Fact Sheet

University of California
Agriculture and Natural Resources

Plumas-Sierra-Butte Livestock & Natural Resources

Grasshoppers

May 2022 ***(update)***

Tom Getts - Weed Ecology and Cropping Systems Advisor - Lassen, Modoc, Sierra, and Plumas Counties and
Tracy Schohr - Livestock and Natural Resources Advisor - Plumas, Sierra and Butte Counties



There are over 200 species of grasshoppers that have been identified in the Western US. With their huge legs, it is easy to identify the insect is a grasshopper, but it can be difficult to differentiate between species. Grasshoppers are a sporadic pest, with boom and bust population dynamics. In 2019, grasshoppers were identified as a problem by ranchers in Plumas County's Indian Valley, eating forage intended for livestock on irrigated pasture. These pests can be problematic in a variety of environments, with populations migrating from rangeland into croplands on bumper years.

Biology: Grasshoppers lay eggs in pods during the fall in the top 2 inches of the soil. Typically a female lays 1-4 pods, with 20 to 100 eggs per pod. Most overwinter as eggs and hatch in the spring, but certain species will overwinter as nymphs. Immature grasshoppers will go through 5 to 6 molts before maturity (30-40 days), where after the adult stage is reached they can live 2-3 months. Fortunately, there is only one generation per year.

Impacts: Grasshoppers can consume massive amounts of vegetation. It is estimated that a grasshopper can consume 30 to 250% of it's body weight per day. In comparison, cows consume 1.5-2.5% of their body weight daily. In certain instances, 30 lbs. of grasshoppers could consume the same forage as a 600 lb. steer. Different species of grasshoppers will feed on various forms of vegetation. Some are grass specific, some are broadleaf specific and others are generalist eating either type of vegetation. Typically they prefer moist vegetation that is more palatable and will readily move to find food, as vegetation dries throughout the summer. Nymphs will walk to more desirable vegetation, while adults can fly 15 miles or more. Swarms of certain species of adult grasshoppers have been recorded moving over 60 miles in a day. As grasshoppers have the ability to move, successful control can only be achieved with coordinated effort from multiple landowners on a regional scale.

Monitoring: The best method to prevent grasshopper damage on pasture and crops is early season detection and prevention. As spring sets in during April-May, farmers and ranchers should conduct regular observations to assess that year's grasshopper population. It is important to monitor early when grasshoppers are still small nymphs, long before they have wings, as control options are much more effective on small molting insects. If large numbers of grasshoppers are observed, contact the Agricultural Commissioner's Department or Cooperative Extension for further information. Thresholds for economic control of grasshoppers have been established in other states, but not in California. Values range from 8-40 grasshoppers/square yard, based on species, developmental stage, crop type , and other factors.

Control: Cultivation after eggs are laid in the fall, but before they hatch in the spring, can be very effective for control. Mowing can remove the immediate food source which will cause the insects to move. Neither of these mechanical techniques are viable options for pasture situations. Biological control can come in the form of birds, spiders, rodents, and fungal pathogens (various species). In many years, biological control organisms keep grasshopper populations in check below damaging levels.

Identification: Grasshoppers have five nymph stages before becoming adults. When determining grasshopper stage, observe a few individuals closely to determine the size of their wing pads, using the University of Nebraska Extension image below. When a grasshopper has wings and can fly, it has already reached the adult stage.

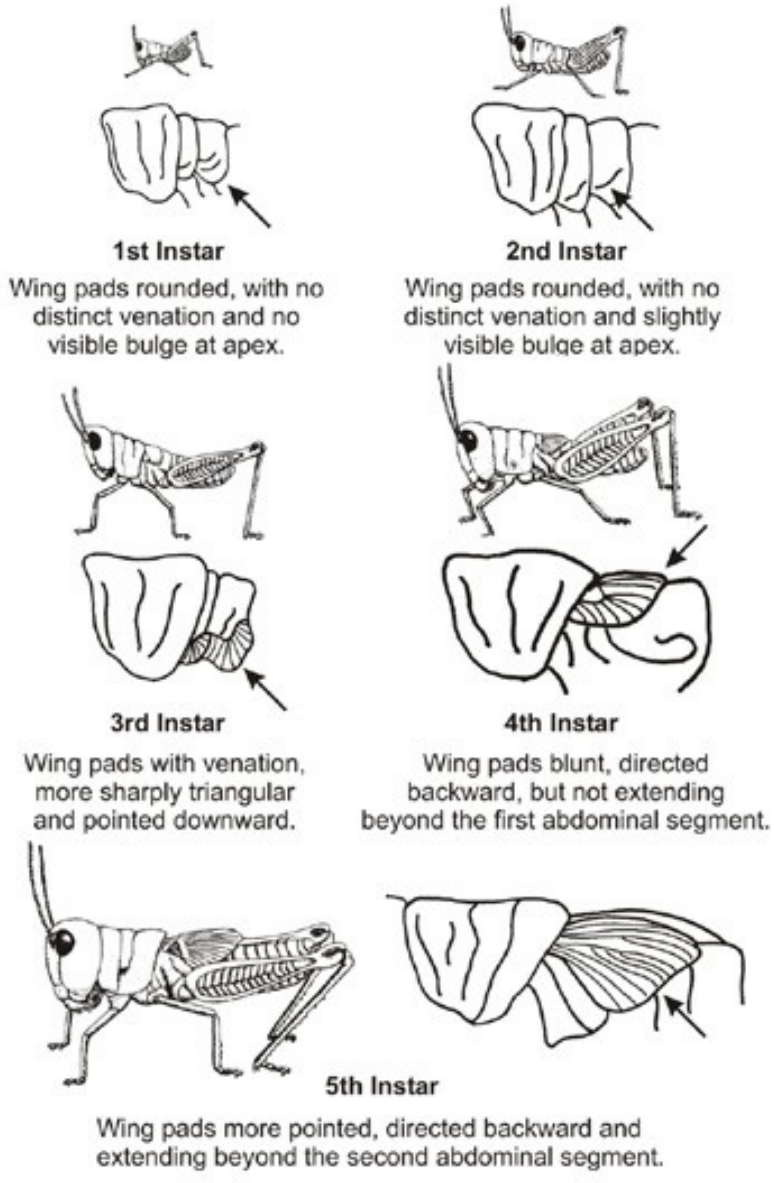

Image courtesy of:
the University of Nebraska Cooperative Extension

For organic control, there are baits which contain the protozoan *Nosema locustae w*hich infect grasshoppers in the early nymph stages, causing deformities, slow growth, and eventually death (e.g. Nolo, Semaspore). However, these baits do not stop feeding immediately and may need re-application for large infestations. Conventional baits containing carbaryl can also be utilized to target grasshoppers in many systems. In certain instances, carbaryl baits can be utilized in non-vegetated zones around high value crops to intercept migrating grasshoppers.

All insecticide sprays are typically more effective on smaller grasshoppers. Dimilin (diflubenzuron) is a moderately selective growth-regulating insecticide, which can be very effective for grasshopper control when applied to small grasshoppers before the third instar. Various Pyrethroid insecticides (group 3) can provide greater control of mature grasshoppers, but are not as selective and have more potential for non-target impact. *Avoid spraying flowering vegetation when possible as all of these insecticides can be harmful to bees.

Studies in Wyoming's rangeland have controlled grasshoppers with an approach called RAATs (Reduced Area-Agent Treatments), where only part of the acreage is treated (e.g. 35-80%) resulting in reduced cost. Applications must be made early when the insects are small with an insecticide with residual activity. In the research, either difubenzuron or carbaryl applications were made in strips, covering part of the acreage. Comparable grasshopper control was achieved with RAATs compared to when the entire acreage was sprayed. RAATs works because grasshoppers from the untreated areas will move into treated zones to feed, and mortality occurs. For rangeland grasshopper control, RAATs could be a good strategy in an IPM system for reduced pesticide use. Additionally, the untreated strips leave refuges for other insects and, in turn, food for birds and other animals.

Select Pesticides

Insecticide	Active	Chemical group	Alfalfa	Grasses	Rangeland	Grazing Restriction
Malathion 57	Malathion	1-B	1.5-2 pints	1.5-2 pints	1.5-2 pints	None
Baythroid XL	cyfluthrin	3	2-2.8 oz	2.6-2.8 oz	2.6-2.8 oz	None
Warrior 2	lambda cyhalothrin	3	1.28-1.92 oz	1.28-1.92 oz	1.28-1.92 oz	None
Mustang	zeta-cypermethrin	3A	3-4.3 oz	3-4.3 oz	3-4.3 oz	Allow application to dry before letting livestock graze on treated area
Dimilin 2l	diflubenzuron	15	NO	1-2 oz	.75-1 oz	None
Sevin 5 Bait	Carbaryl	1A	** Read label for sites, rates, and any grazing restrictions**			
Semaspore Bait	*Nosema locustae*	NA				

***Any mention of pesticide is not a recommendation or endorsement of use by the University of California or the authors. Pesticides are mentioned by trade names for informational purposes only and are not an endorsement over products not mentioned. When using a pesticide, read and follow the label.*

Images: Grasshooper nymphy on cattle fecal pat and close up of grasshopper nymph found on the fecal pat.

Costs Estimate Example

Early season control with Dimilin2l at $300 a gallon, works out to $2:50 per oz, or $5/acre at the high rate of application to control grasshoppers in the nymph stage (before flying).

NOTIFICATION TO AG COMMISSIONER

Prior to any pesticide application, farmers and ranchers need to contact the Agricultural Commissioner's office. A 48-hour notification is necessary when controlling adult grasshoppers when there is flowering vegetation, due to potential impact on local beehives. Also, be aware that after applications there are online reporting requirements.

Plumas-Sierra Agricultural Commissioner's Office - (530) 283-6365

References:

-Capinera, J., and Sechrist, T. 1999. Grasshoppers (Acrididae) of Colorado: Identification Biology and Management. Colorado State University Experiment Station. Bulletin No. 584S.

-Cunningham, G. and Sampson, M. 2000. Grasshopper Integrated Pest Management User Handbook. Technical Bulletin No. 1809. Published by the USDA Animal and Plant Health Inspection Service.

-Evans, E, and Hodgson E. 2008. Grasshoppers. Utah Pests Fact Sheet ENT-125-08. Utah State University Extension and Utah Plant Pest Diagnostic Laboratory.

-Murray, M. 2009. Community Wide Grasshopper Control. Utah Pests Fact Sheet ENT-131-09. Utah State University Extension and Utah Plant Pest Diagnostic Laboratory.

-Campbell, J., Reece, P. and Hein L. 2006. A guide to Grasshopper Control on Rangeland. NEB Guide G1630. The University of Nebraska Cooperative Extension.

-Lockwood, J. and Schell, S. 1997. Decreasing Economic and Environmental Costs Through Reduced Area and Agent Insecticide Treatments (RAAT's) for the Control of Rangeland Grasshoppers: Empirical Results and Their Implication for Pest Management. Journal of Othoptera Research, No. 6, pp. 19-32.

This resource is courtesy of University of California Cooperative Extension. For questions contact:

Tom Getts
Weed Ecology and Cropping Systems Advisor
Lassen, Modoc, Sierra, and Plumas Counties
tjgetts@ucanr.edu - 530-251-2650 *office*
970-481-9174 *cell*

Tracy Schohr
Livestock and Natural Resources Advisor
Plumas, Sierra and Butte Counties
tkschohr@ucanr.edu - 916-716-2643 *cell*