Twostriped grasshopper

Takes bran bait well. Pest of crops, trees, shrubs, and range. Peak hatch range: May 15 – June 15. Female body length:

Redlegged grasshopper

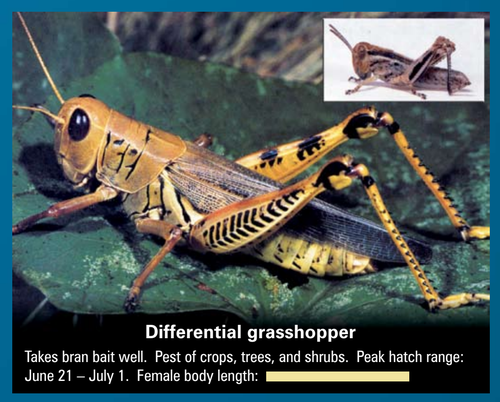
Takes bran bait well. Pest of crops and forage. Peak hatch range: June 21 – July 1. Female body length:

Clearwinged grasshopper

Takes bran bait well. Pest of crops and forage. Peak hatch range: May 15 – June 15. Female body length:

Striped grasshopper

Does not take bran bait. Pest of range grasses. Peak hatch range: May 15 – June 15. Female body length:



Differential grasshopper

Takes bran bait well. Pest of crops, trees, and shrubs. Peak hatch range: June 21 – July 1. Female body length:

Migratory grasshopper

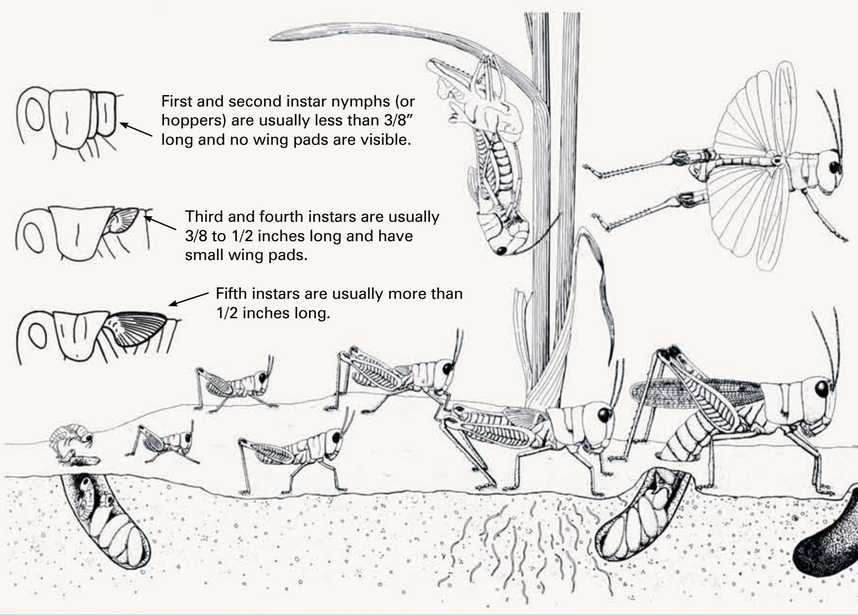
Takes bran bait well. Pest of crops, range, and trees. Peak hatch range: May 15 – June 15. Female body length:

Bigheaded grasshopper

Takes bran bait well. Pest of range grasses, especially crested wheatgrass. Peak hatch range: May 15 – June 15. Female body length:

Grasshopper Life Cycle

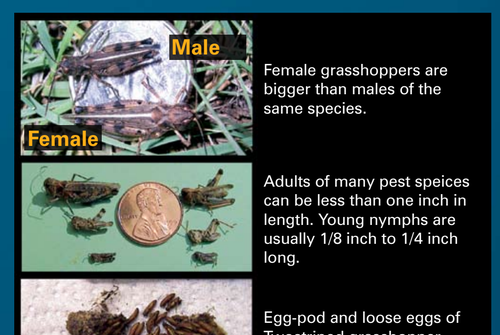
Western grasshoppers produce only one generation per year



1. Hatching usually occurs mid-May to late June. A few species hatch in the summer and overwinter as nymphs.
2. Grasshoppers have to shed their hard exoskeleton to grow bigger through each nymphal phase (instar) to adulthood. They often hang upside down on grass stems to molt. It takes five to seven days to complete an instar.
3. Most species have five nymphal instars.
4. The last molt results in an adult with functional wings that allow low, evasive flights. Some species have very short wings as adults.
5. Only mature adults can reproduce, so egg laying is prevented if nymphs are treated. Adult females require up to 2 weeks to reach reproductive maturity, after which they produce 20 to 100 eggs in several clusters or pods deposited in the soil.
6. Eggs are resistant to cold and desiccation, but they are vulnerable to parasites (tiny wasps, flies, and blister beetles). Birds and other predators feed on nymphs and adults and also help keep grasshopper densities in check.

Spottedwinged grasshopper

Does not take bran bait. Pest of range grasses. Peak hatch range: May 15 – June 15. Female body length:



Female grasshoppers are bigger than males of the same species.

Adults of many pest speices can be less than one inch in length. Young nymphs are usually 1/8 inch to 1/4 inch long.

Egg-pod and loose eggs of Twostriped grasshopper.

PEST GRASSHOPPERS OF THE WEST:

Identification and Management

Packard grasshopper

Takes bran bait well. Pest of crops and forage. Peak hatch range: May 1-30. Female body length:

Flabellate grasshopper

Takes bran bait well. Pest of range forage, likes forbs. Peak hatch range: May 15 - June 15. Female body length: *Note -- This species may be beneficial at low densities in that it consumes the reproductive parts of cactus flowers.*

Whitewhiskered grasshopper

Takes bran bait well. Pest of range grasses and sedges. Peak hatch range: May 15–June 15. Female body length:

Valley grasshopper

Takes bran bait well. Pest of forage and crops. Peak hatch range: April 7 – May 15. Female body length:

Foursposted grasshopper

Does not take bran bait. Pest of range grasses. Peak hatch range: June 21 – July 1. Female body length:

Snakeweed grasshopper

Beneficial species! Feeds on poisonous rangeland weeds. Peak hatch range: May 15 – June 15. Female body length:

Step-by-Step Guide to Deal With a Grasshopper Infestation

How to evaluate grasshopper density

Reason: It is important to accurately estimate grasshopper population density to determine if the economic threshold has been reached (the density at which the cost of damage will be greater than the cost of treatment). A density that almost certainly would warrant treatments is 24 grasshoppers/yd2, and control is rarely justified at densities of less than 14 grasshoppers/yd2. This latter density of pest species can cause a 30% forage loss on typical rangeland. One way to determine economic threshold is through the CARMA software that can be found at http://cs.unk.edu/~hastings/carma/

Method: The most commonly used method to accurately estimate grasshopper population density per square yard is to visualize a square foot area and count the number of grasshoppers that jump from each square-foot as you approach it. It is important to randomly select the visualized sampling areas in the habitat. If you always pick a patch of bare ground, for example, your samples won't represent the habitat as a whole. Accurate density estimates are obtained when the temperature is 60 to 95oF, the wind is less than 15 mph, and the vegetation is not wet (a light dew is acceptable).

Steps to Estimate Grasshopper Density

1. Calibrate your eye to the size of a square-foot survey hoop to consistently estimate the same area on the ground.
2. Walk 50 to 100 feet away from the road, finding typical rangeland area.
3. Stop. Visualize the square-foot area approximately 20 feet in front of you.
4. Walking slowly toward the visualized area, count the number of grasshoppers that jump, fly or escape its boundaries. Do not count grasshoppers that enter the area selected once you have started counting. Once you have reached the site, you may need to brush it with your hand or foot to make sure that all grasshoppers have been counted.
5. Stop. Write the total number of grasshoppers from the visualized area down on a piece of paper.
6. Repeat Steps 3 through 6 until 18 stops have been made in.
7. Add the 18 counts and divide that total by two. This figure will be an estimated number of the grasshoppers per square yard. If necessary, round up to the next whole number.

How to estimate the extent of infestation

Reason: Determining the extent of the infestation will influence treatment options. Large areas can often be treated quickly and economically by airplane whereas small infestations may be most efficiently controlled with ground equipment.

Method: Making survey stops on a 1-mile grid will allow ranchers to find major infestations, but more frequent survey stops (every ¼ mile) will locate incipient "hot-spots." Once an area infested with grasshoppers is found, you need to determine its extent. This will require travel by truck, ATV, or foot as conditions require. Grasshopper densities change with the habitat (e.g., pine trees, grassy plains, or rocky hills), so a short-distance drop in densities may not signal the edge of a large infestation.

The treatment options that are available

The choice of a treatment option depends on the size of the infestation. For large infestations (several thousand acres), aerial application of insecticide sprays (malathion, carbaryl or diflubenzuron) using the Reduced Agent and Area Treatment strategy (RAATs) is the most appropriate. For more information and updates on aerial RAATs, refer to the UW brochure below available at: www.wygisc.uwyo.edu/grasshopper/

For smaller infestations, apply carbaryl or diflubenzuron sprays using the ATV-RAATs approach. Carbaryl insecticide on wheat bran or apple pumice bait can also be an efficient and economic treatment option. Not all grasshoppers take up bait. Bait susceptibility, application rates, and treatment equipment information is available at http://www.sidney.ars.usda.gov/grasshopper/.

If treatment is needed use Reduced Agent and Area Treatments (RAATs)

What are RAATs?

RAATs are a method of integrated pest management (IPM) for rangeland grasshoppers in which the rate of insecticide is reduced from levels recommended by the label, and untreated swaths (refuges) are alternated with treated swaths. RAATs work through chemical control, meaning grasshoppers are killed in treated swaths and as they move out of untreated swaths, and conservation biological control, which allows predators and parasites preserved in untreated swaths to suppress grasshoppers. This IPM approach can reduce the cost of control and the amount of insecticide used by more than 50%.

What to expect from RAATs

Efficacy

This method normally will result in 80 to 95% control, which is approximately 5 to 15% lower mortality than with a conventional (higher rate, blanket coverage) treatment. Leaving low, residual densities of grasshoppers after RAATs does not result in a subsequent outbreak (see Environment below).

Economics

Using RAATs will greatly reduce costs of the control program depending on the agent and swath width. In some cases, costs are reduced by two-thirds. It should be noted that the greatest economic benefits derive from increased swath spacing since this effectively decreases both the costs of insecticide and application.

Environment

RAATs mean 50 to 75% less insecticide is applied to rangelands for grasshopper control. The untreated swaths harbor species essential to rangeland ecosystems, including biocontrol agents of grasshoppers and weeds. Low densities of surviving grasshoppers allow predators and parasites in the untreated refuges to recolonize and thereby re-establish natural regulation of grasshopper populations. For these reasons, RAAT programs also may sustain higher densities of birds than blanket applications.

How to use ATV-RAATs

1. Apply carbaryl (Sevin® XLR) at a minimum of 16 fluid ounces per treated acre. Alkaline water (pH>8) used for carrier fluid should be buffered to neutral pH to prevent degradation of carbaryl.
2. Apply diflubenzuron (Dimilin® 2L) at a minimum rate of 1 fluid ounce per treated acre. Dimilin® 2L is a restricted-use pesticide available only to certified applicators.

To ensure good coverage on the range vegetation and to increase efficacy, add at least 8 ounces of oil adjuvant per treated acre. Crop oil concentrate by itself or a mixture of 1 part crop oil concentrate and 7 parts corn or canola oil work well as spray adjuvants. Their inclusion may increase control by 10% or more.

Nozzles: TeeJet® 1/4-KLC-5 FieldJet and any other boomless nozzle that can produce a 12 to 20-foot spray swath with relatively low volume and fine spray, so several acres can be treated per tank, is suitable. More detailed information on nozzles and calibration can be found at: www.wygisc.uwyo.edu/grasshopper/ under the ATV-RAATs information link and in RAATs brochures available upon request from the University of Wyoming CES.

Coverage recommendations: Percent coverage should be roughly equal to the average grasshopper density per square yard, with a min. of 33% and a max. of 50% coverage.

Exceptions to the "Rules"

Higher rates and/or coverages may be needed if:
1) treatments are applied to late instar nymphs (especially if using Dimilin® 2L),
2) ground temperatures exceed air temperatures (especially if using malathion),
3) grasshopper densities are extreme (e.g., >40 per square yard),
4) forage cover is tall and/or dense,
5) terrain is rough.

If possible, grasshopper management software (CARMA[1] or HOPPER[2]) should be used to assess program options. Always apply insecticides in accordance with label directions and established guidelines for buffers around water, bees, and human habitations.

[1]For more information on RAATs or to download CARMA, visit: www.wygisc.uwyo.edu/grasshopper/

[2]Available from the USDA-ARS Northern Plains Agricultural Research Laboratory at: www.sidney.ars.usda.gov/grasshopper/Support/Hopper.htm

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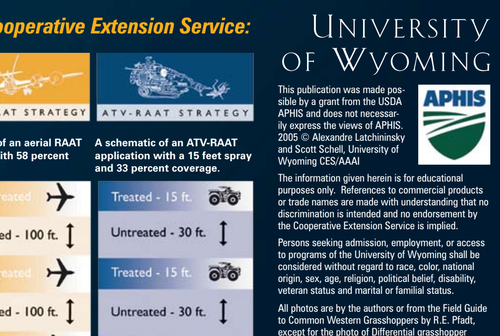


Obscure grasshopper

Takes bran bait well. Pest of range grasses. Peak hatch range: June 21 – July 1. Female body length:

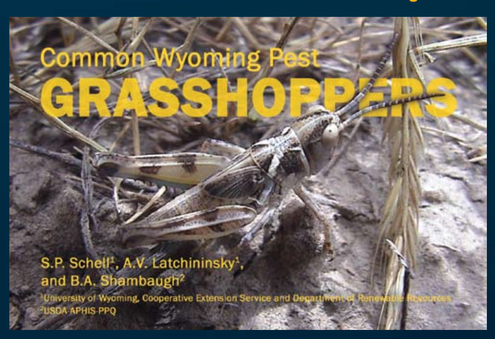
Little spurthroated grasshopper

Takes bran bait well. Pest of range and small grains. Peak hatch range: May 15 – June 15. Female body length:

Kiowa grasshopper

Does not take bran bait. Pest of range grasses. Peak hatch range: June 7- 21. Female body length:

Need more information? Available free of charge from the University of Wyoming Cooperative Extension Service:



This guide covers 17 most common pest grasshopper species in Wyoming.

A schematic of an aerial RAAT application with 58 percent coverage.

A schematic of an ATV-RAAT application with a 15 feet spray and 33 percent coverage.

RAATs brochures explain both aerial and ATV application strategies.

UNIVERSITY OF WYOMING

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