# Range and Pasture XIX-1

# Grasshoppers

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*Grasshopper.*

## Field Biology

While there are a great number of grasshopper species, only about eight to 10 of these ever reach populations which could be considered economic. Some species, in fact, are beneficial. *Hypochlora alba*, for example, is closely associated with *Artemesia ludoviciana* (Louisiana sagewort), an undesirable perennial forb. Species of the genus *Hesperotettix* also feed on undesirable forbs and shrubs and *Melanoplus packardii* feeds on thistles.

Grasshoppers can generally be divided into three groups based on their feeding habits which is dictated by their mandibular types. These are grass feeders, mixed feeders and forb feeders. Generally, several species of mixed feeders and a few grass feeding species are the ones that will increase in numbers to the point that they may become an economic infestation.

## Identification (and Life Cycle/Seasonal History)

Rangeland grasshopper identification, while not easy, can be accomplished by anyone with some knowledge of insects with the aid of Dr. Robert Pfadt's pictorial key (Pfadt, 1994). This publication has colored plates of most of the grasshopper species that are economic in the Northern Great Plains. The pictures are of male and female grasshoppers and of the various nymphal stages. It also gives distribution, feeding habits, life cycle and general preferred habitats for each species. Two other publications, Hewitt, et al (1974) and Haws (1982), were used extensively in developing this manuscript.

Generally, grasshoppers have one generation per year. Eggs are deposited in the ground in the fall. The female depresses the ovipositor into the ground and as eggs are being deposited, a frothing, sticky substance is secreted with the eggs. This material gathers soil particles that form an insulated pod around the eggs that ensures winter survival. The eggs hatch in the spring and summer and hatch is dependent on soil temperature, which differs for different species. Three or four species overwinter as nymphs but these are generally non-economic.

## Plant Response and Damage

Plant damage resulting from grasshopper feeding goes beyond the amount of vegetation consumed. In the feeding process, grass stems and blades are cut and fall from the plant. Thus the leaf tissue is lost and so is some seed stock, which reduces grass production. It has been reported that 20 grasshoppers per square yard will eat or destroy as much forage as a thousand pound steer will consume. However, assessment of potential loss to rangeland is complicated as indicated in the discussion on use of the control decision model. Climatic factors play an important part in the assessment of damage potential of grasshoppers. If adequate moisture is available, forage regrowth will offset much of the grasshopper damage. Unfortunately, most grasshopper outbreaks occur when drought conditions are prevalent. Overstocking livestock is common during moisture shortages. Many of the outbreak grasshopper species prefer overgrazed range as a habitat. In addition, the grasshopper biological control agents such as diseases and predators are not as prevalent in overgrazed, droughthy habitats as they are under normal conditions. Recent joint ARS/North Dakota State University studies indicated that rangeland grazed in a twice-over rotation grazing regime reduced grasshopper nymphs by 79 percent and subsequent adult numbers by 71-96 percent when compared to continual grazing for five months. Earlier studies at the Kansas State University Range Experiment Station determined that adult grasshoppers were more numerous on early-spring burned, heavily grazed, and mid-spring burned pastures than on fall-burned or deferred grazing moderately stocked pastures.

## Management Approaches

### Host Plant Resistance

None.

### Biological Control

Several predators and parasites attack grasshoppers or their eggs. Range inhabiting birds, robber flies, wasps, spiders, Diptera in the families, Sarcophagidae, Tachinidae and Nemestrinidae, blister beetles (grasshopper eggs), and nematodes all have been observed as predators or parasites of grasshoppers. However, none of these seem viable as a control agent that could be manipulated to control a grasshopper outbreak. Disease agents including the micro-sporidia *Nosema locustae*, a virus in the entomopox virus group, and several fungal species have been evaluated as control agents for grasshoppers but to date none have been very successful.

### Chemical Control

### Sampling/Surveying/Timing of Sampling

Grasshopper surveys have been done by APHIS and state entomologists in the fall after egg deposition and again in the spring. These numbers were then mapped for the 11 western range states. APHIS entomologists no longer conduct the surveys and some state entomologists are no longer conducting grasshopper surveys either. Fall surveys served some purpose but were not as useful as the surveys made after hatching is completed. Several methods of determining grasshopper numbers have been used. The most practical is probably a standard sweep net equipped with a bush net.

### Economic Threshold

Economic thresholds are determined by counting the number of grasshoppers per square yard. Fifteen to 20 grasshopper nymphs per square yard is considered the economic threshold. This number is considered to equate to eight to 10 adults. However, the economic threshold can be modified by climatic conditions. If moisture is adequate regrowth of the consumed or destroyed vegetation may offset the damage. Recent insecticide trials in Wyoming indicate that reduced rates of carbaryl (Sevin) both in the amount of pesticide and area treated of about 50 percent only reduced control from 85 to 79 percent. This reduction in pesticide would reduce control costs by 60 percent.

*Product list for grasshoppers:*

| **Insecticide** | **Lbs Active Ingredient Per Acre (Fl oz. Or oz. Product)** | **Preharvest Interval, Remarks** |
|---|---|---|
| carbaryl (Sevin XLR Plus, 80S soluble, 4F, 20% bait) | 0.5-1.5 lb. | No restrictions. |
| Diflubezuron (Dimilin 25), 2L | 2 oz (25W), 1 oz (2L) | Treat for grasshoppers in 2nd to 3rd instar, growth regulator – will not control adults; no grazing restrictions. |
| Malathion (57EC)<br>Malathion (ULV9.33) | EC: 1-1. 5 LB.<br>ULV: 8-12 oz. | Apply undiluted by air.<br>No restrictions. |

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Categories: Range, Insects, Pasture, Grasshoppers

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