

Grasshopper Monitoring Protocol

Host plants:

A wide range of cultivated crops and rangeland grasses.

Significant Pest Species:

***Melanoplus sanguinipes* (Fabricius): Migratory Grasshopper [Orthoptera, Acrididae]**

A grayish-brown species (Figure 1) with a black stripe that usually extends from the eye onto the lateral lobe of the pronotum. Forewings are long, brownish, and bear a row of dark-brown spots centrally. Hind femora usually have two oblique dark bands. Hind tibia is normally red but sometimes blue. The males are about 20 mm and females are about 28 mm long. Favored habitats are weedy pastures, crops, and similar disturbed areas. They feed both on grass and broad-leafed plants. At high densities, a behavioral change occurs wherein the grasshopper become gregarious, moving as a group; thus the species' common name, "migratory grasshopper".

Migratory grasshoppers overwinter as eggs in the soil. Eggs commence hatching in the midspring. **Hatching occurs from early may to mid July.**

Nymphs feed for about a month before reaching the adult stage. Egg laying begins about a week after the female reaches the adult stage. Females lay 200-300 eggs from late July into the fall in pods 5 cm deep in open soil.

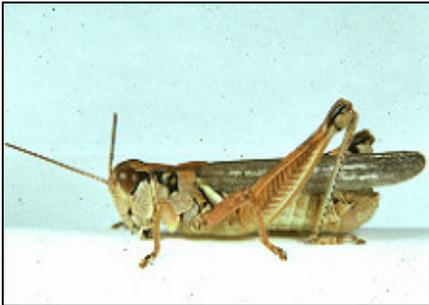


Figure 1: *M. sanguinipes*

***Melanoplus bivittatus* (Say): Twostriped Grasshopper**

Inhabit tall, lush, herbaceous vegetation. Dense populations may reside in tallgrass prairies, wet meadows, roadsides, ditches and crop borders. Hosts include weeds, most crops specially alfalfa and vegetables (broad-leafed plants). It preferentially feed on bean pods. Adults are dark yellowish green in color. This grasshopper derives its name from the two pale yellow stripes extending from the back of the eyes to the tip of the forewings (Figure 2). A solid black stripe is evident along the outer side of the yellowish hind legs. Males are about 24-28 mm long and the females may grow up to 40 mm in length.

Overwinter as eggs that hatch in late May to early June. Nymphs feed for 5-6 weeks. Adults appear in the last 2 weeks of July and lay eggs in pods inserted into soil.

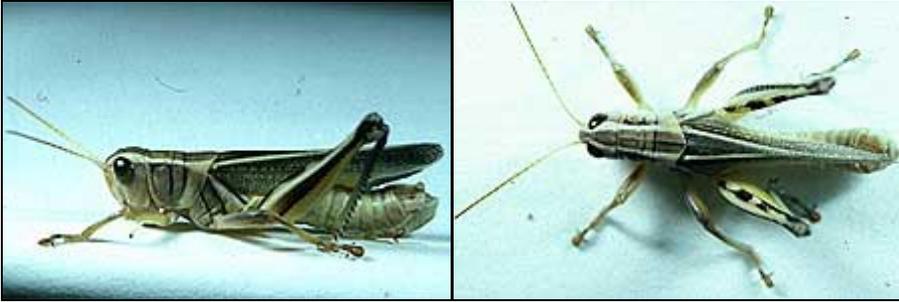


Figure 2: *M. bivittatus*

***Melanoplus packardii* (Scudder): Packard's Grasshopper [Orthoptera, Acrididae]**

Feed on both broadleaf plants and grasses, and is reported to prefer legumes. Adults are grayish, brownish or yellowish brown above and yellowish below (Figure 3). A diffuse dark stripe extends from the top of the head over the top of the pronotum. Forewings are grayish brown, usually with a few small spots. Hind femora are yellowish with a dark stripe along the upper edge. Males are 22-23 mm long, females 26-37 mm.

Eggs commence hatching in midspring. Nymphal development ranges from 47 to 63 days. **Adults are found from July to September.**



Figure 3: *M. packardii*

***Camnula pellucida* (Scudder): Clearwinged Grasshopper [Orthoptera, Acrididae]**

Clearwinged grasshopper inhabits grassy meadows, often in hilly or mountainous areas. Its tendency to aggregate when densities are high can lead to significant damage to pastures, grains and canola crops.

Adult is a yellowish or grayish brown grasshopper with transparent hind wings (Figure 4). Forewings bear dark round or oval blotches. Median ridge on the pronotum is slightly elevated and notched. Lateral lobes of the pronotum are marked with black. Males are 20-25 mm long; females are 25-31 mm.

Nymphal development ranges from 26-40 days. Because nymphs of the clearwinged grasshopper develop faster than those of the twostriped, adults of the clearwinged may appear first.

Eggs are laid in clutches of 10-38 enclosed in pods.

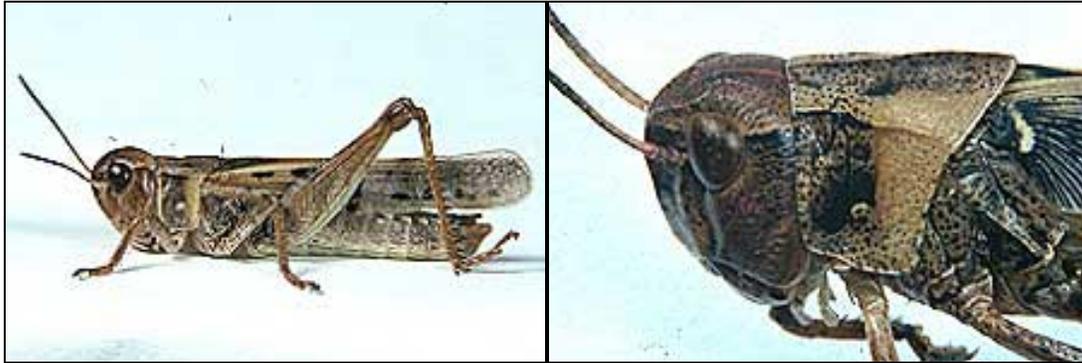


Figure 4: *C. pellucida*

Monitoring

Timing:

Counting adult grasshopper densities in an area in late summer (when grasshoppers are laying eggs) helps estimate the number of eggs overwintering and forecast the risk of grasshoppers being at problem levels in the next growing season.

To count fully winged adult grasshoppers, sites should be surveyed between **August 1st and September 1st**

Location:

50 m of the field and the roadside (Figure 5). Sample enough locations so that you have a good representation of the grasshopper populations in your area. If possible, sample at least five locations in your district.

Estimate the Density:

At each location, the surveyor will estimate the average number of grasshoppers encountered while walking through the field and along the roadside. Preferably, the average is calculated from visual observations while walking 10 (long) X 1 (wide) m sampling areas and repeating this 10 times (field and roadside). When populations of grasshoppers appear similar or terrain becomes an obstacle the sample areas can be reduced to half as long as a reasonable estimate is made for each site.

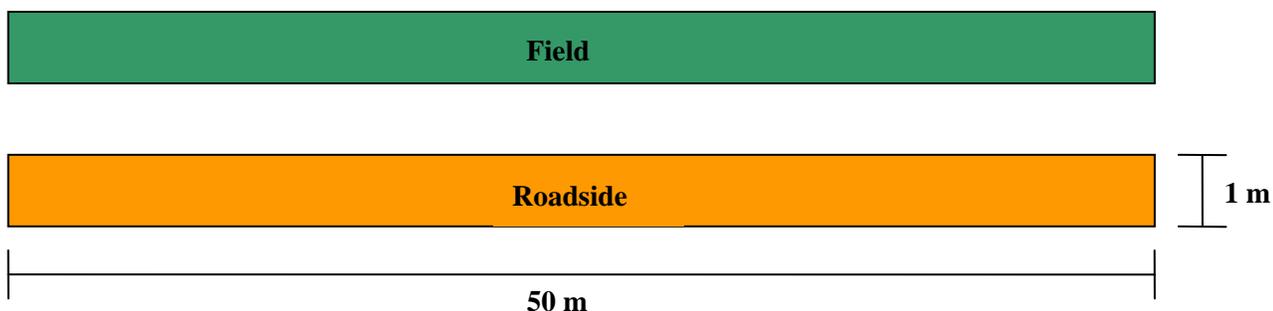


Figure 5. The survey area for each location for both the roadside and field areas.

Measure off a distance of 50 m on the level road surface and mark both starting and finishing points using markers or specific posts on the field margin (Figure 5). These points should be visible from both field and roadside. Starting at one end in either the field or the roadside and walk toward the other end of the 50 m making some disturbance with your feet to encourage any grasshoppers to jump. Grasshoppers that jump/fly through the field of view within a one meter width in front of the observer are counted. A meter stick can be carried as a visual tool to give perspective for a one meter width. However, after a few stops one can often visualize the necessary width and a meter stick may not be required. Also, a hand-held counter can be useful in counting while the observer counts off the required distance. At the end point the total number of grasshoppers is divided by 50 to give an average per meter. For 100 m, repeat this procedure.

Sweep net Sampling:

To monitor different species, use a sweep net to take five sweeps in each location and put in a clear plastic bag to observe the contents of the net for an estimate of species. Enter species percentages **only** if you are sure of the identification.

Damage Rating:

0-2 / m ² = None to Very Light	8-12 / m ² = Moderate (action threshold)*
2-4 / m ² = Very Light	12-24 / m ² = Severe
4-8 / m ² = Light	> 24 / m ² =Very Severe

* > 2 per m² can cause losses in lentils at flowering and podding stages.