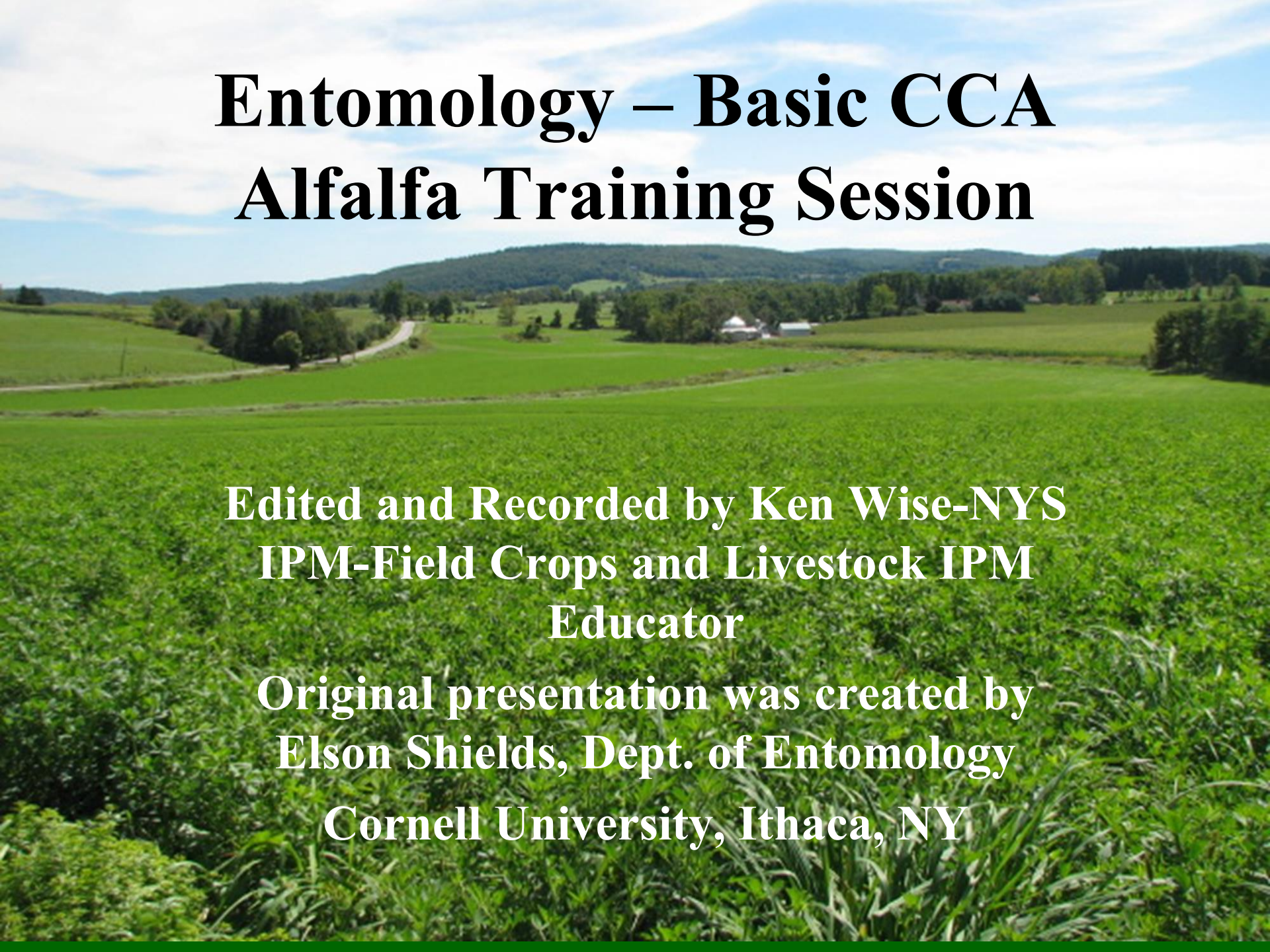
Entomology – Basic CCA Alfalfa Training Session



Edited and Recorded by Ken Wise-NYS IPM-Field Crops and Livestock IPM Educator

Original presentation was created by Elson Shields, Dept. of Entomology

Cornell University, Ithaca, NY

What is an Insect?

Where do Insects fit in the Animal Kingdom?

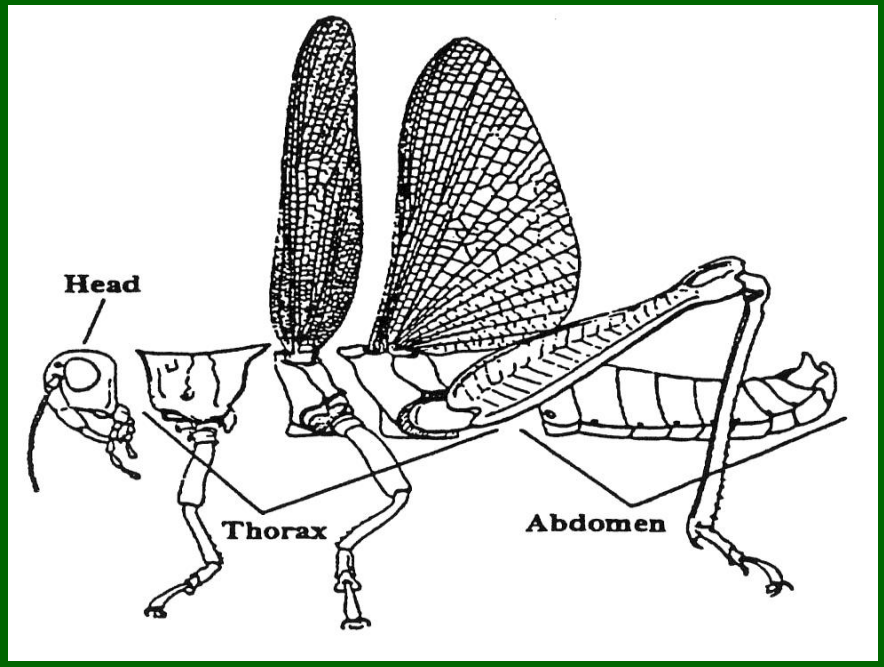
How do Insects differ from Spiders/Mites?

Arthropods

Class of Arthropods	Common Name	Distinguishing Characteristics
Insects	Insects	Three body regions (Head, thorax and abdomen), 6 legs and usually 2 pair of wings on thorax, 1 pair of antennae
Crustacea	Crayfish, Sowbugs, Shrimp, Crabs	The body has 10 to 14 legs, 2 body regions (Cephalothorax and abdomen) and 2 pair of antennae
Arachnida	Spiders, Ticks, Mites Scorpions	Has 8 legs, no antennae, 2 body regions (Cephalothorax and abdomen)
Diplopoda	Millipede	Have long body composed with about 50 segments, each of which as 2 pair of legs
Chilopoda	Centipedes	Have long body composed with 14 to 20 segments, each of which as 1 pair of legs

Class Insecta
(the insects)

- Three Body Regions – head, thorax, abdomen
- Thorax with three pairs of legs, two pairs of wings in adult stage
- Head with one pair of antennae
- Respiration by trachea
- Terrestrial & fresh water inhabitants



Incomplete Life Cycle Example
(hairy chinch bug)

egg | 1st instar | 2nd instar | 3rd instar | 4th instar | 5th instar | shortwing adult | normal wing adult

Egg Stage

Nymphal Stage

Adult Stage

Complete Life Cycle Example
(northern masked chafer)

egg | 1st instar | 2nd instar | 3rd instar | pupa | adult

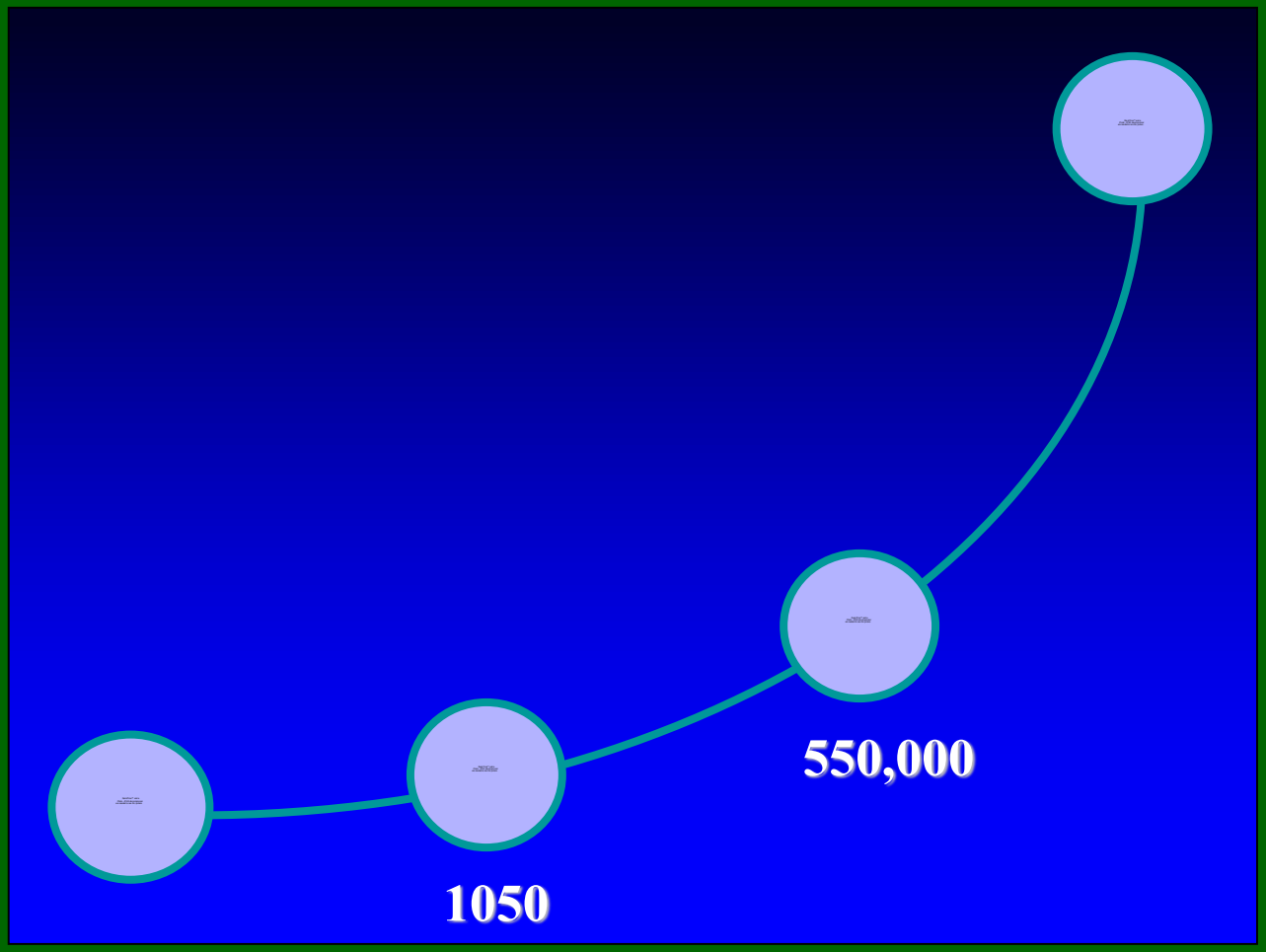
Egg Stage — **Larval Stage** — **Pupal Stage** — **Adult Stage**

Impact of Temperature on House Fly Development Rate

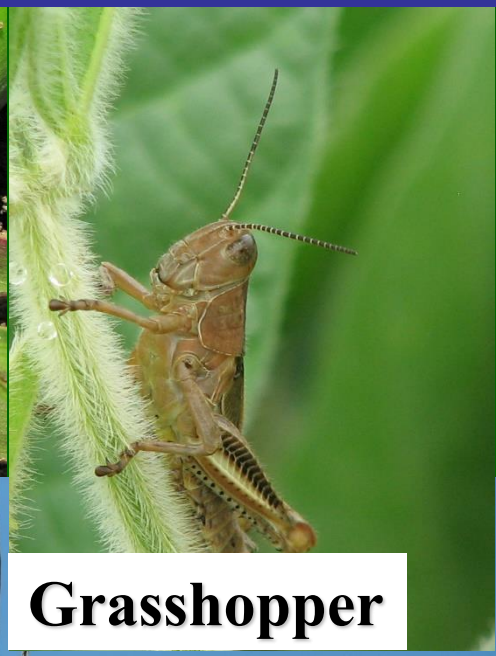
Constant Temp.	Hours to Hatch	Days to Pupation	Days to adult	Total Days
68	23	8 - 10	10 - 11	18 - 21
77	14	7 - 8	7 - 9	14 - 17
86	10	5 - 6	4 - 5	9 - 11
95	8	3 - 4	3 - 4	6 - 8

NOTE: Actual fly development varies with normal daily temperature fluctuations
House fly females can lay 4–6 batches of 100–150 eggs over their lifetime.

Potential Population Growth - 60 days



Chewing Mouth Parts



Piercing & Sucking Mouth Parts

Mosquitoes

Bedbugs

Aphids

Potato leafhopper

Insect Pests of Alfalfa In New York

- Alfalfa Weevil
- Potato Leafhopper
- Clover Root Curculio
- Alfalfa Snout Beetle

Photos by Ken Wise-NYS IPM

Alfalfa Weevil (*Hypera postica*)

Photo by Ken Wise, NYS IPM

Alfalfa Weevil

- Brown weevils with a long snout-like projection on head with antennae attached to it.
- The beetle has a dark stripe running down its back.

Photo by Ken Wise, NYS IPM

Alfalfa Weevil Eggs

- Newly laid eggs are light yellowish
- Eggs will turn brown with a dark spot at the apex
- Eggs hatch in 7-10 days depending on temperature

Photo by Ken Wise, NYS IPM

Alfalfa Weevil Larvae

March	April	May	June	July	August	September	October

Over wintering adults infest fields

Adults lay eggs

Larvae hatch and feed

Pupate (develop a cocoon)

Adults become dormant

Adults find shelter for the winter

Composed with information from Purdue University Field Crops IPM-Alfalfa Weevil

Photos by Ken Wise-NYS IPM

Alfalfa Weevil Damage

- When damaged leaves unfold, you'll see little pinholes/shot holes where the larvae have fed.

Photo by Ken Wise-NYS IPM

Alfalfa Weevil Management

Scouting for larvae before economic loss occurs.

Feeding Damage Method:

Collect 50 random stems and check for the number of stems which show incidence of feeding.

If 40% of the stems show feeding damage then action needs to be taken to prevent economic loss (not 40% defoliation).

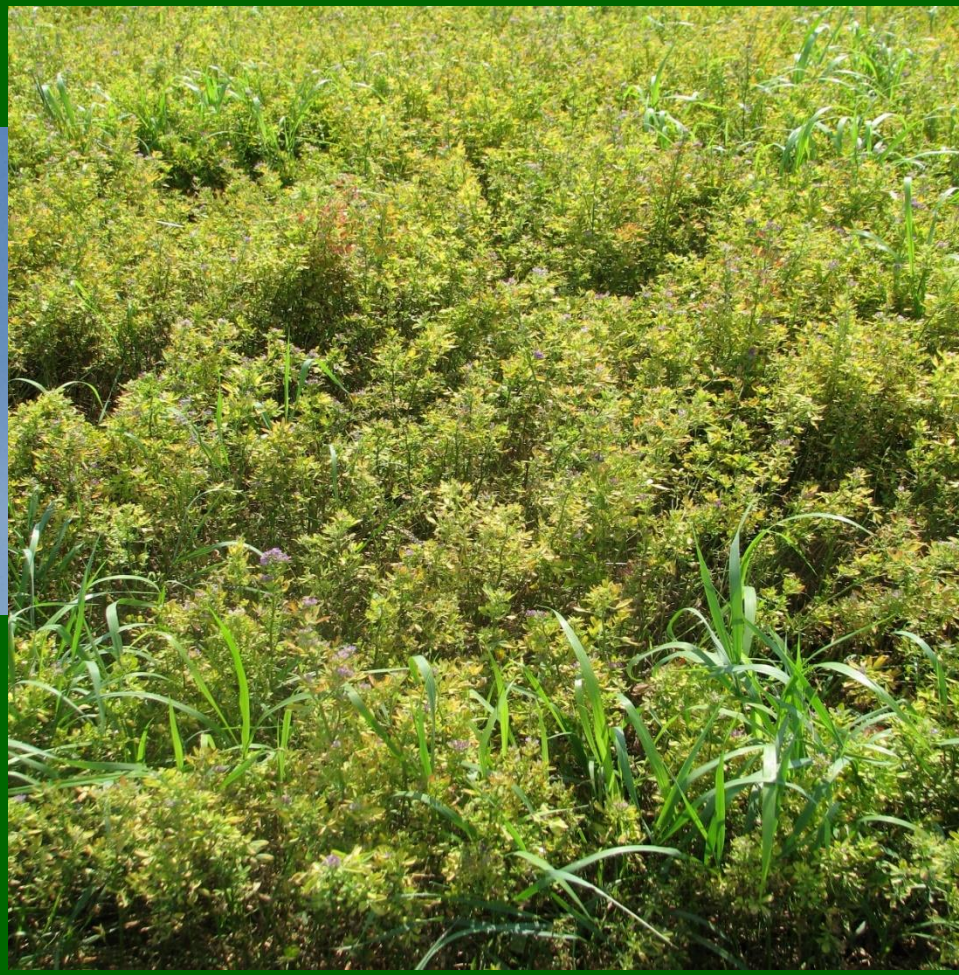
After 1st cutting or regrowth: field is at "Action Threshold" if 50% of the stems have foliar damage or 2+ larvae per crown are present

Management Actions!

- 1st cutting: If over threshold cut early if within 7-10 days from scheduled harvest
- More than 10 days from normal harvest, then use an Insecticide.
- If less than 50% alfalfa in the stand, then do nothing and save the AW biological control.

Photo by Ken Wise-NYS IPM

Potato Leafhopper in Alfalfa



Potato Leafhopper

- **Spring Migrant – Arrives around Memorial Day on thunder storms.**
- **Second and Third Cutting Pest.**
- **Most severe on new seedings in most years.**
- **In heavy migration years**

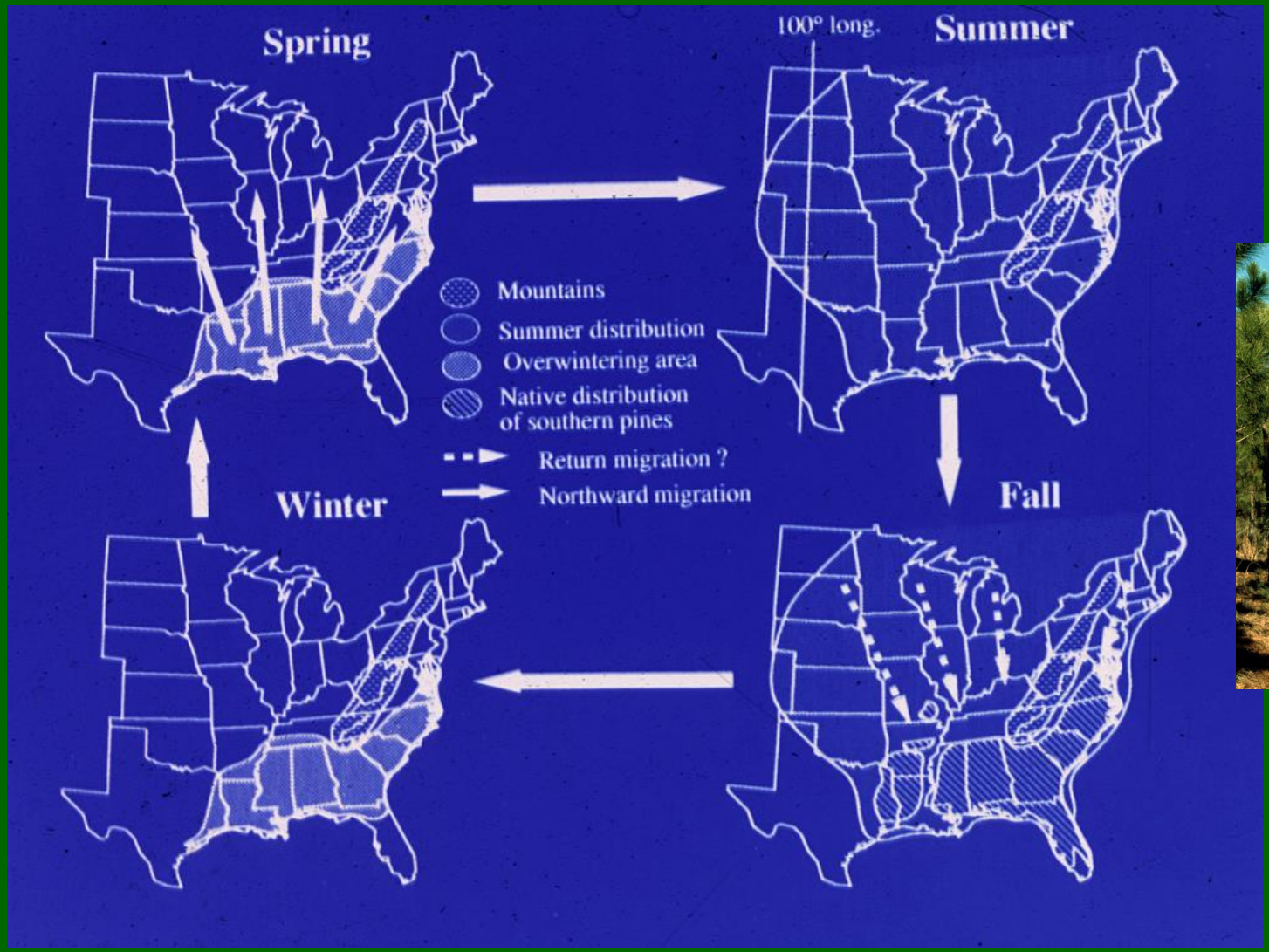
Potato Leafhopper

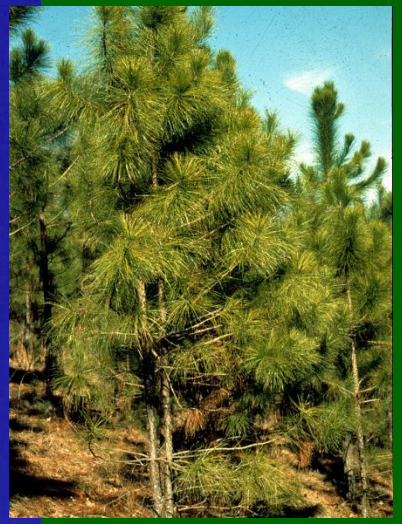
- Adults are about 1/8” long
- Adults are lime green, strong fliers

Potato Leafhopper

- Nymphs are yellow-green, *great walkers* (can't fly)
- Adults and nymphs look similar

Potato Leafhopper

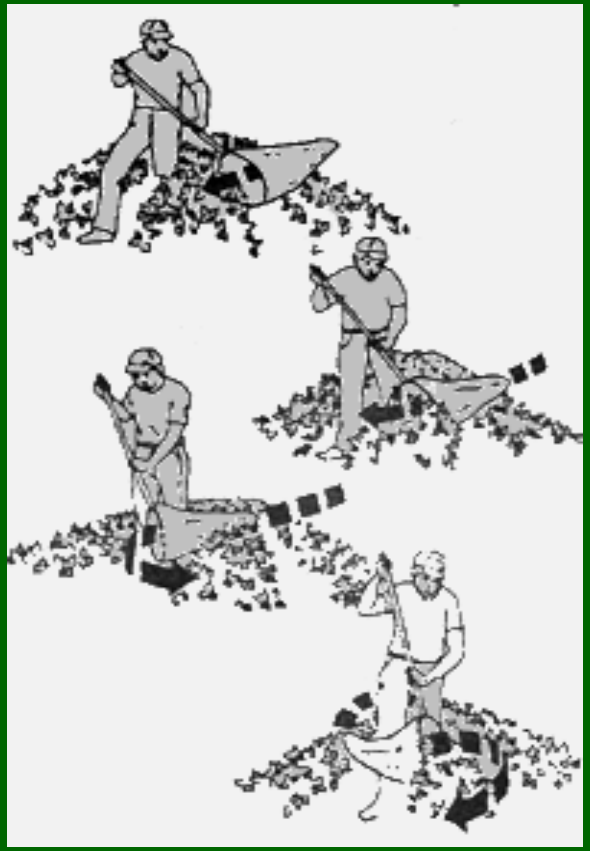




PLH Injury

Scouting Potato Leafhopper

- Sample early June (after 1st cutting) until 1st frost
- Sample weekly
- Use a 15"diameter sweep net and the sequential sampling plan



Scouting Potato Leafhopper

- One sample is 10 sweeps of the net.
- Sweep the top 6 inches of the plants

Sequential Sampling Plan

- Smaller plants are at higher risk
  - New seedings are most vulnerable
- Different thresholds for different plant heights.

Sequential Sampling Plan

# of Sets	1		2		3		4		5		6	
No Treat or Treat	N	T	N	T	N	T	N	T	N	T	N	T
<3”	********		********		2	9	4	11	5	13	7	15
3”- 6”	********		********		9	20	14	25	18	30	23	35
7”-10”	********		********		19	41	29	50	39	60	49	70
>10”	********		********		44	75	64	95	84	115	104	135
Field Counts	5		6		5		7		8			
Running Totals			11		16		23		31			

Potato Leafhopper Scouting

Stem length	leafhopper/sweep
Less than 3 inches	0.2
3 to 7 inches	0.5
8-10 inches	1.0
11-14 inches	2.0
15 inches or taller	if PLH exceed 2.0 per sweep then harvest the field.

Over Threshold?

Early Harvest: A week to 10 days from normal harvest or if alfalfa is taller than 15 inches and leafhoppers are over threshold

Spray with an insecticide (most over threshold situations are on new alfalfa regrowth)

Plant Potato Leafhopper Resistant Alfalfa (next time)

PLH Resistant Alfalfa Cultivars

- Most potato leafhopper resistant alfalfa is now highly resistant with no yield or quality drag.

Photo by Julie Hansen, Cornell University

Clover Root Curculio
(*Sitona hispidula*)

March	April	May	June	July	August	September	October

Clover Root Curculio

Eggs hatch and larvae feed on roots. Adults can be found in foliage.

Larvae pupate.

Adults emerge.

Adults less active.

Adults mate and lay eggs around the crown of the plant.

Adults and eggs can overwinter.

Composed with information from Penn State University: Clover Root Curculio

Clover Root Curculio Root Damage

- Larvae
- Damage

Clover Root Curculio

Management Strategies:

NONE

Alfalfa Snout Beetle is flightless and all females (parthenogenetic)

Alfalfa Snout Beetle

- **Alfalfa snout beetles (ASB) are a very serious pest of alfalfa in northern NY.**
- **The root-feeding larvae of the weevil makes it difficult so produce alfalfa.**
- **ASB is one of the few pests that can completely destroy an alfalfa field**

Alfalfa Snout Beetle Adults

- Adults are mottled gray
- Humpbacked
- 1/2 inch long
- they do not fly
- all females

Alfalfa Snout Beetle Adults

- Adults emerge in the spring
- Note: above ground active adult ASB is only a small portion of the infestation.

Alfalfa Snout Beetle Migration

adults emerge in the spring and migrate in mass numbers in a northeast or northwest direction

Alfalfa Snout Beetle Larvae

- Larvae are white
- Legless
- 1/2 inch long
- found at a depth of 1 foot mid to late summer
- feeding on roots
- Larvae feed and girdles the main taproot

Larval feeding on side roots, and girdles the main taproot causing death to the plant.

Alfalfa Snout Beetle Damage

-Yellowing plants
-Dead Plants
-Missing Plants

Photo by Mike Hunter, CCE Northern NY Team

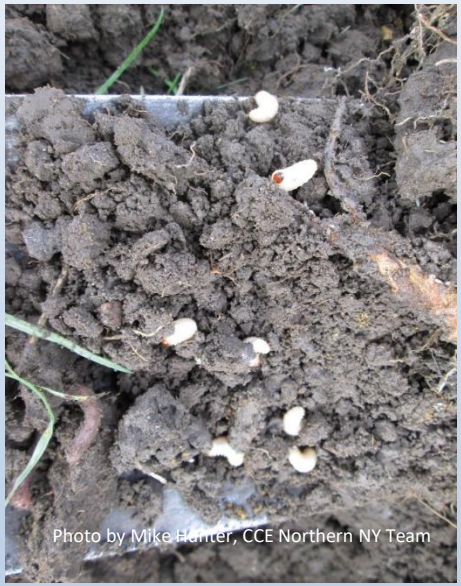
Alfalfa Snout Beetle Life Cycle

Year 1: April-May
-Adults emerge from soil
-Feed on foliage
-Migrate in mass numbers

Year 1: May-June
-Adults do not feed
-Lay eggs in alfalfa fields at the base of the plants
-An adult is capable of laying 500 eggs

Year 1: June-October
-Larvae feed on the roots
-Symptoms can start to show.

Year 1: November
-Larvae dig deeper into the soil for a year.



Year 2: April-May
-Symptoms are present
-Yellow or dying plants
-Missing plant
-Appear as winter kill

Year 2: June-August
-Larvae will remain in diapause but will start to develop into an adult

Year 2-3: Sept-May
-Remain in the soil as an adult until spring

Composed from: Management of Alfalfa Snout Beetle-Cornell University

Alternative Host Plants of Alfalfa Snout Beetle

Host Plants

- Alfalfa
- Red Clover
- Dock
- Wild Carrots
- Quack Grass
- White Clover

Non Host Plants

- Corn
- Wheat
- Oats
- Soybeans
- Potatoes
- Birdsfoot Trefoil

Management of Alfalfa Snout Beetle

- **Short rotation (after 2-3 seasons) with non-susceptible crops is very important.**
- **Short rotations do not allow the beetle to build large populations in a field.**

Photo by Ken Wise-NYS IPM

Photo by Ken Wise-NYS IPM

Management of Alfalfa Snout Beetle

- **Limit transporting possible infested hay bales, gravel and soil to non-infested sites.**
- **Insecticides are not effective against ASB.**

Biological Control

- **Establishing entomopathogenic nematodes are effective at controlling ABS**
- **The nematodes are native to NY**
- **They persist from year to year once they are applied.**

For detailed information on using nematodes please refer to Management of Alfalfa Snout Beetle
http://www.nnyagdev.org/wp-content/uploads/2012/01/Shields_ASBPamphlet_FINAL.pdf

More Materials to Study

- CCA Manual (Know it all inside and out!) https://docs.wixstatic.com/ugd/0ff601_2c6ad6fe80e04de88ead4ac4270d5dd8.pdf
- NYS IPM YouTube Station-Field Crops https://www.youtube.com/playlist?list=PLE19BD8A62BE7D671
- NYS IPM on-line materials for field crop https://nysipm.cornell.edu/agriculture/livestock-and-field-crops/
- Cornell fact sheets on all the insect pests of field crops https://fieldcrops.cals.cornell.edu/