

Grasshoppers

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IPM

- Integrated Pest Management, or IPM, is a process you can use to solve pest problems while minimizing risks to people and the environment. IPM can be used to manage all kinds of pests anywhere - in urban, agricultural, and wildland or natural areas.



Step One

- Pest Identification!
 - Books, Internet, People
- Knowledge!
 - Lifecycle
 - Habitat
 - Damage potential
 - Help choose best management options...

Management

- Cultural
- Physical
- Biological
- Chemical

- Economics-thresholds



Management

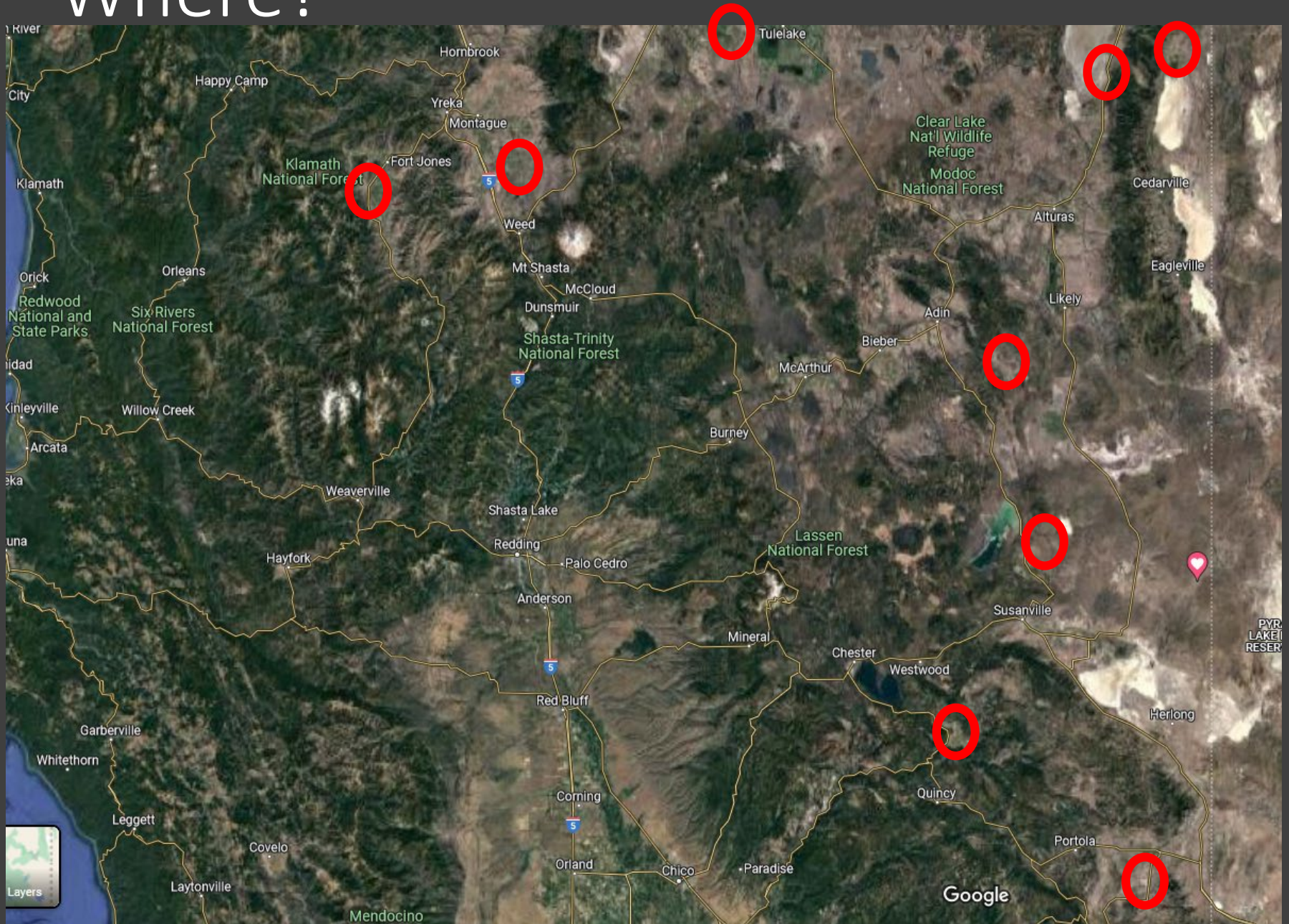
- Cultural
- Physical
- Biological
- Chemical

- Economics-thresholds





Where?



Grasshoppers

- Over 200 species in California
- Huge legs!
- Easy to identify
- Sporadic pest, with boom and bust population dynamics



Clearwing Grasshoppers

Camnula pellucida



Species

Clearwinged grasshopper

Camnula pellucida (Scudder)

Subfamily *Oedipodinae*

Identification

Adults of the clearwinged grasshopper are of medium size, yellow to brown, and possess mottled forewings and transparent **hindwings** (Fig. 8). The forewings have along their angles light stripes that in the resting grasshopper with closed **wings** converge near the middle. The male (Fig. 6) is noticeably smaller than the female (Fig. 7). First **instar nymphs** are strikingly colored cream, tan, and black (Fig. 1).

The **nymphs** (Fig. 1-5) are identifiable by their color patterns and external structures:

1. Head with **lateral foveolae** triangular (Fig. 9). Usually a dark bar crosses transversely across front of head under **antennal** sockets, across lower part of **compound eyes**, and onto sides of head.
2. **Pronotum** with **median carina** low but uniformly elevated: **median carina** entire (without notch) in early **instars**, notched once in front of middle in the older **instars** (Fig. 9). **Pronotum** with **lateral carinae** clearly defined (Fig. 9).
3. Hind **tibia fuscous** in first to third **instar**, **fuscous** or tan in fourth and fifth **instars**.

Distribution and habitat

The clearwinged grasshopper, *Camnula pellucida* (Scudder), is distributed widely in North America. It inhabits a variety of grasslands including the northern mixedgrass prairie, the bunchgrass prairie, and mountain meadows. A resident population lives in a mountain meadow at 10,800 feet in Colorado, just below timberline.



Geographic range of *Camnula pellucida* (Scudder)



Fig. 1, first instar: BL 42-5.5 mm, FL 2.4-2.7 mm, AS 11-13



Fig. 2, second instar: BL 5-7.1 mm, FL

Biology

- Eggs laid in pods during the fall (not in tilled fields)
- 1-4 pods/female
- 20 to 100 eggs per pod
- Top 2 inches soil
- Most overwinter as eggs, some as nymphs
- Hatch in spring
- 5 to 6 molts before maturity (30-40 days)
- Adults live 2-3 months
- One generation per year



Photo courtesy of: <https://rstorage.filemobile.com/storage/6829995/15>

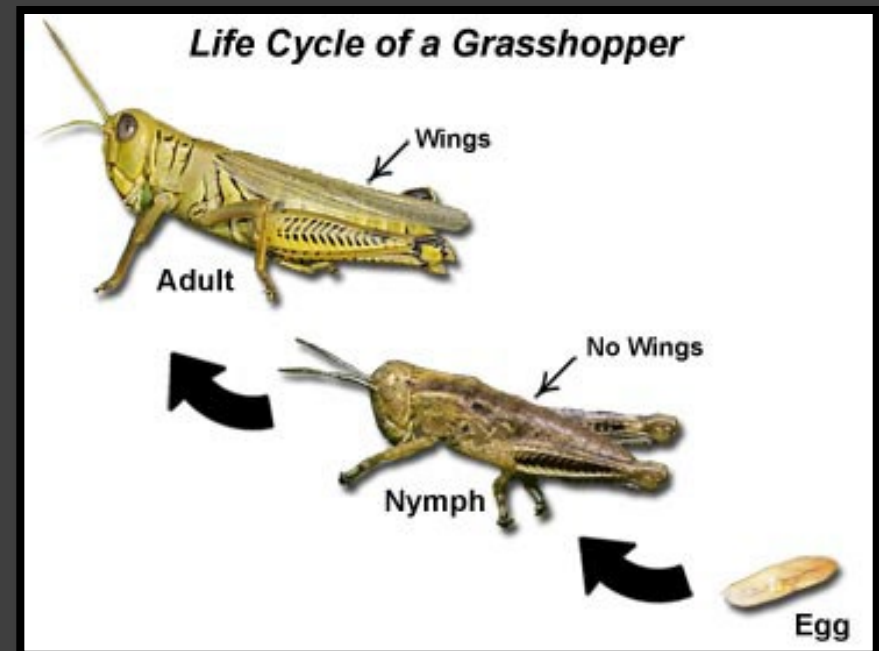


Photo courtesy of: <https://targetstudy.com/nature/animals/grasshopper.html>

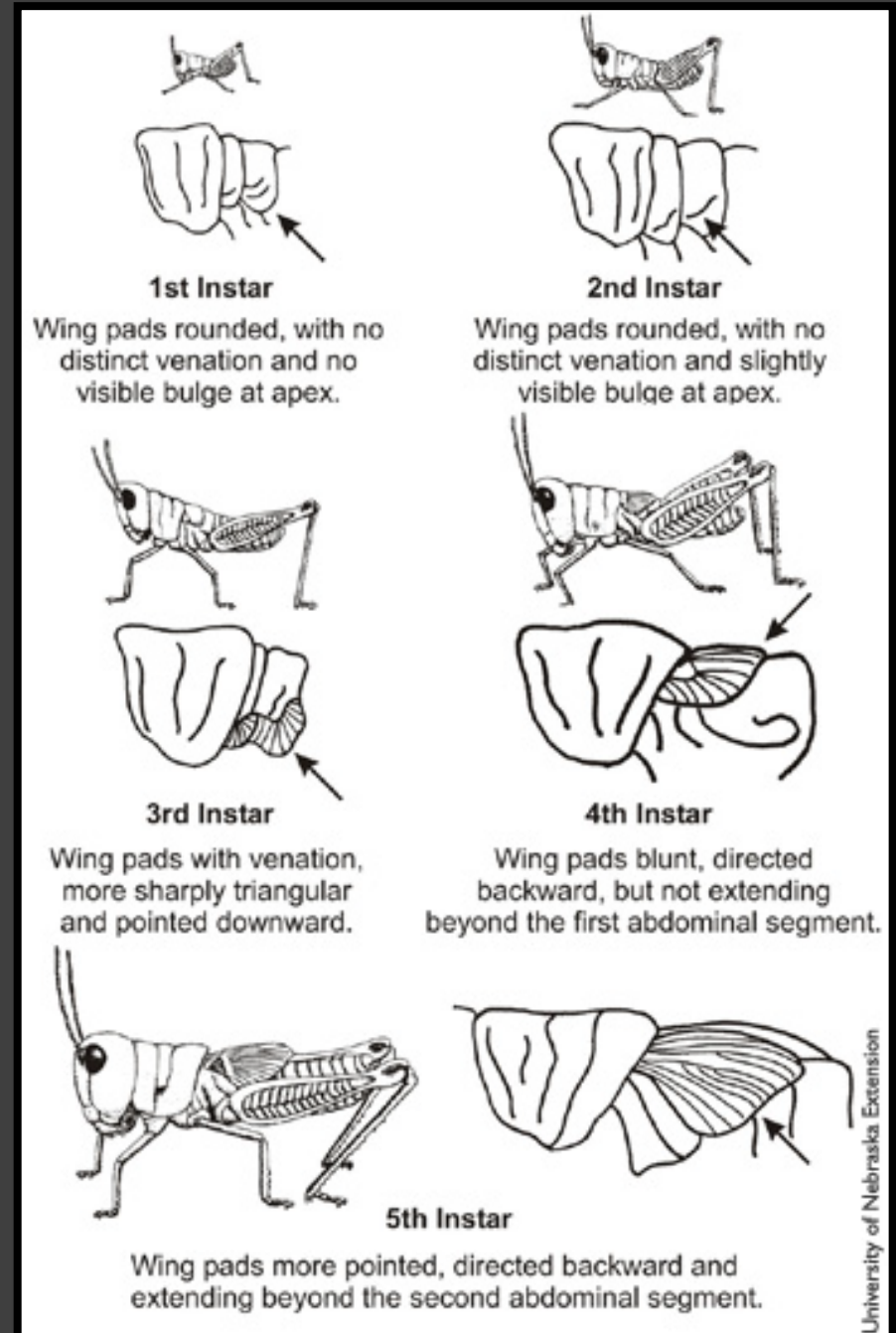


Instar Sizes

General Sizes of Grasshopper Stages

Stage	Size
1st instar	1/4 inch
2nd instar	3/8 inch
3rd instar	1/2 inch
4th instar	3/4 inch
5th instar	1 inch
Adult	1.5 inches

Note: size is approximate, and depending on species, can vary by 1/4 to 1/2 inch.











Weather Can Impact Populations

- Spring
 - Cold - decrease
 - Warm/Dry - increase
 - Wet - fungus
- Fall
 - Warm - more eggs
 - Cold - less eggs
 - Frost-
- Drought
 - Negatively impacts populations
 - Can cause movement
- Cold winters - no effect
- Various species impacted differently



Vegetation Consumed

- Some species
 - Grass specific
 - Broadleaf specific
 - Generalist
- Moist vegetation is more palatable
 - Readily move to find food



Movement

- Nymphs will walk to more desirable vegetation
- Adults can fly 15 miles or more
- One source in Wyoming states swarms move over 60 miles
- Adults can “swarm”
- Typically starts in rangeland can move to cropland

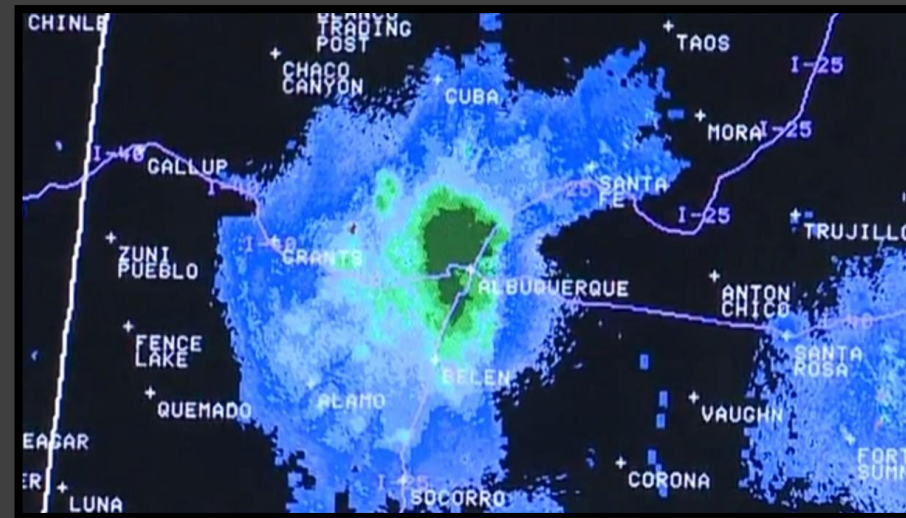


Photo courtesy of:
<http://www.nydailynews.com/news/national/grasshopper-swarm-spotted-weather-radar-article-1.1812545>

Damage

- Consume massive amounts of foliage
- Estimates - 30 to 250% of body weight per day
- Cows - 1.5-2.5% of their body weight
- 30 lb grasshoppers consume the same forage as a 600 lb steer



Photo courtesy of: <http://entomology.k-state.edu/images/alfalfa-pests/grasshopper.tif>

Management

- Area wide approach
- Coordinated effort
- Monitor
- UC IPM
 - Control on rangeland and field edges before move into crops!



Extension Literature-

“Typically starts in rangeland can move to cropland”

- UC IPM
- Utah State
- Wyoming
- Western US....
- But do they?
 - Indian Valley-2019- to 2022
 - Goose lake???

Economic Thresholds Range

- Oregon Rangeland
 - 8 or more/square yard
 - USDA Aphis Standard before assistance
- California - no threshold
- Wyoming Rangeland
 - Less than 8/square yard - Not economic
 - 8-15/square yard - Potentially economic
 - 15-20/square yard - Economic
- Economic threshold vary by species, time, developmental stage, crop, cost, etc.

Economic Thresholds Nebraska

Table 1. Treatment guidelines based on number of grasshoppers (nymphs and adults) per square yard.

Grasshopper Population	Within Fields	Field Borders	Treatment necessary?
Non-economic	0-2	5-10	No
Light	3-7	11-20	Uncertain – depends on size, species, type of crop
Moderate	8-14	20-40	Probably
Abundant	15 or more	41 or more	Yes

Grasshopper Control

- Mechanical
 - Cultivation
 - Eggs do not persist in cultivated fields
 - Mowing
 - Eliminates food source
 - Double edge sword



Photo courtesy of: <https://www.haugimp.com/>

Grasshopper Control


- Biological
 - Birds, spiders, rodents, fungal pathogens (various species)
 - Nolo bait or Semaspore bait, etc.
 - Protazoa infect grasshoppers/Mormon crickets
 - Deformities, slows growth
 - Does not stop feeding immediately!
 - Needs reapplication



Photo courtesy of: https://vignette.wikia.nocookie.net/grasshoppers/images/6/62/Bird_Eating_Grasshopper.jpg/revision/latest?cb=20141205220809

Sprayable fungus

- *Beauveria bassiana*
 - 0.5-2QT./ACRE
 - Multiple applications may be needed
- *Metarhizium acridum*
 - No USA registration



Mycotrol® ESO
Beauveria bassiana
A WSDA Certified Beauveria Bassiana Insecticide In a Convenient Liquid.

WRITE A REVIEW

Quart SKU: 1332781	\$117.00	1	BUY NOW
Gallon SKU: 1332782	\$415.00	1	BUY NOW
Case of 10 - Quarts SKU: 1332781	\$1,053.00	1	BUY NOW
Case of 4 - Gallons SKU: 1332782	\$1,494.00	1	BUY NOW

DESCRIPTION INSTRUCTIONS SHIPPING INFO TECHNICAL DOCS REVIEWS

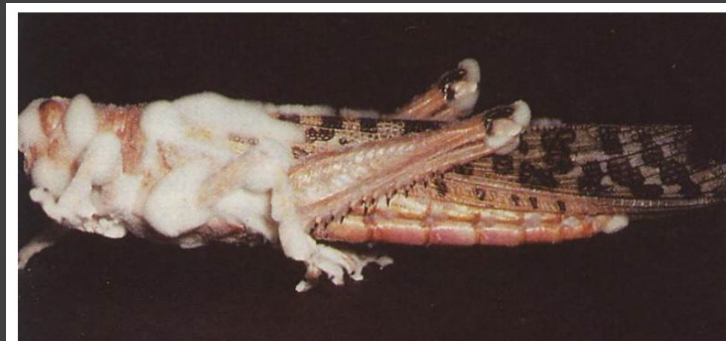


Photo 8. Adult locust infected with fungus *Beauveria basiana*. ©C. Lomer

Buffer Zone with Baits

- Non-vegetated zone
 - 60 ft. zone
- Utilize carbaryl baits
- As hoppers migrate to fields eat the baits

Select Insecticides for Grasshoppers (product/acre)

Insecticide	Active	Chemical group	Alfalfa	Grasses	Rangeland
Sevin 4F	Carbraryl	1-A	NO	NO	1 pint
Malathion 57	Malathion	1-B	1.5-2 pints	1.5-2 pints	1.5-2 pints
Besige	chlorantraniliprole and lambda cyhalothrin	28+3	6-10 oz	6-10 oz	6-10 oz
Baythroid XL	cyfluthrin	3	2-2.8	2.6-2.8	2.6-2.8
Warrior 2	lambda cyhalothrin	3	1.28-1.92 oz	1.28-1.92 oz	1.28-1.92 oz
Mustang	zeta-cypermethrin	3A	3-4.3 oz	3-4.3 oz	3-4.3 oz
Dimilin 2I	diflubenzuron	15	NO	.75-1oz	.75-1oz
Prevathon	Chlorantraniliprole	28	8-20 oz	8-20 oz	-
Steward	Indoxacarb	22	6.7-11.3 oz	NO	NO

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Economics

- Prevathon- 9-23\$ per acre
- Warrior/Lambda Cy- 1.25-2.5\$ per acre
- Dimilin- 1.25-1.63\$/acre (less if RATTTS)

- ***More now- numbers from 2 years ago
- Price of hay is more now.....

Insecticidal Control Rangeland

- RAAT Treatments (Reduced Area-Agent Treatments)
 - Only treat part of acreage 35-80%
- Rangeland treatments
- Reduce cost of treated acreage
- Insects move from untreated to treated residual activity
- Provide haven for beneficial insects/food for birds
- UC IPM - treat young grasshoppers outside of crops

Wyoming Studies

- Products used in study
 - Carbaryl, Malathion, Dimilin
- Applications made to early instars!!
- Dimilin only effective on first three instars
- Blanket/Broadcast treatments
 - 85-99% grasshopper control
- RAAT Treatments
 - 75-90% grasshopper control
 - 50% of the cost
- Information courtesy of the University of Wyoming
 - Dr. Alex Latchininsky

Insecticides

- Generally much more effective on nymphs
- Dimilin only effective on first three instars - Timing!
- Pyrethroid better on adult grasshoppers
 - Not very selective
 - More non-target impacts



Grasshopper Case Study Modoc 2021

	2-Jul	9-Jul	2-Jul	9-Jul	
	Hopper Count/m		lb's/acre		ton's forage lower
Pasture Edge 1	12.25	12.5	1972	2180	-0.10
Pasture Edge 2	33.75	8.25	2316	907	0.70
Pasture Medium	26	14.5	3355	1550	0.90
Pasture Interior 2	0	61.5	4452	3171	0.64
Pasture Interior 2	1	10	4603	3153	0.72

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\$200-350/acre loss with current hay prices

Monitor!

- Catch them whole young
- Control outside of crops
- Looking- Late April-May
- Hatching Indian Valley May 23rd





