopper**

The earliest hatching grasshopper, this small silver species is often found on grassland in March, but should not cause concern. It is not an indication of a bad grasshopper year coming, and it does no damage to crops itself.

Fig. 39: Club-horned grasshopper.

Chorthippus curtipennis, **marsh meadow grasshopper**

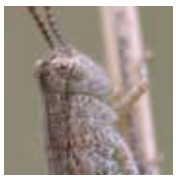
This species is common around moist areas and may move into irrigated margins, but causes no damage.

Fig. 40a: Adult female marsh meadow grasshopper.

Fig. 40b: Adult male marsh meadow grasshopper.






Eritettix simplex tricarinatus, **velvet-striped grasshopper**

The velvet-striped grasshopper overwinters as a hopper, unlike most grasshoppers, which overwinter as eggs. It is tan, silver or green, and does no damage to any crop.

Fig. 41: Velvet-striped grasshopper.

Psoloessa delicatula, **brown-spotted range grasshopper**

This early spring species is grey with an hourglass on the back and black triangles on the legs. As with any grasshopper seen before early May, it causes no damage to crops or to grazing. Later in the season, it does not move into crops of any kind. It represents an important food source for wild birds.

Pseudopomala brachyptera, **bunch-grass grasshopper**

This unusual looking grasshopper is sometimes called the toothpick grasshopper. It is flightless, feeds on grasses, and is often found in roadside brome, but causes no damage to pulses or other crops. This species was once found closer to the U.S. border, but has moved farther north in the Canadian Prairies during 1984-2007, as climate warmed on average.

Fig. 42: Bunch-grass grasshopper.

Fig. 43: The brown-spotted range grasshopper (adult male and female; female is the larger).

Arphia conspersa, **speckled rangeland grasshopper**

The crackle of this grasshopper as it flies is heard in April and May. Like all species that have red or yellow hindwings (seen when flying), it causes no damage to crops, pastures or range. This species flies in April and May, and another species like it flies in the fall (*Arphia pseudonietana*, the red-winged grasshopper).

Fig. 44: Speckled rangeland grasshopper.

Chortophaga viridifasciata, **northern green-striped grasshopper**

This band-winged grasshopper overwinters as a nymph (not as an egg, like the pest species) and matures very early in the spring. It is noticed because of its large size and early appearance (usually flying in May and June). Although high numbers in eastern Canada and the eastern U.S. have caused it to approach pest status in rare cases, it is no harm in the west, and can be discounted while checking for grasshopper problems.

You can recognize it by the keel-shaped pronotum (upper thorax) and light yellow wings. Both sexes can be either green or brown. There is a southern green-striped grasshopper, which is found, for example, in Arkansas to Florida.

Fig. 45: Adult female northern green-striped grasshopper.

Fig. 46: Adult male northern green-striped grasshopper.

Metator pardalinus, **blue-legged grasshopper**

This species has either red or yellow wings (it is found in both forms, at the same locations), and a bright blue inner hind leg. It causes no damage to crops, but because it is a good flier, it may be noticed.

Fig. 47: Blue-legged grasshopper.

Xanthippus corallipes latefasciatus, **red-shanked grasshopper**

This species has a large body, and may seem like a problem because of its locust-like appearance, but it causes no damage to any crop, and no significant damage to rangeland in most years. It is found very early (appearing even in February, on warm days), and is an important source of food for larger birds such as burrowing owls.

Fig. 48: Adult female red-shanked grasshopper.

Rangeland species and others restricted to certain habitats

Although they are not the subject of this book, an additional 20 or so species are found mainly on native grassland and rangeland. These rarely venture into crops, and do not significantly damage grazing in most years.

Fig. 49: Amphitornus coloradus, striped slant-faced grasshopper, is a typical rangeland grasshopper that will not move to crops.

Fig. 50: Melanoplus bowditchi canus, sagebrush grasshopper, an example of a grasshopper that is restricted to one range plant, and will not present a threat.

Fig. 51: Phlibostroma quadrimaculatum, four-spotted grasshopper, is an easily recognized rangeland grasshopper that has increased in numbers, with recent warmer weather.

Fig. 52: Ageneotettix deorum, the white-whiskers grasshopper, captured by a robber fly (Diptera : Asilidae).

Fig. 53: Some grasshoppers, such as these striped sedge grasshoppers (Stethophyma lineatum) are restricted to moist vegetation such as bogs.

Katydids and bush crickets

Katydids, bush crickets, and long-horned grasshoppers are typically found in roadsides, dense pastures, irrigated cropland, and where shrubs, forbs and tall grass occur. They are noticed for their size and loud singing, and sometimes mistaken for pests. Here is how to recognize them:

Anabrus simplex, Mormon cricket

(Family Tettigoniidae, Subfamily Tettigoniinae)

The Mormon cricket is actually in the katydid family, and the males can be heard singing from roosting sites in vegetation. Females have a long egg-laying organ that looks like a stinger, but is harmless. The Mormon cricket can be green, brown, blue-gray or black. This species is a serious pest in the U.S. in some years, but so far has not reached damaging levels in Canada. It is usually harmless, even though it seems large and aggressive. It feeds on a range of vegetation, and in some cases will eat seed that is within reach. The Mormon cricket cannot fly.

Fig. 54: Adult female Mormon cricket.

Conocephalus saltans, prairie meadow katydid

(Family Tettigoniidae,
Subfamily Conocephalinae)
This small katydid is active in moist vegetation, but causes no damage. A similar but larger katydid, *Orchelimum*, sings in large numbers in roadsides and irrigated crops. No singing grasshoppers cause crop damage.

Fig. 55: Prairie meadow katydid.

Scudderia pistillata, **broad-winged bush katydid**

(Family Tettigoniidae, Subfamily Phaneropterinae)
The broad-winged bush katydid is a large green insect that flies slowly and can draw attention. It generally lives around streams, shrubs or irrigated crops. It causes no damage, but has increased in numbers during recent warm years.

Fig. 56: This female broad-winged bush katydid has a J-shaped egg-laying organ.

Crickets

Ceuthophilus, **camel crickets**

(Family Rhaphidophoridae)
These small, amber crickets are recognized by their long legs. They may congregate in moist areas, under cover, or in buildings, but do not affect crops.

Fig. 57: A number of camel cricket species are found in rural and urban areas.

Fig. 58: The fall and spring field cricket are similar in appearance. Both live in soil crevices and similar cover.

Gryllus pennsylvanicus, fall field cricket and *Gryllus veletis,* spring field cricket

(Family Gryllidae, Subfamily Gryllinae)
These black crickets are sometimes abundant, but generally do not harm crop (although in rare cases they may feed slightly on swaths or stored crop). In fact, the fall field cricket sometimes digs up and devours grasshopper eggs.

Fig. 59: An adult female four-spotted tree cricket.

Oecanthus quadripunctatus, four-spotted tree cricket

(Family Gryllidae, Subfamily Oecanthinae)
Tree crickets have a shrill, long call from shrubs, alfalfa and tall grass, and draw attention. They are not pests to any crop.

Special note: early spring grasshoppers are not pests

Some non-pest species of grasshoppers overwinter in active stages or hatch much earlier than pest grasshoppers, and can cause confusion during surveys early in the spring. The hatching grasshoppers that may damage pulse crops, forages and cereals (such as the two-striped grasshopper) can be distinguished because they are small when hatching (around 1/8th inch, 2 to 3 mm, in late May and early June), and tan, black or brown. Many overwintering grasshoppers are silver, green or rust-coloured, and much larger. Some of these harmless species are mentioned above, but because they are found early in the year, deserve some extra attention as a group, with tips for identification.

1. One of the most common insects found on pastures and roadsides in the spring and early summer is the club-horned grasshopper (*Aeropedellus clavatus*), a small, grey slant-faced grasshopper. It is normally grey, black and tan, but it can be partly green and even white. It can be recognized by the hourglass marking on the back, the short wings and especially by the knobbed antennae. No other grasshopper has such thickened tips on the antennae. The club-horned grasshopper is well adapted to survival and development in cold conditions, and hatches earlier in the spring than any other grasshopper. This grasshopper eats western wheat grass, needle and thread grass, and other native species, but it has a light diet. It never damages pulse crops, oilseeds or cereals. You can avoid being fooled by looking for the knobs on the end of the antenna.

2. The velvet-striped grasshopper (*Eritettix simplex tricarinatus*) is a small green and silver slant-faced grasshopper, with a sharply pointed head and two dark stripes highlighted by light-colored stripes, running down the back. It's often found on grassy slopes and roadsides in April and May, not because it hatches early but because it overwinters as a grasshopper, not an egg. The main food for this species is blue grama grass and sedge, but it eats so little that it causes no harm.

3. The brown-spotted range grasshopper (*Psoloessa delicatula*) is usually the first grasshopper found in the spring. It lays eggs that hatch in summer, unlike the pest species, which lays eggs in late summer that hatch in the spring. You can recognize this species by the early date, grey color (rarely green), constricted hourglass on the back, tiny colorless wings, and distinct black triangles on the back legs when seen from above. Like the club-horned grasshopper, the brown-spotted range grasshopper is important food for the nestlings of grassland songbirds. This grasshopper eats native grasses and sedge but it causes no significant damage, and there is no reason to spray to control it.

4. In April you can find a dark brown or charcoal-colored grasshopper called the speckled rangeland grasshopper (*Arphia conspersa*). When it flies, usually in May, blood-red wings are visible. It causes no problem itself, although it tends to be more common in years in which the pest species are also out there, so it is an indication that monitoring a little later in the spring would be useful.

5. The northern green-striped grasshopper (*Chortophaga viridifasciata*) comes in either green or tan, but it can be recognized by the strong ridge on the back. No other grasshopper in early spring has such a sharp ridge (but later in the summer, the green fool grasshopper has an even higher ridge). The northern green-striped grasshopper has a yellow wing in flight, and tends to fly only short distances. It looks like a problem because it is large, but never causes crop damage in western Canada.

6. The heaviest grasshopper on the Prairies is the red-shanked grasshopper (*Xanthippus corallipes latefasciatus*). It spends the winters as a bumpy immature that looks a little like a tiny toad, which you can find in grassland as soon as the ground warms in the spring. The immature is usually brown, but can be olive green and grey or shades of tan. When it grows wings, they can be either red or yellow. This grasshopper is important food for burrowing owls and other large birds.









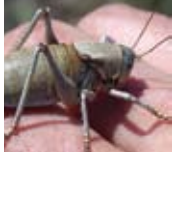
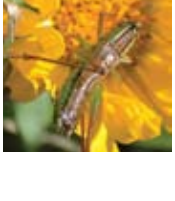
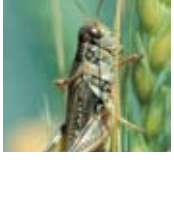
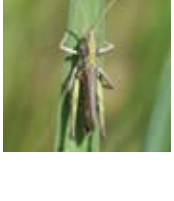
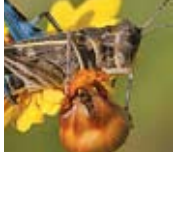




Pests to watch for during June and July

Summary: The most common grasshopper pests in the Canadian prairies in recent years have been the two-striped grasshopper and the clear-winged grasshopper. Both of these can occur in large numbers, and tend to eat crops down to the ground around the edge of the field or other choice spots. If a forecast predicts high densities in an area, it may be prudent to check fields in late May and early June. Forecasts typically indicate the abundance of grasshopper observed during the previous August, for example, 2-4 per square meter. This does not represent the expected hatching abundance in early spring. An adult female grasshopper can easily lay over 100 eggs (50+ per pod), and the potential number that hatch the following spring depends in part on weather and survival.

Remember that the two-striped feeds on a wide range of grassy and broadleaf plants, and the clear-winged grasshopper is mainly restricted to cereal crops and grass. They both overwinter as eggs and hatch in time to grow in June, so the date can help to separate them from the harmless species that overwinter and emerge in April and early May. In the last decade, the lesser migratory grasshopper and Packard's grasshopper ranked a distant third and fourth in pest status, although they were bigger problems in past outbreaks, such as in the 1980's, early 1970's, 1940's and 1930s.


Chemical control methods

Chemical control agents are carefully regulated in Canada and the U.S., and labels should be strictly followed. In Canada, provincial government websites and guides contain the latest recommendations. In the U.S., USDA, APHIS and state agencies should be consulted.

All grasshoppers are highly susceptible to pyrethroid insecticides (such as Matador and Decis), certain organophosphate insecticides (such as Lorsban) and carbamate insecticides (such as Sevin XLR). Even coverage is a crucial factor that may affect effectiveness. Problems regarding poor performance during warm temperature are rarely as significant, despite some warnings that have been made. Baits (such as wheat bran containing small amounts of insecticide) are effective ways to control grasshoppers with lower rates of insecticides, when application conditions and equipment allow. Alternatives are under development.

Note that not all insecticides act immediately, and 1 to 3 days may be required. Do not enter fields to check immediately after spraying.

Cultural Control Methods

Although heavy infestations will cause some damage unless controlled, some steps may be taken to adjust agricultural practices and decisions, to reduce risk of grasshopper damage while reducing the use of pesticides.

Crop and cultivar selection. Some crops are either more resistant to grasshoppers, or less preferred. It has been known since the 1940s that oats are usually less damaged than barley or wheat. Chickpeas and green peas are often not damaged by grasshoppers that otherwise readily attack roadside grass, alfalfa and cereal crops nearby. The timing of damage is important to consider. Immature grasshoppers may damage flowering pulses early in the season, but cause much less damage to the vegetative parts or pods later in the year.

Early seeding. In some years, weather may allow options in seeding date that could reduce grasshopper damage to crops. Older, more vigorous plants can withstand more feeding damage.

Weed control. Reduced weed cover, by tillage or chemical fallow, can reduce egg-laying by grasshoppers in late summer and also reduce survival of the hatchlings in May and June.

Trap strips. Hungry grasshoppers move rapidly and far to find food, and then stop at the discovery of acceptable plants. This is why grasshopper damage at the edge of a growing crop often forms a sharp line that is visible from the road. Leaving green strips may concentrate grasshoppers in narrow zones (for example, one or two swaths wide around the outside of a field, or where grasshoppers will concentrate). Grasshoppers drawn to the trap strips can be economically killed with insecticide.

In some years, natural enemies of grasshoppers reduce numbers substantially. These can include beeflies, fungal diseases, predators, and parasites (mainly flies that kills grasshoppers).

Economic thresholds

Thresholds are typically levels of pest abundance that indicate control action is economically warranted. At lower densities, the crop saved is less than the cost of control. The economic threshold concept does not work well with grasshoppers, because they may move quickly or concentrate in zones along field edges, and feeding is highly dependent on grasshopper species, crop condition, and weather.

The best basis for decisions is evidence of hatching and actual damage. Grasshoppers may hatch in small numbers and cause damage to crops, but continue to hatch. In this case it is best to wait, to try for a balance between the gains resulting from immediate control of the hatched grasshoppers, and the losses that would result from missing the ones that have not yet hatched.

Grasshopper eggs are below ground and immune to insecticide, although they can be killed if they emerge 1 to 3 days after spraying. Once grasshoppers are mostly hatched (this varies, but in Canada usually around June 5 in a warm spring and late June in a cool spring), control action can be taken where crop damage is visible. All the damage from grasshoppers comes from chewing, and no toxins or other effects are involved.

Densities on the ground of about 10 grasshoppers per square meter and above indicate possible risk to crops, but only if feeding is apparent. Lower numbers than this can damage seedlings or flowering crops. Research in Saskatchewan found that 2 to 4 per square meter can damage young lentils, but recent tests in Alberta show that 10 or more per square meter in late summer may not cause significant damage to leaves and pods. Often the threshold is not an issue, because typical summer densities are either in the below 5 per square metre range, or about 30 per square meter. Very high numbers that are damaging crops do indicate continued risk. If the numbers seen are low, or appear to be a species which may not attack crops, it is best to wait and see.

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