Grasshopper Pests In The West

Economically important in 17 western states

20-25 pest species(out of >500)

Remove 20-25% of rangeland vegetation/year

Loss $400 million per year

Require vast areas to be chemically treated (up to 20 million acres per year during outbreaks e.g. in 1986-88)

Forage Losses in Texas

$190 Million in 2000

Grasshopper Diversity

>500 species in North America

170 species in New Mexico

White Whiskered Grasshopper

Packard Grasshopper

Migratory Grasshopper

Big Headed Grasshopper

Pallid Winged Grasshopper

Weed Bio control Agents?

Some Grasshoppers *ARE* Beneficial!

- Snakeweed grasshopper

- Cudweed grasshopper

Collecting Grasshoppers

Why do I need a bagful of grasshoppers?

Age of grasshoppers determines if you can use insect growth regulators (IGRs) which won't work if most grasshoppers are adults.

Collect 30 grasshoppers with net and examine wing pads to determine if immature.

Identifying Nymphs

1st-2nd instar nymphs

Have no wingpads

3rd and 4th instar nymphs

have small wingpads

Adults

have fully developed wings

Size of NM grasshoppers

Size doesn't matter when determining maturity across species

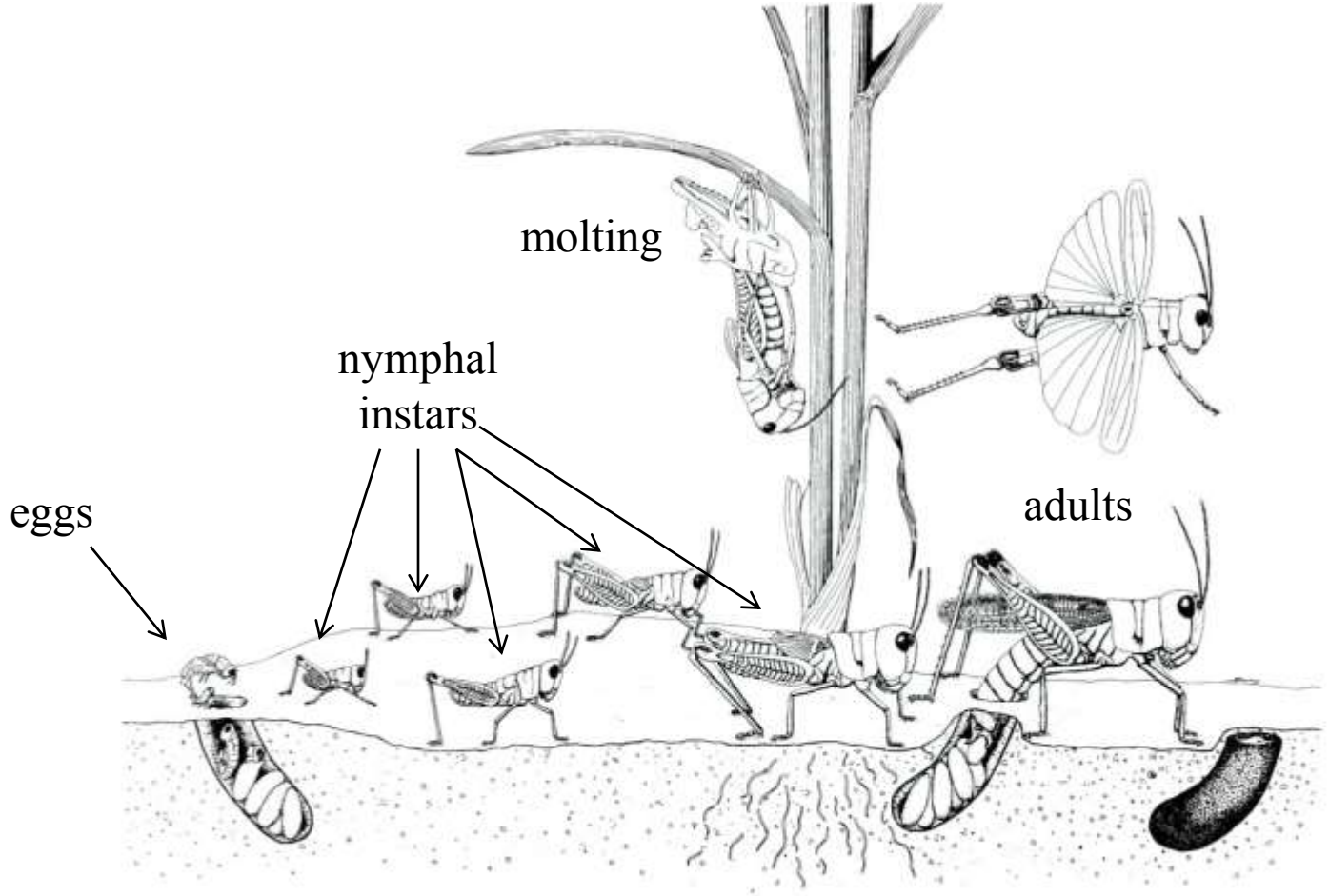
- Texas Spotted Range Grasshopper
- 0.4 inches

- Vagrant grasshopper
- 2.4 inches

Nymph or Adult?

Nymph or Adult?

Grasshopper life cycle



Grasshopper Development

- Nymph to Adult about 26-40 days
- About 1 week per instar
- Generally 5 instars

Grasshopper Biology

- Adult lifespan 40-60 days
- Egg laying mostly in soil
- 1-4 pods per female
- 4-80 eggs per pod
- = 4 - 320 eggs per female

Seasonal Development

- Typical

Hatching in spring (April-May)

Nymph and adult develop in summer

Overwinter as eggs

Less common

Overwinter as late-instar nymphs

Adults in early summer

(mostly bandwinged species)

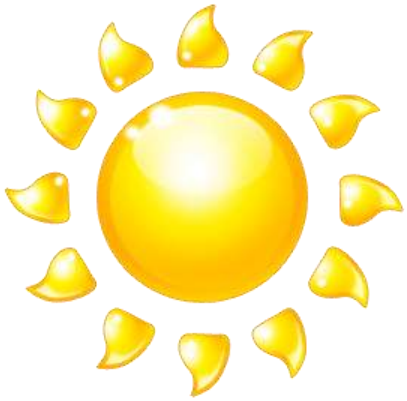
Grasshopper Population Dynamics

Normally:

Grasshopper populations are regulated by abiotic (weather) and biotic (natural enemies) factors, but if they fail…..

..Outbreaks!:

Last for 1-4 yrs. Occur at irregular intervals – every 4-10 yrs



In New Mexico, moist springs followed by Warm/dry conditions in the summer are particularly favorable for outbreaks

Unfavorable Conditions for Grasshoppers
Cool Weather: Direct and Indirect Effects

- Slower development
- More likely to die from

  diseases and natural enemies
- Higher mortality
- Fewer eggs produced

  = less damaging

Favorable Conditions for Pest Grasshoppers in NM

Mild autumn for egg laying

Cool wet winter for good spring plant growth

Dry warm spring for good nymphal development and low incidence of disease

What causes populations to crash in NM?

Below normal spring and summer temperatures

Low soil temperature in winter /high overwintering egg mortality

Fungal epizootics

Extreme drought

Grasshopper Outbreaks

- Usually preceded by several years of gradual population buildup associated with
  - mild spring weather
  - a low incidence of disease, parasites, and predators.
  - late summer rains that provide adequate food for egg-laying females

  Populations normally collapse in a year when weather conditions are poor for egg-laying and grasshopper development, and also when parasites, predators, or disease levels have reached their maximum levels.

Natural Enemies

Predators

Robber Fly

Wind Scorpion

Natural Enemies

Egg predators

Bee flies

Blister beetles

Natural Fungal Control

Excellent source of control under moist conditions

Will not control late instars well

Can dessimate early instars

Evaluating Damage

Feeding

How much do they eat?

A grasshopper can eat about its own weight in vegetation daily

How does that translate to damage?

Most grasshoppers can eat/destroy about 6x their own weight daily

Ten adult two striped grasshoppers per square yd can defoliate a corn crop

Thirty adult two striped grasshoppers per square yd = 200 lb grasshoppers /acre!

And 200 lb direct loss+ 1000 lb indirect loss.

Grasshopper Damage/EIL

Damage:

Primary concern is rangeland

May move into cropland

Control:

Economic injury Level=

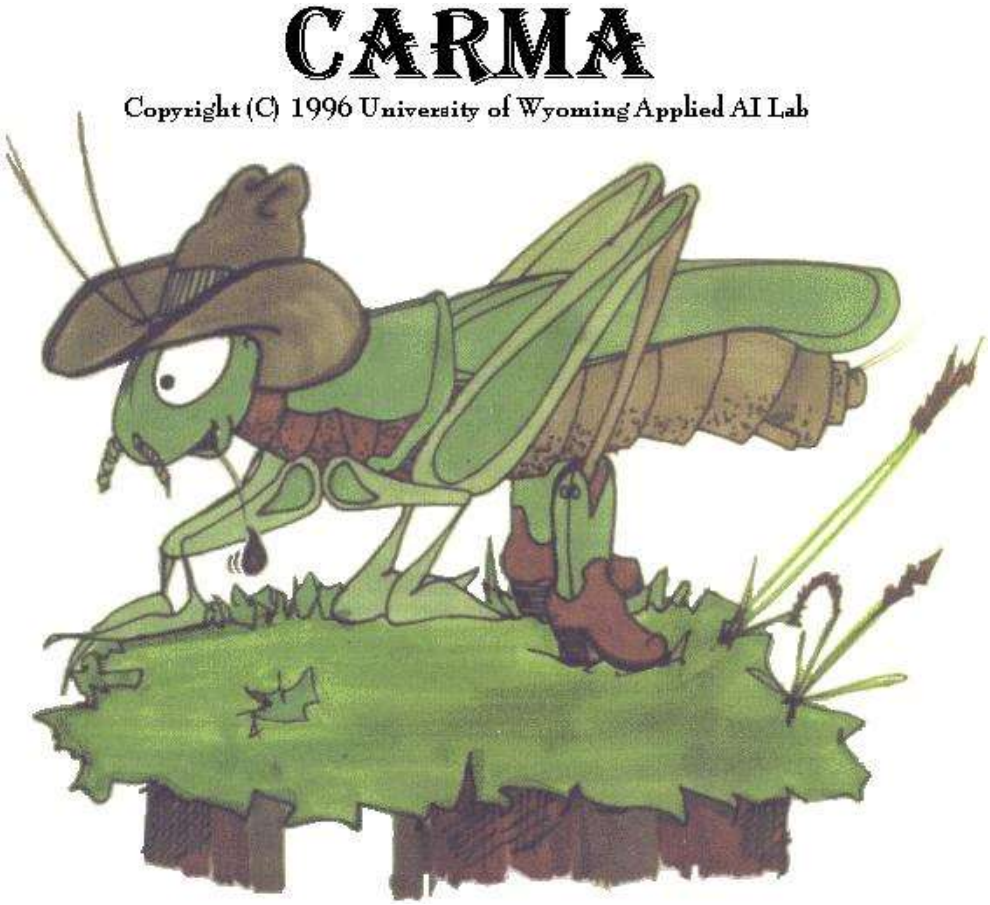
=Damage > treatment cost

Economic Threshold=

= 15-20, larger hoppers / sq. yd.

You could calculate losses…

Decision Making Tool



Grasshopper Control

Grasshopper IPM: 1. Prevention

Range management practices

- Twice over livestock grazing vs 5 month grazing
- Produces conditions that resulted in
  - 300 lb/A more forage
  - 60-75% reduction in grasshoppers

Twice Over Rotational Grazing

- Increases Plant Cover
  - Cools microhabitat slowing hopper development
  - Increases microhabitat humidity increasing fungal eipzootics

  Decreased bare ground from 15% to 5%

  Increased production from 730 to 1460 kg/ha

  Reduced hopper density from 11 to 4 /square meter

Grasshopper IPM: 2. Intervention

- If prevention is not enough
- Survey
- Treatment of hotspots in wide area
- Can prevent expansion of grasshopper infestations into large scale outbreaks

Grasshopper IPM: 3. Suppression

- If prevention and intervention are not enough
- Use Reduced Agent Area Treatments (RAATs)

RAATS Concept

- Hoppers killed in treated swaths
- More predators and parasitoids survive treatment
- Hoppers move into treated strips
- Savings compared to treating 100% area

Insecticide Options

- Dimilin: Insect Growth Regulator
  - Timing is issue; not effective on adults
- Carbaryl: Carbamate
  - Non target effects, toxicity to people
- Malathion: Organophosphate
  - Hot weather less effective, low residual, non-targets

Standard vs RAATS Control

Agent	oz	% Coverage	Method	% Control
Carbaryl	16	100	standard	85-95
	8	50	RAAT	75-85
Malathion	8	100	Standard	90-99
	4	80	RAAT	75-85
Dimilin	1	100	Standard	95-99
	0.75	50	RAAT	80-90

The RAATs Concept: Economics

1. Assume 50% of cost: insecticide 50% application
2. Control cost $ 4.60/Acre
3. 25% reduction in rate applied to alternate swaths
4. Results:

    Application: $2.30/2=$1.15

    insecticide: $2.30 x 75%= $1.73 / 2 (alternate swaths)

    =$0.87

Total cost = $1.15+$0.87= 2.02

Savings 4.60-2.02=2.58/Acre =56% savings