

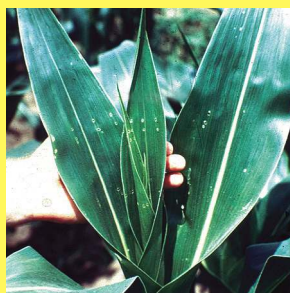
1st generation European Corn Borer (ECB)



Full-grown gray to creamy white larvae overwinter in stalks left in field, pupate into moths and emerge in late May. Moths lay eggs in tallest corn. Eggs hatch in 6 days during normal seasonal temperatures, and the first generation larvae begin feeding in plant whorl with approximately 20 days to maturity.



Damage Key



Shotholes as leaves emerge from the whorl

Scouting Tip! To scout for recent leaf feeding, pull the whorl leaves from the plant and unroll the leaves to look for borers.



Entrance holes — frass and silk may be present.

As larvae grow, they move out of the whorl, feed on the leaf sheaths, tunnel into the midrib, and eventually bore into the stalk (usually at a lower node). They remain in the stalk until they pupate into second generation moths.

Scouting Worksheet

For 1st generation ECB (non-Bt transgenic corn only)

Scout at 700 degree days (Base 50°F) or when corn reaches 18 inches extended leaf height.

Examine 10 consecutive plants in 10 random locations in field for recent leaf feeding in the whorl. Record number of damaged plants per set. Record the number of larvae found in the whorls of 2 infested plants per set.

Total the columns and do the calculations to determine if treatment is economically warranted.

	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Total
Number of Infested Plants											
Number of Larvae											

divide by 100 =

divide by 20 =

$$\text{infestation factor of field} \times \text{borers/infested plant} = \text{average borers/plant}$$

$$\text{average borers/plant} \times 0.05 = \text{yield loss/borer}$$

$$\text{yield loss/borer} \times \text{expected yield bu/acre} = \text{loss bu/acre}$$

$$\text{loss bu/acre} \times \text{expected selling price \$/bu} = \text{loss \$/acre}$$

$$\text{loss \$/acre} \times 0.80 = \text{control*}$$

$$\text{control*} - \text{preventable loss \$/acre} = \text{cost of control \$/acre}$$

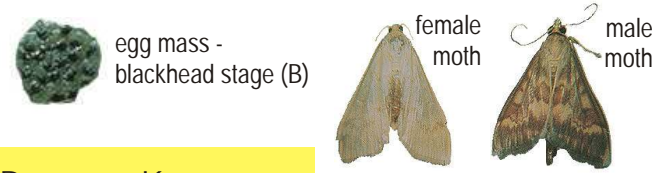
$$\text{cost of control \$/acre} = \text{gain (+) or loss (-) \$/acre if treatment is applied}$$

* Assume 0.80 control for most products: assume 0.50 control for Asana, Furadan and Lorsban sprays.

2nd generation European Corn Borer (ECB)



Straw-colored adult moths peak when 1700 degree days (base 50°F) have been reached. Newly hatched larvae migrate to leaf sheaths and burrow into stalk. Damage also occurs when larvae feed on ear shank, corn kernels, and beneath ear husks.



Damage Key



Newly laid egg mass on underside of leaf — egg stage shown is white stage (W).



Broken stalks and dropped ears

Warning! Once larvae are in the stalk, insecticide treatment is not effective.

Scouting Worksheet for 2nd generation ECB

Scouting Worksheet

For 2nd generation European Corn Borer (non-Bt transgenic corn only)

Scout at weekly intervals starting in early July or when 1250 degree days (Base 50°F) are reached.

Examine 5 consecutive plants in 10 random locations (L) for egg masses on the undersides of leaves near the midrib. Record number of egg masses per set. Record the predominant stage of the egg masses found per set (see damage section for photos of egg mass stages):

White stage (W) - eggs are newly laid
Blackhead stage (B) - hatch in a few hours

Information you collect on egg mass stage will help determine the timing of application. For example, if the predominant egg mass stage is blackhead and there is a significant gain (see worksheet below), then treatment must occur quickly to be effective.

Total the first column.

Divide the total by 50 = average egg masses per plant

Repeat the process 7 days later. Then add the averages and divide by 2 to get the cumulative average of both counts. Enter the cumulative average in the management worksheet below (blue box) to determine if treatment is economically warranted.

$$\text{average egg masses/plant} \times 2 = \text{borers/egg mass*}$$

$$\text{borers/egg mass*} \times 0.04 = \text{borers/plant}$$

$$\text{borers/plant} \times \text{yield loss/borer**} = \text{yield loss}$$

$$\text{yield loss} \times \text{expected yield bu/acre} = \text{loss bu/acre}$$

$$\text{loss bu/acre} \times \text{expected selling price \$/bu} = \text{loss \$/acre}$$

$$\text{loss \$/acre} \times 0.75 = \text{control}$$

$$\text{control} - \text{preventable loss \$/acre} = \text{cost of control \$/acre}$$

$$\text{cost of control \$/acre} = \text{gain (+) or loss (-) \$/acre if treatment is applied}$$

* Assumes survival rate of 2 borers per egg mass
** Use 0.03 yield loss per borer if infestation occurs after silks are brown. The potential economic benefits of treatment decline rapidly if infestations occur after corn reaches the blister stage.

	Number of Egg Masses	Egg Mass Stage
L1		
L2		
L3		
L4		
L5		
L6		
L7		
L8		
L9		
L10		

Corn Rootworm

Creamy-white larvae overwinter as eggs in soil. After hatching, the larvae feed on corn roots. After three weeks, larvae pupate near the base of the plant. The adults emerge and feed on the silks, with the Western adult feeding on leaves also. High soil moisture favors egg laying.

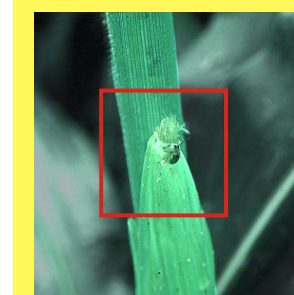


Damage Key



Goosenecking in corn - damage can be done by larvae feeding on roots.

Best Defense! Rotate field out of corn for a year. Larvae will perish after hatching if there is no corn to feed on.



Pruned corn silks - damage done by adult beetles.

Scouting Tip! Grasp the ear tip tightly, enclosing the silks in the palm of your hand and count beetles on all other areas of the plant. Slowly open your hand and count the beetles that come out of the silks as you strip the husk away from the ear tip.

Scouting Worksheet

Silk clipping — current growing season: Begin scouting when 70% of the plants are in the process of silking. Select 10 locations and examine 5 non-consecutive plants per location. Record number of beetles per plant (P). Record condition of the silk on each plant (fresh, brown, clipped to _ inches, not silked)

Number of Beetles/ Silk condition	P1	P2	P3	P4	P5

Repeat worksheet for each location

Consider treatment (of adults) : Silks of several plants from each location are clipped to within one-half inch from the tip of husk prior to browning of silks.

Root protection — following year: Beginning in mid-August, scout 3 times at 7-10 day intervals thru mid-September. Select 10 locations and examine 5 non-consecutive plants per location. Record number of beetles per plant (P).

Number of Beetles	P1	P2	P3	P4	P5	Total

Repeat worksheet for each location

Add totals from 10 locations and divide by 50 =

Consider treatment (for following year) : Average of 0.75 or greater beetles per plant and corn is planted in same field the following year.

Introduction

This guide covers five insect pests, the damage they do, how to scout your fields for them and how to quantify them so that you can make informed pest management decisions on your farm.

The goal of this guide is to give you a feel for what is involved in scouting for insect pests, an important part of integrated pest management (IPM). It is handy to know what IPM is, what degree days are and some corn anatomy, but that is about as technical as it gets (definitions of these terms are listed below). Some supplies that may be helpful are a shovel, small containers, large plastic bags, graph paper and a calculator.

This guide will enable you to determine if treatment is worth considering based on the information you collect. However, specific treatment recommendations are not addressed in this publication. An annually updated treatment guide, *Pest Management in Wisconsin Field Crops (A3646)*, can be obtained from your Wisconsin county Extension office or from Cooperative Extension Publications, Rm. 170, 630 W. Mifflin St., Madison, WI 53703, phone (608) 262-3346.

Remember that proper identification of the insect pest is critical to effective treatment. If you are in doubt, contact your county Extension office or farmers' cooperative. They can provide you with local people who can help correctly identify your corn pest.

Definitions

Integrated pest management or IPM is a decision-making process that utilizes all available pest management strategies, including cultural, physical, biological and chemical control to prevent economically damaging pest outbreaks and to reduce risks to human health and the environment. One of the major components of an IPM program, if not its foundation, is crop scouting. The goal of crop scouting is to provide accurate and unbiased pest and crop development data.

Degree days (also known as "day-degrees" or generically as "heat units") provide a means of predicting insect phenology (i.e., the timing of life history events) by combining time and temperature to measure insect development and activity. Degree days are available from your Extension office and farmers' cooperatives.

Instar refers to the stage between molts. As insect larvae grow they molt or shed their skin. Most insects have three to seven instars.

For additional copies of this publication, call (608) 265-2660. Nutrient and Pest Management Program, College of Agricultural and Life Sciences, University of Wisconsin-Madison, University of Wisconsin-Extension, Cooperative Extension. Printing of this publication was funded by the Wisconsin Corn Promotion Board. 2/06

May — June



Black Cutworm

Grainy, rough-skinned larvae feed at night, at or below ground surface. They are usually found in wet or low areas.

Damage Key

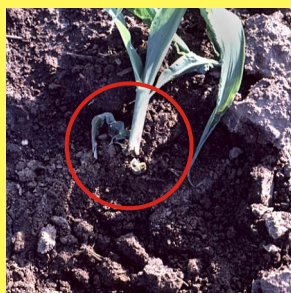


3rd instar of larvae chews holes and often defoliates leaves.

Scouting Tip! Crane-fly larvae and dingy cutworm can be confused with black cutworm larvae but are not economic pests! Notable differences are that the crane-fly larvae are legless and dingy cutworms have a smooth skin texture. If you are doubt, contact your county Extension office or farmers' cooperative. They can provide you with local people who can help correctly identify cutworm larvae.

To determine the instar stage of larvae, hold head between thumb and index finger, and place on the closest corresponding ruler.

Instar 3	1/32" inch
Instar 4	1/16" inch
Instar 5	3/32" inch
Instar 6	1/8" inch
Instar 7	5/32" inch



4th and 5th instar of larvae cut the stem at, or just below the soil surface.

6th and 7th instar of larvae cause wilted whorl or "dead heart." (see stalk borer damage section for photo and treatment warning)

Scouting Worksheet

Scout at emergence and weekly until corn is at V5 (five fully emerged leaves). Select 5 locations in field. Examine 50 plants per location (L). Record number of damaged plants. In each location, dig around the base of damaged plants and collect 10 live larvae. Determine their instar stage by using the head capsule gauge and record the predominant instar.

	L1	L2	L3	L4	L5	Total
Number of Damaged Plants						
Predominant Instar						

Multiply the total by 0.40 = %

Consider spot or border row treatment when:

5% or more of the plants show damage

AND larvae are 6th instar or smaller

mid-May — June



Stalk Borer

The purplish-brown larvae with off-white stripes bore or tunnel inside stems and are extremely active when disturbed. The adult moth lays eggs on grassy weeds, ragweed, pigweed, curlydock and burdock.

Damage Key



Small irregular holes in leaves

★ Important!

This is the only stage of damage in which insecticide treatment is recommended.



Series of irregular holes in unfurled leaves of older plants

Larvae feeds in whorl before tunneling downward into stalk (see description below for treatment effectiveness).



Wilted whorl or "dead heart"

✗ Warning! Once larvae are in the stalk, insecticide treatment is not effective. The most effective control for the following season is to eliminate grassy weeds prior to August when moths emerge and lay eggs.

Scouting Worksheet

Scout at corn emergence or when 1300-1400 (Base 50°F) degree days are reached.

Infestations will typically be found in the first 4-6 rows around field margins, grassy waterways and alfalfa/grass strips. Damage can be found within field if grassy weeds were present the previous year. Monitor the potential for stalk borer larvae by noting locations of grassy weed hosts. Select 5 locations with infestation potential. Examine 50 consecutive plants per location (L). Record number of plants with small, irregular shaped holes. Make detailed maps if damage is localized.

	L1	L2	L3	L4	L5	Total
Number of Damaged Plants						

Multiply the total by 0.40 = %

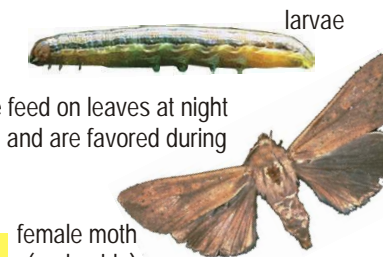
Consider spot or border row treatment when:

It is prior to early June and damage does not exceed 25%.

mid-May — June 1st generation

late June — July 2nd generation

Armyworm



Hairless, brownish-green larvae feed on leaves at night (or during the day when cloudy) and are favored during cool, wet springs.

Damage Key



4th instar of larvae cause irregular notching of leaf margins.

To determine the instar stage of larvae, hold body lengthwise parallel to closest corresponding ruler.

Instar 4 9/16" in.

Instar 5 3/4 in.

Instar 6 1-1/2 in.



5th and 6th instar of larvae feed in whorl and can strip leaf tissue to the midrib.

Outside rows of corn damaged - infestation results when armyworms migrate from pastures, oats, grassy pea or alfalfa fields.

Scattered areas damaged (July) - infestation results when grassy weeds such as foxtail, quackgrass, goosegrass, and nutsedge are present for egg-laying in the field.

Scouting Worksheet

Scout when damage is noticed.

Select 5 locations in field. Examine 20 plants at random per location. Record the number of worms (3/4" or smaller only) found on each plant.

Using data from all 5 locations:

Count the number of plants with 2 or more worms = %

Count the number of plants with 1 or more worms = %

Consider spot treatment when at least :

1 armyworm per plant on 75% plants

or

2 armyworms per plant on 25% plants