

# IPM For Insect Pests of Stored Grain

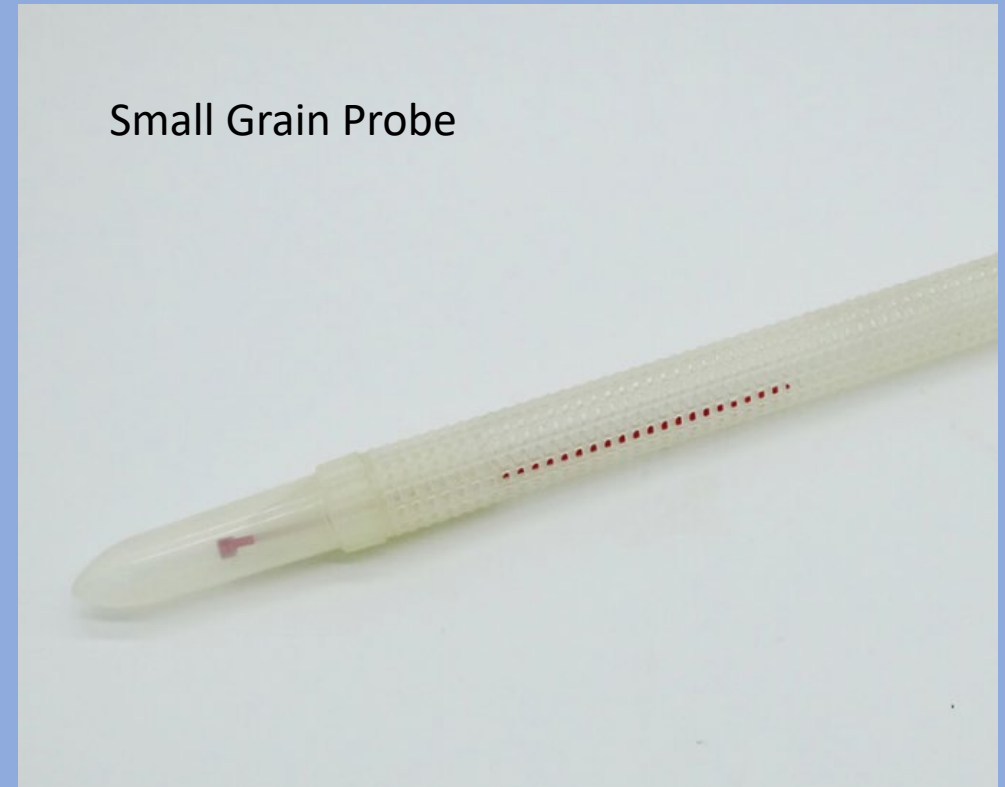


# Sampling for Insects



# Monitoring for Insects

- When grain warms the insects become active
- Check every few weeks
- Probes
- Pheromone traps
- Sticky cards
- Image sensing (Being tested)
- Acoustic sensor(Being tested)
- monitoring temperature
- moisture sensor





# Prevent Infestations-KEEP AREA CLEAN!



# Primary Stored Grain Feeders in NYS

## Weevils

- Granary Weevil
- Rice Weevil
- Maize Weevil

## Beetles

- Lesser Grain Borer

## Moths

- Angoumois grain moth



# Weevils Have Snouts!



**Maize Weevil**



**Lesser Grain Borer**



## Granary weevil *Sitophilus granarius*

- polished, blackish or brown.
- 3/16 of an inch long
- no wings
- Not in the field
- 80-300 eggs laid

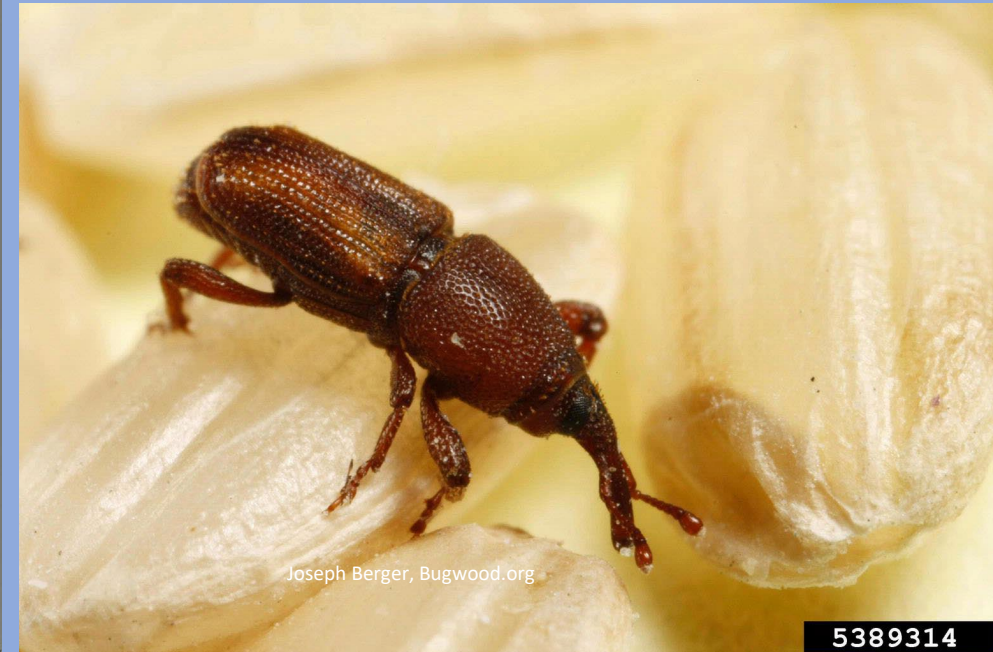


## Rice Weevil *(Sitophilus oryzae)*

- 3/32 of an inch.
- Has wings with yellow markings
- Lays 80-500 eggs inside of grain
- One egg per grain kernel
- Start in the field

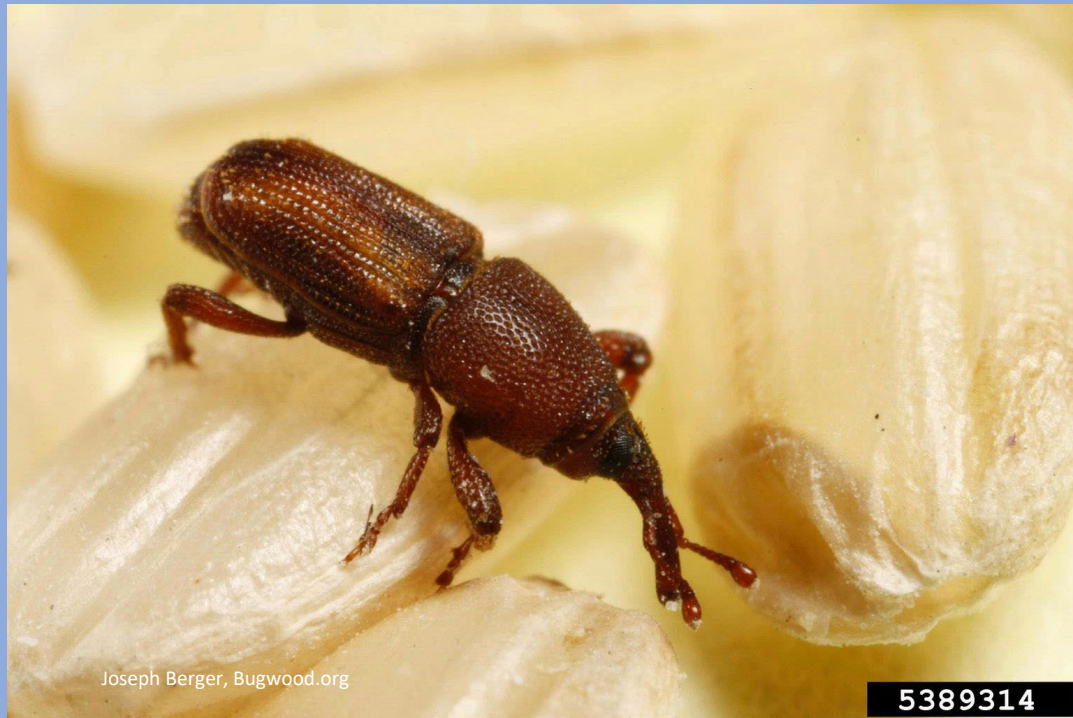
## Maize Weevil *Sitophilus zeamais*

- 1/8 of an inch long
- Small round pits on thorax with a mid line.
- Lays 80-500 eggs inside of grain
- Start in the field



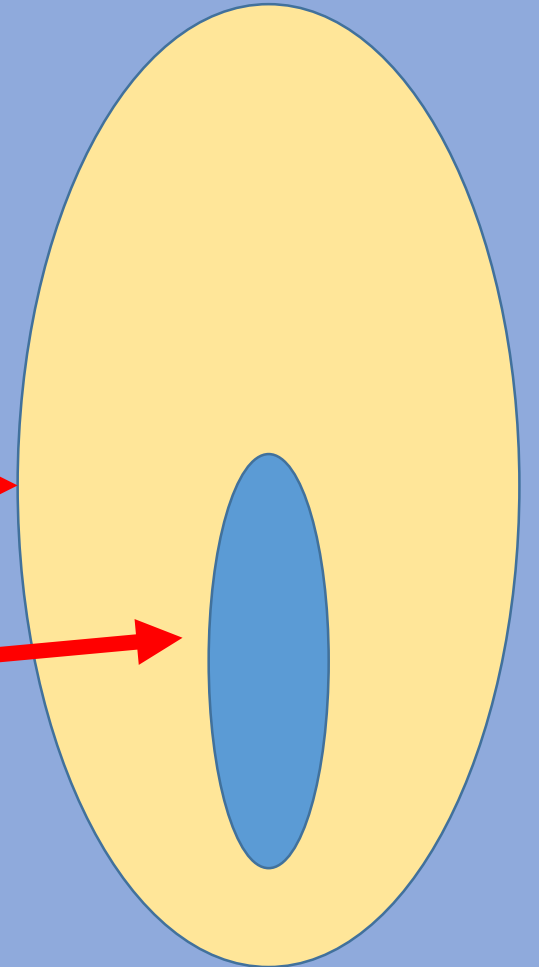


# Life Cycle of the Weevil



Chew a hole and  
lay eggs inside a  
kernel

Larvae feeds on  
the inside of the  
kernel



# Damage by Weevils

- Primary Pest
- 5% to 40% losses
- Cause secondary insects pests feed on fines
- Larger infestations can increase heat and moisture. Molds can occur.



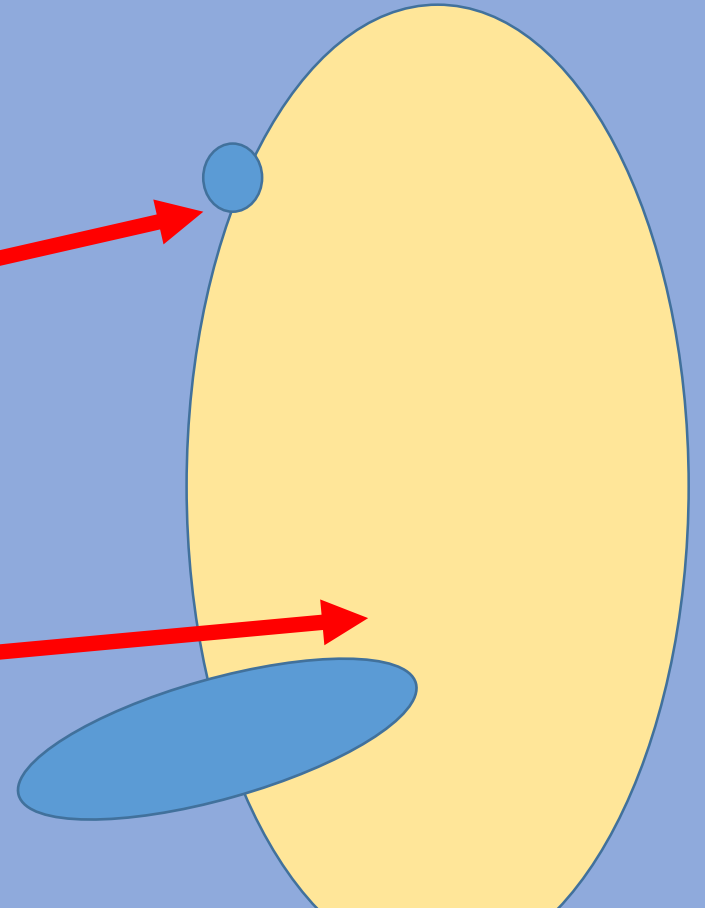
# Life Cycle of the Lesser Grain Beetle



Clemson University - USDA Cooperative Extension Slide Series

Lay eggs on a kernel

Larvae chews its way inside



# Lesser Grain Borer Damage

- Dust and fines
- Both larvae and adults feed on grain
- sweet, musty odor



Whitney Cranshaw, Colorado State University, Bugwood.org



# Angoumois grain moth (*Sitotroga cerealella*)

## Description

- Yellow-brown moth
- 1/3 inch long
- Wings are fringed on rear margins
- eggs white turn red.
- Larvae reach 1/5 inch long
- white-yellowish head.
- Infestations start in the field
- Mostly a pest of corn in a crib
- Larvae chew their way into the kernels



Clemson University - USDA Cooperative Extension Slide Series , Bugwood.org



# Secondary insect pests of stored grain

- Red flour beetle (*Tribolium castaneum*)
- Confused flour beetle (*Tribolium confusum*)
- Saw-toothed grain beetle (*Oryzaephilus surinamensis*)
- Flat grain beetle (*Cryptolestes* spp.)
- Indian meal moth (*Plodia interpunctella*)
- Warehouse moth (*Ephestia* spp.)
- Warehouse beetle (*Trogoderma variable*)
- Rusty Grain Beetle (*Cryptolestes* spp.)
- Foreign Grain beetle (*Ahasverus advena*)
- Merchant Grain beetle (*Oryzaephilus Mercator*)

## Soybeans

- Bean weevil (*Acanthoscelides obtectus*)
- Cowpea weevils (*Callosobruchus* spp)
- Pea Weevil (*Bruchus pisorum*)



# Main modes of Pesticide Application

**There are four main modes of pesticide application for stored grain:**

- 1. CLEAN-empty bin sprays**
- 2. grain protectants**
- 3. Topdressing**
- 4. Fumigation**

Adapted from the Penn State University Agronomy Guide



# Review: An IPM Program includes:

1. grain bin and harvest equipment sanitation (**very important!!!**)
2. grain cleaning
3. uniform distribution of the grain during uploading into the bin
4. moisture management
5. temperature management
6. periodic grain monitoring
7. monitoring insect pests
8. residual insecticide treatment for long-term storage
9. fumigation as a last resort. If the first eight tactics are used effectively, fumigation should be needed only rarely.

Adapted from the Penn State University Agronomy Guide





# Questions?



- [https://www.researchgate.net/publication/328824346 Sensing Technologies used for Monitoring and Detecting Insect Infestation in Stored Grain](https://www.researchgate.net/publication/328824346)