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PEST MANAGEMENT GUIDE for FIELD CROPS INSECTS: Corn Section

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Introduction Figure 1: How to read the insecticide tables in this bulletin – a made-up example!

Active ingredients (AI) are listed alphabetically. Insecticides are listed by Trade Name under each AI to allow for comparison or substitution of products.

See Table 1 to cross reference active ingredients x insecticide.

A letter under an insect indicates it is on the label
• The specific letter corresponds to use rates in column 2.

Compare PHIs between products

A few of the important statements on the label

Active ingredient Trade names	Labeled rate per acre	caterpillars	cutworm	grasshoppe	spider mite	stink bugs	Pre - harvest Interval (PHI) in days	Precautions and Remarks
abamectin Big-Ten SC	(a) 1.7 - 3.5 oz				a		28	• Apply when spider mites are first observed
bifenthrin Brutus Buckeye	(a) 3.5 - 5.0 oz (a) 7.0 - 10 oz	a	a	a		a	18	• Do not make applications less than 30 days apart
chlorantraniliprole O-Hi Advanced	(a) 14 oz (b) 20 oz	a		b			1	• Must be applied before insects reach damaging levels
cyhalothrin (lambda) Izzo AG Green-UP WDG Lansing LV Scarlet 4F Spartan Izzo Extra Spartan Maxx	(a) 3 oz (b) 6 oz (a) 1 oz (b) 2 oz	a	a	b		b	30	• Do not graze or harvest vines as forage or hay

An AI with one trade name with a single rate (a) for one pest, spider mite

An AI with two trade names, each with its own single rate (a) for multiple insects
- For example, for cutworm the rate per acre is 3.5-5.0 oz of Brutus and 7.0-10 oz of Buckeye

An AI with one trade name but different use rates, (a) and (b), for different pests
- For example, the rate per acre is (a) 14 oz for caterpillars and (b) 20 oz for grasshoppers

An AI with many trade names, grouped by use rates; products in a group are similar and interchangeable
- For example, for cutworm use (a) 3 oz of Izzo Ag or 1 oz of Izzo Extra. Use the higher rate (b) for hoppers
- If you can't find Izzo Extra, Spartan Maxx is a similar product

Management of Insect Pests of Field Corn in Michigan and Ohio *Updated: December 2025*

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How to Use this Guide

This publication is set up as a series of stand-alone tables with information on insect biology, damage, management recommendations, and insecticides registered in Michigan and Ohio on **field corn**. Pesticide names and rates are current as of the date at the top of the page.

- ✓ **Table 1** shows the timing of common insect pests in field corn, from early to late season.
- ✓ **Table 2** is a checklist of damage symptoms from these pests to aid in field scouting.
- ✓ **Table 3** has information on the life cycle of each pest, plus a detailed description of its damage and the conditions that may lead to or favor infestations. A rating of pest status (and thus damage potential) is given based on experience in the state. Most insect pests are uncommon or do not increase to damaging levels in a typical year.
- ✓ **Table 4** has information on management. Most insects are kept in check by natural enemies (biological control) or by adverse environmental conditions. Some pest problems can be reduced by simply changing or avoiding certain agronomic practices. Table 4 also gives scouting and threshold recommendations. Note that these recommendations vary in quality. Key pests tend to have research-based scouting methods and thresholds. But many insects are not at damaging levels often enough to generate good information. Sampling recommendations and thresholds for these species are based on observations, experience, or a best guess. This is noted on the table.
- ✓ Insecticides registered in Michigan and Ohio on field corn are listed in **Table 5** (at planting) and **Table 6** (foliar sprays)**.** Active ingredients (AI) are listed alphabetically in column 1. All products with the same active ingredient are grouped together for easy comparison or substitution of one product for another. Use rates and pests are listed in columns 2 and 3. A letter under a pest indicates that species is on the label (i.e. the label claims control of that insect). The letter itself corresponds to the use rate in column 2. Some insecticides are applied at a single rate for all insects ('a'), while rates for other insecticides vary by insect ('a', 'b', 'c'). The final columns in the table list the preharvest interval (PHI) in days and notes on application - for example bee toxicity warnings, minimum recommended spray volumes, or other restrictions.

Table 1: Timing of damage from insect pests of corn in Michigan and Ohio

- Pests are listed from early to late-season. Key species are highlighted in bold text.

Common name	Overwintering stage, location	May	June	July	August	Sept
white grubs	larvae (grubs), underground	Asiatic garden Euro Chafer				
		Japanese beetle				
		June beetle				
seedcorn maggot	pupae, in soil	larval damage				
wireworm	larvae, in soil	larval damage				
flea beetle	adults, on field edge	adult feeding				
slugs & snails	both eggs and adults, in field	feeding on seedlings	feeding on lower leaves			
billbug	adults, on field edges	adult feeding	larval feeding - root crown			
sandhill crane	-----	birds pull out & consume seeds				
black cutworm	Southern USA, migrate north	larvae feed on leaves and cut off plants at the base				
true armyworm	Southern USA, migrate north	1st generation larvae feed on leaves	2nd generation larvae may defoliate plants			
corn rootworm	eggs, underground		larvae feed on roots	adult beetles clip silks and feed on ear tip		
corn blotch leafminer	adult flies		larvae mine leaf tissue			
grasshoppers (multiple species)	egg clusters, underground			nymphs, then adults, feed on foliage		
European corn borer	5th instar, in crop residue		1st generation larvae feed on leaf and stalk	2nd generation larvae feed on leaf, ear, stalk		
Japanese beetle adult	larvae (grub), underground			adult beetles clip silks		
corn earworm	Southern USA, migrate north				larvae feed in the ear	
fall armyworm	Southern USA, migrate north			larvae feed on leaves and then in ears		
western bean cutworm	prepupae, underground			larvae feed on tassels and silks, then on the ear tip and kernels		
stink bug	adults, nymphs(?), in & around fields		feed on young corn leaves		feed on juicy kernels	
corn leaf aphid	Southern USA, migrate north			multiple generations feed on plant sap		
spider mite	adult females, at base of hosts			multiple generations pierce plant cells		
sap or picnic beetles	pupae & adults, crop residue				adults & larvae feed in ear tips	

Table 2: Damage checklist to aid in scouting for insect pests of corn in Michigan and Ohio

Plant part or timing Type of damage or injury	aphids	billbug	black cutworm	corn earworm	corn leafminer	corn rootworm larvae	corn rootworm adults	European corn borer	fall armyworm	flea beetle	grasshoppers	Japanese beetle adult	sap beetle	seedcorn maggot	slugs & snails	spider mite	stink bug	true armyworm	western bean	wireworm	white grubs
Stand (emergence)																					
seeds fed-on														x	x					x	
gaps in row			x											x	x					x	x
wilted or cut plants			x																	x	
hole through base of plant			x																	x	
seedling top cut-off straight			x																		
variable plant stages, heights																					x
Leaf tissue																					
slimy or shiny trails															x						
scraping of top layer of leaf							x			x					x						
leaf mining					x																
shot-, pin-, or round holes								x													
parallel oblong holes		x															x				
small hole in midrib								x													
skeletonized between veins							x					x									
irregular leaf feeding			x	x					x		x							x			
severe defoliation, midrib left											x							x			
stippling (tiny yellow spots)																x					
purpling deficiency symptom																					x
brown ‘crispy’ dead leaves	x															x					
sticky leaves or sooty mold	x																				
webbing																x					

Plant part or timing Type of damage or injury	aphids	billbug	black cutworm	corn earworm	corn leafminer	corn rootworm larvae	corn rootworm adults	European corn borer	fall armyworm	flea beetle	grasshoppers	Japanese beetle adult	sap beetle	seedcorn maggot	slugs & snails	spider mite	stink bug	true armyworm	western bean	wireworm	white grubs
Tassels																					
fed-on				x															x		
broken								x													
sticky or with sooty mold	x																				
Stalks																					
tunneling into stalk								x													
stalk breakage								x													
lodging, goosenecking						x															
Roots																					
brown tracks, scarring						x															
root hairs missing						x															x
pruning of whole roots						x															x
Ear																					
silk clipping				x			x					x							x		
feeding on ear tip				x				x	x				x						x		
scraping of kernel surface								x											x		
tunneling into side									x										x		
tunneling in shank								x													
ear drop								x													
shriveled kernels																	x				
poor pollination / ear fill	x						x														x
brown frass, messy or pellets				x					x									x	x		
white frass, powdery								x													

Table 3: Life cycle, damage, and pest status of insect pests of corn in Michigan and Ohio

Terms to describe the pest status of each insect. Ratings apply to Michigan and Ohio.

- **Rare**: Unusual, typically goes unnoticed. May not even be present
- **Uncommon**: Usually present but well-below damaging levels. An outbreak once a generation.
- **Occasional**: Present in most fields, sometimes in high numbers. An outbreak once a decade.
- **Important**: Present in most fields, potentially increasing to damaging levels every season. A common target of scouting, management programs, or insecticide use.
- **Sporadic:** Damaging levels occur after favorable weather patterns (such as drought) or mass movement from south to north during the season
- **Localized**: Damaging levels occur in specific locations under specific agronomic conditions, for example in no-till production or in older stands.

Pest (abbreviation)	Life cycle and Number of generations	Description of Damage	Conditions which favor infestation or damage	Pest Status in MI & OH
aphids *Usually the corn leaf aphid*	The summer population is female. Females do not mate to reproduce (parthenogenesis)They also give birth to live young. Multiple overlapping generations. Large numbers of winged migrants may build up on corn in southern states and be carried south to north, raining out over fields in MI and OH.	• Aphids suck plant sap (water and nutrients) from leaves • In rare outbreaks (plants covered with aphids) leaf death sometimes occurs • Aphids secrete sticky honey dew as a waste product. Sticky leaves get coated with black sooty mold growth - mostly cosmetic, but photosynthesis is reduced if mold is severe • Sticky honeydew on tassels & fresh silks may inhibit pollen shed & pollination. If severe, this can impact ear-fill and thus yield	• Plant stress under dry conditions may be exacerbated if feeding from high numbers of aphid removes a lot of water. Lack of rainfall also leaves sticky honeydew on plants • Insurance use of insecticides and fungicides can favor aphids, since their natural enemies and fungal pathogens may be killed	Uncommon Populations are rarely high enough to cause damage The most recent infestation in Southern MICH and Ohio in 2024 resulted from an intense migration from the south.
billbug	Adults overwinter along field borders and emerge during corn planting, usually walking to corn. Eggs laid in soil or in holes chewed in stalk. Larvae feed on roots & root crown. Adults emerge between midsummer and fall 1 generation per year	• Adults cut slits in the whorl, resulting in extensive tillering • Another symptom of feeding is oblong shot-holing that appears as leaves unfurl • Larvae can damage root crown by feeding	• Continuous corn • No / reduced tillage • Field edges • Fields with heavy nutsedge infestation (alternate host)	Rare No recent reports of significant numbers in this region
corn blotch leafminer (CBL)	Flies lay eggs on leaf surface. Larvae (maggots) tunnel between leaf layers, creating mines that widen as larvae grow. Mature larvae chew out of the leaf and drop to the soil to pupate. Several generations per summer	• Females create numerous tiny pinholes wounds • In heavy infestations, entire leaf is mined by multiple larvae • Mined foliage dries up and shrivels, giving plants a frosted appearance	• Highest levels in Michigan were observed in muck fields	Rare
corn earworm (CEW)	Moths move north into Michigan and Ohio in July or August. Eggs are laid on silks or upper leaves. Larvae (caterpillars) feed on leaves, then on silks and ears. Larvae drop and pupate in soil. Overwintering is not successful in our region.	• Larval feeding can damage tassel, silks, kernels in ear • Ear injury is associated w/ invasion of other insects and ear molds that produce mycotoxins	• Late-planted fields which are silking during egg-laying	Uncommon Rarely impacts field corn in the region, but a major pest of sweet corn

Pest (abbreviation)	Life cycle and Number of generations	Description of Damage	Conditions which favor infestation or damage	Pest Status in MI & OH
corn rootworm (CRW)	Eggs overwinter in the soil and hatch in late May-early June. Larvae feed on corn roots for about three weeks and pupate in soil. Adults begin to emerge in early July and feed through the summer. Eggs laid in soil of corn fields, except in areas with the rotation-resistant variant of western corn rootworm, which will lay eggs in soybean and other crops. 1 generation per year	Larvae • Root scars, tunneling, severe pruning of nodes of roots • Plant stress & yield loss from poor water & nutrient uptake • Lodging and goose necking of plants results in harvest issues Adults: • Scraping of leaf surface • Silk-clipping • Feeding on the ear tip	• Continuous corn provides by far the biggest risk for CRW root damage • Volunteer corn from the previous season attracts adults to lay eggs in soybean. This can lead to root damage in rotated corn • Late-planted corn may attract adults to feed on silks and impact pollination	Larval damage: Important & Localized *in continuous corn production* Adult beetles consuming silks: Occasional & Localized *in continuous corn & sometimes adjacent rotated corn fields*
cutworm *Mostly black cutworm but also dingy, sandhill, and variegated*	Adult moths migrate north in early spring. Eggs laid on low-growing weeds or crop residue. Small larvae first feed on weeds, then shift to corn after herbicide is applied. Larvae hide during the day, & feed at night. Pupation in soil. Several generations per season, but the 1st is most damaging.	• Small larvae create shot-holes in leaves • Older larvae feed on leaves (variegated), tunnel into base of stalk (black) or cut seedlings off (black), reducing stand	• Low, dense weeds are egg-laying sites • No-till fields • Fields with high crop residue • Planting into cover crops or wet areas • Late-planted corn	Sporadic Outbreaks occur after a heavy spring flight from the south
European corn borer (ECB)	Mature larvae overwinter in corn residue and pupate late spring. Moths emerge in late May- early June. Females lay egg masses on the undersides of corn leaves. Larvae feed on all above-ground parts of plants. Pupation in stalk (1st gen) or residue (2nd gen). Two generations in south & central Michigan & all of Ohio, the first in June & the second in late July/ early August. One generation in northern Michigan and its upper peninsula.	• Small larvae scrape leaf surface (windowpaning) or chew through whorl, resulting in shot-holing damage • Larger larvae bore into midrib & stalk, disrupting water flow, weakening stalk, or causing breakage • Both shank boring (ear drop) and direct kernel feeding reduces yield • Ear injury is associated with infection of ear molds that produce mycotoxins. Stalk boring is associated with stalk rot, breakage, and ear drop	• Areas with a high % of non-Bt corn • Early planted (taller) fields at risk for 1st generation • late-planted fields at risk for 2nd generation Note: Besides field corn, hosts include sweet corn, snap & dry beans, potato, tomato, peppers	Occasional & Localized *in non-Bt corn* Used to be important, but region-wide outbreaks are suppressed due to widespread planting of Bt hybrids
fall armyworm (FAW)	FAW is a tropical species that cannot survive freezing temperatures. Adult moths migrate north, arriving in mid to late season. Eggs are laid on corn leaves. Larvae feed in whorl or in the ear. Pupation in soil. 1-3 generations at end of season, if temp is warm enough. Larvae cannot overwinter in our area.	• Leaf damage to whorl-stage corn • Kernel feeding (part of the caterpillar complex feeding in the ear) and subsequent risk of ear molds	• Late-planted corn is attractive to moths for egg-laying • Edge rows may be damaged by larvae marching from infested grassy edge, pasture, or forages	Uncommon in MI Sporadic in Ohio
flea beetle	Adults overwinter and emerge in the spring. Eggs are laid in soil around corn plants. Larvae feed and pupate in soil. Several generations per year	• Adults feed on upper leaf surface, leaving white scraping or scratches. Direct damage is rarely a concern • Infected adults transmit Stewart's wilt bacteria during feeding. This isn't a problem in field corn but Stewart's causes yield loss in susceptible inbred lines used for seed production	• Mild winters favor survival of over-wintering beetles (and thus Stewart's wilt bacteria). If the avg daily temp for Dec/Jan/ Feb is >90, flea beetle survival may be high.	Occasional *as a vector in seed corn* Rare *in field corn*

Pest (abbreviation)	Life cycle and Number of generations	Description of Damage	Conditions which favor infestation or damage	Pest Status in MI & OH
grasshoppers *several species*	Eggs overwinter in soil. Nymphs emerge in June. Amount of feeding increases with size. Females deposit groups of eggs in the undisturbed soil in late summer. 1 generation per year	• Defoliation of plants by nymphs and adults. Feeding has a ragged appearance	• Fallow areas and pastures that border fields are preferred egg-laying sites • A hot summer & fall can lead to a high population the following season	Uncommon Outbreaks rare
Japanese beetle adults	Larvae (grubs) feed underground on roots of many hosts. Adults emerge mid-summer, and feed on corn leaves, silks, and pollen, plus on hundreds of other hosts. Eggs laid in soil in July -September 1 generation per year	• Feeding skeletonizes leaves but damage isn't economic • Also clips silks, similar to rootworm adults. Severe clipping can reduce pollination	• populations often higher on field edges, especially near turf and grassy areas	Uncommon
sap beetle *= picnic beetle*	Adults overwinter. Eggs are laid on or near decaying and fermenting stuff. Thus, adults are attracted to ear tips with insect damage, insect poop, and mold growth. Larvae feed in ear and pupate in soil. Several generations per season	• Larvae and adults are secondary pests in ears fed on by other insects like rootworm adults or caterpillars. Sap beetles create additional damage and areas for ear mold infection	• Ears opened and injured by other insects (such as CEW, ECB, WBC) • Cool, wet weather late in the season, which enhances ear mold growth	Uncommon
seedcorn maggot (SCM)	Overwinter as pupae in soil. Adult flies emerge in early spring, laying eggs in tilled or disturbed soil with decaying organic matter. Larvae (maggots) feed on decaying matter and germinating seeds. Several generations per year, only the first causing damage in field corn	• Larvae feed on germinating seeds which can result in variable emergence and stand loss. • Damage often occurs over a large part of field	• Tillage • Recently (w/in 2 weeks) incorporated organic matter such as alfalfa, green cover crops, weeds, or fresh manure • Cool, wet weather which delays emergence • Peak egg laying near planting time	Localized Occurs under specific field and environmental conditions
slugs & snails	Slugs overwinter as eggs & adults, so both are present at planting. Eggs laid in soil in spring hatch in about one month and these slugs feed through the summer	• Feeding on germinating seeds, cotyledons, & lower leaves as the plant grows. Feeding up on plants tends to occur at night • Heavy feeding on small corn plants may slow development or reduce stand	• No or reduced-till • Planting into heavy stubble, crop residue • Cool, wet weather delaying emergence • Poorly-closed furrows act as slug buffet lines	Localized (but increasing) Occurs under specific field conditions
spider mites (two-spotted)	Adults overwinter in field borders and other sheltered areas. In spring, adults move to new growth and lay eggs on undersides of leaves. Mites spread from field to field by crawling or blowing in the wind. Multiple overlapping generations	• Adults & nymphs pierce individual plant cells, creating tiny yellow spots (stippling) • Severe damage results in leaf yellowing, death, water loss • Webbing is a sign on a heavy infestation	• Prolonged hot, dry weather favors outbreaks and increases the impact of mite feeding • Infestations often start on dusty edges of fields	Sporadic Outbreaks occur in hot, dry seasons
stink bugs *several species*	Adults and nymphs feed by injecting salivary enzymes into plants and sucking up plant juices	• Feeding in V4-V5 corn creates characteristic pattern of circular holes with yellow margins as the whorl unrolls • In severe case, plants may be twisted, growing point can die • Ear feeding can cause aborted or shriveled kernels	• No-till corn • Rye cover crop or weeds which were killed by herbicide	Uncommon

Pest (abbreviation)	Life cycle and Number of generations	Description of Damage	Conditions which favor infestation or damage	Pest Status in MI & OH
true armyworm (TAW)	Adult moths migrate into Michigan in early spring. Eggs of the 1st generation are laid on weedy grasses before corn emerges and on small grains like wheat. In corn, small larvae first feed on weeds then shift to the crop after herbicide is applied. Larvae in wheat move into nearby crops, including corn, in June as wheat dries down. Larvae pupate in the soil and adults emerge in a week. 2nd generation moths lay eggs in weedy or cover-cropped corn in July, or move in to corn from adjacent infested hay fields. 2 to 3 generations per year, the first is usually the most damaging.	• Larvae feed on leaf margins, sometimes completely defoliating plants, leaving only the midrib • Corn plants usually recover if growing point is not injured, but a severe infestation can defoliate a field in several days	• Adjacent areas where eggs were laid, such as field margins, small grains (1st gen) or hay fields • Heavy weed growth or a cover crop are favored egg laying sites within a field. Organic fields are often very susceptible	Sporadic Outbreaks usually occur after a heavy spring flight from the south.
western bean cutworm (WBC)	Overwinter in pre-pupal stage. Adults emerge in July. Females key in on late whorl & pre-tassel stage corn for egg laying. Larvae feed first on tassels and silks, then in the ear. Feeding ends in early- to mid-September when caterpillars drop and burrow into soil. 1 generation per year	• Larger larvae feed in the ear, usually at the tip, but sometimes directly through the husk into the side • In rare, heavy infestations, there can be multiple caterpillars per ear • Feeding damage allows other insects like sap beetles to infest. Damaged ears also have an increased risk of ear mold infection and quality reduction from mycotoxins	• Fields in the pre-tassel stage • Areas with sandy soils which increase the overwintering survival of larvae • Areas where both corn and dry beans (an alternate host) are grown	Important and often Localized Corn stage during flight is often key to infestation
white grubs - Asiatic garden beetle (AGB)	Mature grubs overwinter in field. Adults emerge in June, move and mate at dusk (come to lights). Females attracted to low-growing canopy for egg laying (for ex, soybean or potato). Grubs feed on roots from July-fall, then move down in soil profile in late fall to overwinter. Feeding resumes in the spring until pupation. 1 generation per year. See free AGB pocket guide at: https://aginsects.osu.edu/news/new-agb-pocket-field-guide-available	• Grubs feed on cotyledons and roots, reducing stand and plant uniformity. In severe cases, stand loss has been documented • Adults feed on ornamentals plus some veg & fruit crops. Adults do not appear to feed on corn leaves	• Previous crop of soybean, potato, alfalfa, or late season infestations of weeds like marestail • Fields or portions of fields with a sandy (> 80% sand) profile	Localized Damage in field crops is currently limited to counties in northern Ohio and Indiana, and southern Michigan
white grubs - European chafer	Mature grubs overwinter in field. Adults emerge in June and mate at dusk near a landmark (ex, tall tree). Grubs feed on roots from July into fall then move down in soil profile in late fall. 1 generation per year	• Grubs feed on cotyledons and roots, reducing stand and uniformity • Adults do not feed	• Corn following soybeans • Field edges near lawns, golf courses, tree lines • Fields or portions of fields with sandy (> 80% sand) soil • Spring populations tend to be higher after a dry summer	Uncommon and Localized *No recent reports of losses from EC grubs in corn*

Pest (abbreviation)	Life cycle and Number of generations	Description of Damage	Conditions which favor infestation or damage	Pest Status in MI & OH
white grubs - **Japanese beetle (JB)**	Mature grubs overwinter in field. Adults emerge in July-August. Eggs laid in soil July-Sept. Grubs feed on root from July-fall then move down in soil profile in late fall. 1 generation per year	• Grubs feed on cotyledons and roots, reducing stand and uniformity • Adults also feed on corn (see JB adults)	• Planting into fallow fields or pasture • Fields near pasture, lawns, ornamentals • Spring populations are higher after a wet summer	Uncommon
white grubs - **multiple species of June beetle**	Adults emerge in May/June, move and mate at dusk (come to lights). Eggs laid in soil. Grubs feed for three summers, with the 3rd (last) stage causing the most damage to roots. Between summers, larvae move to a lower depth in soil. Late in the third summer, grubs pupate underground. Adults emerge the following spring, some years in very large numbers. 1 generation takes three years	• Prune cotyledons prior emergence, reducing stand • Prune root hairs and sometimes whole roots, causing wilting, water and nutrient deficiency, or plant death	• Planting into fallow fields & pasture • Fields near pasture, home lawns, tree borders	Uncommon
wireworm	Wireworms are the immature form of click beetles. They spend up to six years underground in the immature stage. Overlapping generations	• Feed on newly planted corn seeds & roots • May tunnel straight through the base of seedlings below the soil surface	• Planting into long-standing fallow fields and pasture	Uncommon & Localized Related to field history

Table 4: Management notes, scouting recommendations, and thresholds for insect pests of corn in Michigan and Ohio

Pest	Notes on non-chemical and chemical management	Scouting recommendation	Threshold
aphids	• Biological: Predators (such as ladybugs, lacewings, parasitoids) usually keep populations in check. Under humid conditions, entomopathogenic fungi kill aphids • Environmental: Heavy rainfall and irrigation can wash off aphids. Adequate moisture reduces feeding stress and increases humidity for infection by pathogens	Check 100 plants (5 plants x 20 sets)	Tassels covered w/ aphids & honeydew on 50% of VT stage plants & field is under moisture stress. Rarely justified in Michigan or Ohio
billbug	• Agronomic: Crop rotation (adult billbugs are slow and don't move far) and tillage reduce populations. Control of sedges removes an alternate host • Insecticide: Note that granular soil insecticides applied at planting for another insect will control billbug	No specific recommendation	No specific recommendation We have never seen infestations in Michigan in Ohio
corn blotch leafminer	• Biological: Numerous wasp parasitoids attack larvae • Insecticide: Not effective because larvae are protected in leaf mines. Spraying also disrupts parasitism.	None	none Not justified in Michigan or Ohio
corn earworm	• Biological: Several predators attack eggs and larvae • Agronomic: Planting early or on-time avoids egg-laying • Insecticide: Spraying to protect the ear is generally not effective • Seed selection: Some Bt corn hybrids provide control. See Table 7 in this corn chapter for details	None	None Not an economic pest of field corn in Michigan or Ohio
corn rootworm larvae	• Agronomic: Crop rotation is by far the most effective way to control CRW. Eliminating volunteer corn in the rotational crop is important to achieving larval reduction • Environmental: Wet conditions during egg hatch usually reduce populations in a field (but this can also negatively impact root growth). Adequate soil moisture and nutrients promote good root growth later in the season and help plants recover from larval feeding • Seed selection: Some Bt corn hybrids provide control. See Table 7 in this corn chapter for details	Scout fields for beetles to predict the need for an insecticide or a Bt trait the <u>following season</u> • In continuous corn: Check 100 plants after adult emergence (20 plants x 5 sets)	1 beetle per plant Threshold indicates that CRW control is needed next season. Plant Bt corn, use a soil insecticide, or rotate the field out of corn
corn rootworm adults	• Agronomic: Crop rotation is by far the most effective way to reduce larval, and thus adult, populations	Check 100 plants (20 plants x 5 sets) for silk clipping by CRW & Japanese beetle	Silks clipped shorter than ½ inch before/ during pollination, <u>and</u> adults are still feeding
cutworm	• Biological: Ground beetles and parasitoids kill larvae • Agronomic: Good weed control and timely cover crop termination prior to planting reduce likelihood of infestation • Insecticide: Rescue (post-planting) treatments are effective and preferred, as populations vary by year & location • Seed selection: Some Bt corn hybrids provide black cutworm control. See Table 7 in this corn chapter for details	Walk fields to determine % wilted or cut plants Dig around base of plants to confirm cutworm larvae are present Note: Pheromone traps can indicate flight and aid in timing of scouting	> 5% plants cut or damaged
European corn borer	• Biological: Numerous natural enemies eat larvae. Egg and larval parasitoids and pathogens are common • Agronomic: Early-planted fields are most at risk for 1st generation infestation while late-planted fields are most at risk for 2nd generation. Plowing and shredding stalks reduce overwintering larval numbers to some extent, but not enough to make a difference in the next season • Insecticide: Spray timing is critical because larvae eventually tunnel into midribs and stalks, out of reach from sprays.	• <u>1st Generation</u>: count # of plants (20 plants x 5 sets) with windowpane or shot hole damage. Unroll whorls to check for live larvae • <u>2nd Generation</u>: count # of plants (20 plants x 5	General guidelines: <u>1st Generation</u>: > 50% of plants with damage and live larvae still present in whorls <u>2nd Generation</u>: > 50% of plants

Pest	Notes on non-chemical and chemical management	Scouting recommendation	Threshold
European corn borer continued	Percent control is usually higher for applications against 1st generation ECB on whorl stage corn than against 2nd generation larvae in the ear zone. • Seed selection: Bt corn hybrids provide excellent control of corn borer. See Table 7 in this corn chapter for details *Note: To see ECB trapping data online in the summer, visit the 'Great Lakes and Maritimes Pest Monitoring Network'*	sets) with egg masses on undersides of leaves Note: Trapping can aid in timing of scouting. ECB in Michigan and Ohio respond to the Z (Iowa) strain pheromone	with egg masses Economic thresholds varying by expected yield, spray cost, and market price are calculated using worksheets available in extension pubs
fall armyworm	• Biological: Parasitized by several wasp and fly species • Insecticide: Spraying to protect the ear is generally not effective • Seed selection: Some Bt corn hybrids control fall armyworm. See Table 7 in this corn chapter for details	Check 100 plants (20 plants x 5 sets) for larvae, feeding, and frass	> 50% of plants infested with small (under 1 inch) larvae
flea beetle	• Agronomic: Most corn hybrids are resistant to Stewart's Wilt disease transmitted by flea beetles. Avoid early planting of susceptible inbred lines used in seed production. • Environmental: Cold winters reduce the survival of beetles and thus the incidence of Stewart's Wilt	<u>In seed corn production</u> Check 100 plants (20 plants x 5 sets) for beetles	<u>On susceptible inbreds</u> 5 or more beetles per plant, up to the four-leaf stage
grasshoppers	• Biological: Blister beetle larvae and other insects prey on eggs. Insects, birds, and mammals eat nymphs & adults. Fungal pathogens kill eggs and nymphs under wet spring conditions • Agronomic: Tillage reduces survival of eggs and newly hatched nymphs • Insecticide: May be able to limit sprayed area if hoppers invade from a neighboring field or grassy border	No specific recommendation	General guideline: 5 or more hoppers per plant We have never seen populations high enough to treat in Michigan or Ohio
Japanese beetle adults	• Biological: Predation and parasitism by other insects on adult beetles is likely low, although vertebrates eat them • Agronomic: Adults move around the landscape, so tillage and other practices in nearby fields do not have much impact	Check 100 plants (20 plants x 5 sets) for silk clipping by the combo of Japanese beetle & CRW	Silks clipped shorter than ½ inch (usually in tandem w/ rootworm adults)
seedcorn maggot (SCM)	• Agronomic: Potential for injury decreases with 1) shallow seeding into warm soil and 2) delaying of planting until herbicide-killed or disced cover crops and weeds decompose • Agronomic: Problems rarely occur in no-till fields • A degree day model predicts when peak flight & egg-laying will occur based on MSU weather station data. See this site: https://enviroweather.msu.edu/crops/corn • Insecticide: Management is essentially preventative. If choosing to plant early and into a recently tilled field, an insecticide seed treatment can help, but may not be 100% effective if the maggot population is high. Note that granular soil insecticides, applied at planting for another insect, will help to control SCM	No specific recommendation To assess risk of SCM before planting, check the degree day model listed in the previous column	No rescue treatment is available. Consider replanting fields or areas with significant stand loss
slugs & snails	• Biological: Some insects consume slugs, like ground beetles and firefly larvae • Agronomic: Fields with a history of slug damage could be planted early, so the crop is further along by the time slug feeding starts. Tillage and crop rotation reduce corn residue (slug habitat). Zone tillage and row cleaners help to dry a band along the row and may quicken crop growth. Avoid planting in wet conditions, as open furrows act as slug highways • Insecticide: Slugs are not insects, so soil insecticides and seed treatments have no impact on them. Some studies suggest that seed treatments make slug problems worse by killing ground beetle predators	No specific recommendation Walk fields at night or early morning, turning over residue and looking for slime trails	None established A guess - Consider applying a slug bait (molluscicide) if stand is reduced by 5%

Pest	Notes on non-chemical and chemical management	Scouting recommendation	Threshold
spider mites (two-spotted)	• Biological: Under humid conditions, a natural fungal pathogen can infect and wipe out mite populations in a matter of days. Some natural enemies eat mites • Agronomic: Irrigation mitigates the impact of spider mite feeding and increases humidity for fungal biocontrol, but during a drought irrigation still isn't enough. • Environmental: Rainfall can have a similar effect as irrigation • Insecticide: Insecticide resistance is common in mites. Some insecticides (including most pyrethroids) flare mite populations by killing off natural enemies. Likewise, fungicide applications may disrupt fungal pathogens of mites. This is one reason that insurance applications of insecticide and fungicides are discouraged. Be especially cautious about applications in dry seasons	Infestations often start on field edges Look for mites on undersides of leaves using hand lens or tap leaves over a piece of paper Webbing is present when population is very high	A guess: At least a third of plants have mites and leaves are yellowing Factors to consider: *the mite population is still growing *the forecast remains hot and dry *corn is pollinating *there is low humidity under the canopy *excellent coverage is possible
stink bugs	• Agronomic: Proper adjustment of planter to close the furrow, so overwintered stink bugs cannot feed on the growing point early in the season	No specific recommendation	None established We have never seen populations high enough to treat in Michigan or Ohio
true armyworm	• Biological: Often controlled by predators and parasitoids • Agronomic: Good weed control (especially grassy weeds) and timely cover crop termination prior to planting reduce likelihood of infestation • Insecticide: May be able to limit spray to the field edge if larvae invade from a neighboring field or grassy border • Seed selection: Some Bt corn hybrids provide armyworm control. See Table 7 in this corn chapter for details *Note: To see armyworm trapping data online in the summer, visit the 'Great Lakes and Maritimes Pest Monitoring Network'*	Check 100 plants (20 plants x 5 sets) for larvae, feeding, or frass. Target fields that had a cover crop or heavy weed pressure early During the day, larvae hide in the whorl, at base of plants, or under crop residue	<u>Seedlings:</u> 10% stand loss <u>Whorl stage:</u> 25% of plants with <u>≥</u>2 larvae per whorl OR 75% of plants with 1 larva Treat only if larvae are less than 1.25 inch
western bean cutworm	• Biological: Many predators consume eggs and larvae, and tiny parasitoids attack eggs • Insecticides: Adding an insecticide to a fungicide spray simply as insurance is discouraged, unless the field is over threshold for WBC. But if a tank mix is being done anyway, default to the optimal timing for the disease target (ear molds, tar spot, etc). WBC control may not be as good, but fungicides are expensive, and proper timing is critical for disease control • Seed selection: Only Bt corn hybrids with the Vip3A trait provide effective control of WBC. Corn with all other Bt traits should be managed for WBC just like non-Bt corn. See Table 7 in this corn chapter for details *Note: To see WBC trapping data online in the summer, visit the 'Great Lakes and Maritimes Pest Monitoring Network'*	To detect first flight, use pheromone bucket traps starting at end of June Just after peak flight, check 100 plants (20 plants x 5 sets) weekly for egg masses on leaves and young larvae in the tassel or silks. Target pre-tassel and just-tasseling fields for scouting	In the Great Lakes Region: 5% of plants with egg masses or small larvae. This is a <u>cumulative</u> threshold - add % infestation from one week to the next towards the 5% threshold
white grubs	• Biological: Some species are attacked by pathogens. • Agronomic: Fall plowing of long-standing fallow fields & pasture prior to planting is recommended. Tillage also exposes grubs to mammal and bird predation. For Asiatic garden beetle in southern Michigan and northern Ohio, delaying planting may avoid most grub feeding • Insecticide: Granular soil insecticides, applied at planting for another insect, may have some effect on grubs. Seed treatments often have mixed results, especially on Asiatic garden beetle. There are no rescue treatments *Note: it is important to identify grubs to distinguish annual species from species of June beetle, which remain in fields for multiple seasons*	Sampling methods aren't well-defined. Use a shovel to check 1x1 ft^2 sections in fall or spring. Grubs tend to be patchy, especially on sandy knolls or near tree lines Grubs may be detected while plowing in fall or spring, especially when birds follow tillage equipment	<u>June beetle:</u> 1 grub per ft^2 <u>Annual grubs</u> European chafer, 2 grubs per ft^2 Japanese beetle and Asiatic garden, use chafer threshold

Pest	Notes on non-chemical and chemical management	Scouting recommendation	Threshold
wireworm	• Agronomic: Depending on species, wireworms remain in the larval stage for 1-5 years, thus they are favored by undisturbed soil. Fall plowing of long-standing fallow fields & pasture prior to planting is recommended • Insecticide: Granular soil insecticides, applied at planting for another insect, will have some effect on wireworms. Seed treatments protect seed, but not seedlings. Rescue treatments are not effective	Sampling must be done 2-3 weeks before planting using wireworm bait traps (described online or in extension pubs). This method is often impractical	At least 1 wireworm per bait trap Otherwise, consider using a soil insecticide or seed treatment in fields coming out of fallow, pasture, alfalfa, or that have a history of wireworm

Table 5: Soil/at-plant insecticides to manage insect pests of corn in Michigan and Ohio

- Insecticides are grouped by active ingredient(s), which are listed alphabetically, allowing for easy comparison of products with the same chemistry.
- Application rates are listed for pests which appear on the label. If a column is blank, the pest is not on the label. The letters in the pest columns refer to the use rate from column two.
- Note that insecticide rates per 1000 feet of row are based on a **30-inch row spacing**. See label for specific per-acre rate and gauge-setting charts for narrower row spacing.

Active ingredient Trade Names	**Use rate(s)** per 1000 feet of row or per acre	**cutworm**	**rootworm larvae**	**white grubs**	**seedcorn maggot**	**slugs & snails**	**wireworm**	**Precautions and Remarks**
bifenthrin (granular) Empower2	(a) 6.4 - 8 oz T-band per 1000 ft (= 3.4 - 8.7 lbs/acre) (b) 8 oz per 1000 ft (= 8.7 lbs/acre)	a	b	a	a		a	• Do not apply as a T-band application, unless you can incorporate granules into top 1 inch of soil using tines or chains • The rootworm rate controls light to moderate larval pressure
bifenthrin (liquid) Bifen2 AgGold Bifenthrin 2EC Bifenture EC Brigade 2EC Discipline 2EC Fanfare EC, 2EC, ES Reveal & Reveal EndurX Sniper & Sniper Helios	(a) 0.15 - 0.30 oz per 1000 ft (= 2.6 - 5.2 oz/acre) (b) 0.30 oz per 1000 ft (= 5.12 oz/acre)	a	b	a	a		a	• Apply as a 5 to 7 inch T-band over the open seed furrow • In-furrow pop-up fertilizer may be applied alone or in tank mixes with bifenthrin See label for instructions • Some labels say 'Do not apply to soil with >30% crop residue' • See label for separate instructions on applying with pre-plant incorporated (PPI) or pre-emerge (PRE) herbicides
Xpedient Plus V Tundra EC	(a) 0.15 - 0.60 oz per 1000 ft (= 2.6 - 10.24 oz/acre) (b) 0.30 - 0.75 oz per 1000 ft (= 5.2 - 12.8 oz/acre)							*Note: Bifenture LFC and Capture LFR labels specifically support a rate of 8.5 oz per acre to control Asiatic garden beetle grubs in Michigan and Ohio. However, bifenthrin has only low to moderate efficacy on AGB.*
Bifender FC	(a) 0.17 - 0.67 oz per 1000 ft (= 2.9 - 11.6 oz/acre) (b) 0.34 - 0.84 oz per 1000 ft (= 5.9 - 18.2 oz/acre)							
Annex LFR Sniper LFR	(a) 0.20 - 0.39 oz per 1000 ft (= 3.4 - 6.8 oz/acre) (b) 0.39 - 0.49 oz per 1000 ft (= 6.8 - 8.5 oz/acre)							
Bifenture LFC Capture LFR Nirvana RTU	(a) 0.20 - 0.78 oz per 1000 ft (= 3.4 - 13.6 oz/acre) (b) 0.39 - 0.98 oz per 1000 ft (= 6.8 - 17.0 oz/acre)							
Capture 3RIVE3D	(a) 0.23 - 0.92 oz per 1000 ft (= 4 - 16 oz/acre) (b) 0.46 - 0.92 oz per 1000 ft (= 8 - 16 oz/acre)							
bifenthrin + fungicide Nirvana Complete	(a) 0.57 - 0.75 oz per 1000 ft (= 10 – 13 oz/acre)	a	a	a	a		a	• Similar to bifenthrin alone but contains the fungicide pyraclostrobin • Rate of bifenthrin in combo is equivalent to the high rate in bifenthrin-only products

Active ingredient Trade Names	**Use rate(s)** per 1000 feet of row or per acre	**cutworm**	**rootworm larvae**	**white grubs**	**seedcorn maggot**	**slugs & snails**	**wireworm**	**Precautions and Remarks**
bifenthrin + biofungicide Ethos XB Ethos Elite LFR	(a) 0.2 - 0.98 oz per 1000 ft (= 3.4 - 17.0 oz/acre) (b) 0.39 - 0.98 oz per 1000 ft (= 6.8 - 17.0 oz/acre) (a) 0.20 – 0.98 oz per 1000 ft (= 3.5 – 17.1 oz/acre) (b) 0.49 -0.98 oz per 1000 ft (= 8.5 – 17.1 oz/acre)	a	b	a	a		a	• Apply T-band or in-furrow • Similar to bifenthrin alone, but contains a biological fungicide for suppression of early season root diseases (apply in-furrow for disease control) XB: *Bacillus amyloliquefaciens* Elite: *Bacillus velezensis & subtilis strains* See label for instructions on PPI or PRE tank mixing with herbicides for cutworm control
bifenthrin+ **cypermethrin (zeta)** Hero Hero EW	 (a) 4.0 - 10.3 oz/acre (a) 4.5 - 11.2 oz/acre	a		a	a		a	• Apply in-furrow or as a 3 to 4 inch T-band for seedcorn maggot, grubs, and wireworm Apply on the soil surface in a 5 to 7 inch band or broadcast for cutworms • See label for max use rates for all bifenthrin products combined
brofanilide Nurizma	(a) 0.05 – 0.07 oz		a	a	a		a	• <u>Apply in-furrow only</u> thru spray nozzles or microtubes into open seed furrow. Product must be covered immediately • High potential for movement with water. Avoid applying if rain forecast within 48 hrs • See 2ee recommendation for reduced application volume of 3 gal/ acre
chlorethoxyfos **+ bifenthrin** Index At-Plant Liquid Smartchoice HC (Smartbox) Smartchoice 5G (Smartbox / Lock'N Load)	 (a) 0.44 - 0.72 oz (b) 0.65 - 0.72 oz (a) 1.0 - 1.67 oz (b) 1.5 - 1.67 oz (a) 3.0 – 3.5 oz (b) 4.5 – 5.0 oz	a	b	a	a		a	• Apply in-furrow only (do not apply T-band or other banded application) • Must be applied with enclosed tractor cab and closed handling system, e.g., a Dosatron, modified Raven system (Index), Smartbox or Lock'N Load system (Smartchoice) • Rotational interval is 30 days for all crops except corn • Index has a special 2ee label for Asiatic garden beetle control in MI and OH
cyfluthrin Baythroid XL Tombstone Tombstone Helios	(a) 2.0 - 2.8 oz per 1000 ft (= 35 - 49 oz/acre)				a		a	• Apply in water or in pop-up fertilizer, in open furrow ahead of closing wheel • Do not mix with fertilizers containing zinc • Application may suppress white grubs
cyhalothrin (lambda) LambdaStar Lambda-Cy Lambda-T Lambda Cy 1EC Kendo Paradigm VC Ravage Silencer Grizzly Too Lamcap II Province II Warrior II	(a) 0.66 oz per 1000 ft (= 11.5 oz/acre) (a) 0.33 oz per 1000 ft (= 5.75 oz/acre)	a	a	a	a		a	• Apply in-furrow, as a T-band, or as a 7-inch band behind the press wheel
iron phosphate Ferroxx AQ Sluggo	(a) 20 - 44 lbs/acre					a		• Formulation includes bait to attract slugs • Pellets must be broadcast across field • Apply in evening before slugs are active
metaldehyde Deadline GT Deadline Bullets & MPs Durham Granules 7.5	<u>Max rate per application</u> (a) 33.3 lbs/acre (a) 25 lbs/acre (a) 13.3 lbs/acre					a		• Formulations include bait to attract slugs • Apply in evening just before slugs are active, especially after rain or irrigation • GT formulation has uniform prills ideal for blending with dry fertilizer • Limit of 3 applications per season, up to the VT growth stage • Fatal to some domestic animals (dogs)

Active ingredient Trade Names	**Use rate(s)** per 1000 feet of row or per acre	**cutworm**	**rootworm larvae**	**white grubs**	**seedcorn maggot**	**slugs & snails**	**wireworm**	**Precautions and Remarks**
permethrin Pounce 1.5G Arctic 3.2EC Permastar Ag Perm-Up 3.2EC	(a) 8 oz per 1000 ft (=8.7 lbs/acre) (a) 0.3 oz per 1000 ft (= 6 oz/acre)	a			a		a	• Apply in-furrow, band, or T-band • Check label for specific instructions for pre-emergence or pre-plant incorporated applications
sodium ferric EDTA Ferroxx Slug & Snail Bait	(a) 5 – 20 lbs/ acre					a		• Apply uniformly with a granular spreader
tebupirimphos + cyfluthrin Aztec 4.67G Defcon 4.67G Aztec HC for SmartBox or SmartCartidge	(a) 3 oz per 1000 ft (= 3.27 lbs/acre) (a) 1.5 oz per 1000 ft (= 1.63 lbs/acre)	a	a	a	a		a	• Apply in-furrow or as a T-band for of all pests except cutworm. For cutworm, apply as a T-band or band behind the press wheel. Incorporate as instructed
tefluthrin Force 6.5G Force 10G Smartbox or SmartCartidge Force EVO	(a) 1.8 - 2.3 oz /1000 ft (= 2.0 -2.3 lbs) (a) 1.25 - 1.5 oz /1000 ft (= 1.4 - 1.6 lbs/ acre) (a) 0.46 - 0.57 oz per 1000 ft (= 8-10 oz/acre)	a	a	a	a		a	• Apply in-furrow (optimal method for all pests except cutworm) or as a T-band • See label for specific instructions on how to make and incorporate applications of granular formulations at cultivation within 30 days of seedling emergence
terbufos Counter 20G Lock'N Load, Smartbox, or SmartCartidge	(a) 4.5-6 oz per 1000 ft (4.9-6.5 lbs/acre)		a	a	a		a	• Apply in-furrow or as a 7-inch band over the row • If crop debris prevents proper placement of granules, in-furrow application is recommended. In-furrow application also reduces run-off from rain • Also controls flea beetle and corn nematodes, and may suppress cutworm • DO NOT use an ALS-inhibiting herbicide if Counter has been applied at planting

Table 6: Foliar Insecticides to manage insect pests of corn in Michigan and Ohio

- Insecticides are grouped by active ingredient(s), which are listed alphabetically, allowing for easy comparison of products with the same chemistry
- Application rates are listed for pests which appear on the label. If a column is blank, the pest is not on the label. The letters in the pest columns refer to the label use rate from column two

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
***Bacillus thuringiensis* (Bt)** Agree WG Dipel DF, Xentari Dipel ES Javelin WG Dipel 10G	(a) 1.0 - 2.0 lbs (a) 0.5 - 2.0 lbs (a) 1.5 - 4.0 pints (a) 0.25 - 1.5 lbs (a) 10 lbs granules applied into whorl			a	a							a	*	0	• Selective biological insecticide to control caterpillars. Larvae must eat treated foliage to be controlled, so good coverage is important. Must be targeted on small (1st or 2nd stage) larvae • The type of Bt differs by formulation: *Bt aizawai* = Agree and Xentari and *Bt kurstaki* = all other products • All can be used on organic crops, except Dipel ES * Western bean cutworm is on the Dipel ES label. Corn earworm (not on this table) is on many Bt labels as well
bifenthrin Bifenthrin 2EC Bifenture EC Brigade 2EC Discipline 2EC Fanfare EC, 2EC, & ES Sniper & Sniper Helios Reveal & Reveal EndurX Tundra EC Bifender FC Nirvana RTU	(a) 2.1 - 6.4 oz (b) 5.1 - 6.4 oz (a) 2.4 - 7.4 oz (b) 5.9 - 7.4 oz (a) 2.8 – 8.5 oz (b) 6.8 – 8.5 oz	a	a	a	a	a	a	a	a	b	a	a	a	30	• Do not apply as a ULV (ultralow volume) application • See label for specific instructions for spider mite control • Check label for Bee Warning
bifenthrin + fungicide Nirvana Complete	(a) 13 oz	a	a	a	a	a	a	a	a	a	a	a	a	30	• Combo product with pyraclostrobin fungicide. Similar precautions to bifenthrin alone. Bifenthrin rate is equivalent to the high rate in bifenthrin-only products. • See label for the list of leaf diseases controlled
bifenthrin + biofungicide Ethos XB	(a) 2.8 - 8.5 oz (b) 6.8 - 8.5 oz	a	a	a	a	a	a	a	a	b	a	a	a	30	• Contains a biological fungicide strain *Bacillus amyloliquefaciens*. Otherwise, similar to bifenthrin alone

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
bifenthrin + chlorantraniliprole Elevest	(a) 4.8 – 9.6 oz (b) 5.6 – 9.6 oz (c) 7.7 – 9.6 oz	a	a	b	b	a	a	a	a	c	a	b	a	30	• Max 3 applications per year with a minimum of 7 days between treatments in field corn and 1 day in seed corn • For most ear-feeding pests, apply at beginning of silking and repeat as needed. For ECB & WBC, apply at egg hatch • For spider mite and grasshoppers, see label for specific recommendations to improve performance • Highly toxic to fish & aquatic life & to bees exposed directly
bifenthrin+ cypermethrin (zeta) Hero Hero EW Steed	(a) 2.6 - 6.1 oz (b) 4.0 - 10.3 oz (c) 10.3 oz (a) 2.8 - 6.7 oz (b) 4.5 - 11.2 oz (c) 11.2 oz (a) 2.5 - 3.5 oz (b) 3.5 - 4.7 oz	b	a	b	b	a	b	b	b	c	b	b	a	30 grain 30 graze 60 forage	• Do not apply as a ULV (ultralow volume) application • Do not apply if heavy rainfall is imminent • Spider mite is not listed on the Steed label • Check label for Bee Warning
bifenthrin + sulfoxaflor Ridgeback	(a) 4.5 – 13.8 oz (b) 11.0 – 13.8 oz	a	a	a	a	a	a	a	a	b	a	a	a	30	• Do not apply "3 days before bloom & until after seed set" • Do not apply as a ULV (ultralow volume) application
carbaryl Carbaryl 4L Sevin 4F Sevin XLR Plus	(a) 1 - 2 qts (b) 1.5 - 2 qts (c) 2 qts		c	b	a	a		a	a			a	c	14 silage 14 graze 48 grain	• REI = 24 hours with an exception of 21 days for workers detasseling seed corn • Check label for Bee Warning
chlorantraniliprole Coragen Prevathon Shenzi 400SC	(a) 3.5 - 5.0 oz (a) 14 - 20 oz (a) 1.7 - 3.8 oz			a	a							a	a	14	• Novel mode of action. Insects are paralyzed & stop feeding. Must be applied before populations reach damaging levels. See label for specifics • Do not make more than 2 sequential applications
chlorantraniliprole + lambda-cyhalothrin Besiege	(a) 5 - 10 oz (b) 6 - 10 oz		a	b	b	b	b	b	b		b	b	a	21	• Minimum 7 days between applications • Check labels for specifics on maximum application rates for products containing gamma & lambda cyhalothrin
cyfluthrin / beta cyfluthrin Baythroid XL Tombstone Tombstone Helios	(a) 0.8 - 1.6 oz (b) 1.6 - 2.8 oz (c) 2.8 oz		a	b	c	a	c	b	b		b	b	b	21 grain 21 fodder 0 forage	• Check label for Bee Warning

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
cyhalothrin (gamma) Declare Proaxis	(a) 1.0 - 1.5 oz (b) 1.5 oz (a) 1.92 - 3.2 oz (b) 2.56 - 3.84 oz	b	a	b	b	b	b	b	b		b	b	a	21 grain 21 silage	• Check labels for specifics on max application rates of products containing gamma & lambda-cyhalothrin • Highly toxic to bees. Do not apply to pollinating corn or drift on flowering weeds if bees are visiting field
cyhalothrin (lambda) Kendo LambdaStar Lambda-Cy Lambda-T Lambda Cyhalothrin 1EC ParadigmVC Ravage Silencer Warrior II w/ Zeon Tech. Grizzly Too Lamcap II Province II Ravage II	(a) 1.92 - 3.20 oz (b) 2.56 - 3.84 oz (a) 0.96 - 1.60 oz (b) 1.28 - 1.92 oz		a	b	b	b	b	b	b		b	b	a	21	• For armyworm, only small caterpillars (1st & 2nd stage or ¼ inch) are controlled • Check labels for specifics on maximum application rates for products containing gamma & lambda cyhalothrin • Check label for Bee Warning
cypermethrin (alpha) Fastac CS Fastac EC	(a) 1.3 - 2.8 oz (b) 1.8 - 3.8 oz (c) 2.7 - 3.8 oz (d) 3.2 - 3.8 oz	c	a	c	d	c	c	c	c		c	d	b	30 grain 60 forage	• Do not use other products containing cypermethrin or zeta-cypermethrin during the same season as this product • Check label for Bee Warning
cypermethrin (zeta) Mustang Maxx	(a) 1.3 - 2.8 oz (b) 1.8 - 4.0 oz (c) 2.7 - 4.0 oz (d) 3.2 - 4.0 oz	c	a	c	d	c	c	c	c		c	d	b	7	• Check label for Bee Warning
deltamethrin Delta Gold	(a) 1.0 - 1.5 oz (b) 1.5 - 1.9 oz	b	a	b	b	a	a	b	b		b	b		12 silage 12 graze 21 grain	
dimethoate Dimate 4E Dimethoate 4EC & 400	(a) 1 pint	a					a		a	a				14 silage 28 grain	• Max 1 pint per year • Use 20-40 GPA of water • REI = 48 hours with an exception of 4 days for workers detasseling seed corn • Do not apply during pollen shed if bees are visiting field
esfenvalerate Asana XL S-Fenvalostar Zyrate	(a) 2.9 - 5.8 oz (b) 5.8 - 9.6 oz (c) 7.8 - 9.6 oz	b	b	c		b	b	b	b			b	a	21 grain 1 seed	• Check label for Bee Warning

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
etoxazole Zeal or Zeal WSP Zeal SC Stifle SC	(a) 1 - 3 oz (a) 2 - 6 oz									a				21	• Make applications at least 14 days apart • For resistance management, alternate with a miticide with a different mode of action
flupyradifurone Sivanto 200SL Sivanto HL Sivanto Prime	(a) 7.0 - 10.5 oz (a) 3.5 - 7.0 oz (a) 7.0 - 14.0 oz	a												7 forage 21 grain	• A systemic insecticide, effective on sucking pests (aphids listed as well as whiteflies)
GS-omega/kappa-Hxtx-Hv1a Spear-Lep	(a) 1 – 2 pts		a	a	?							?	?	0	• Novel mode of action. MUST be applied in conjunction with a low dose of Bt insecticide (see label for details). Bt damages the caterpillar gut, allowing Spear-Lep to enter the body • Species with a '?' are not listed on the label, but Spear-Lep probably has the same activity on them • Fun fact, this product is derived from spider venom
hexythiazox Onager	(a) 10-24 oz									a				30	• Limit of 1 application per year
indoxacarb Steward	(a) 6.0 - 11.3 oz			a	a								a	14 grain 1 forage 1 silage	• Label also claims suppression of stink bugs and Japanese beetles
malathion Malathion 5 and 5EC Fyfanon ULV Ag	(a) 1.5 pints (a) 4-8 oz	a					a		a					7	• REI = 12 hours with an exception of 3 days for workers detasseling seed corn • Aphids are not listed on the Fyfanon ULV label
methomyl Annihilate LV Lannate LV Lanveer LV Nudrin LV Annihilate SP Corrida 90WSP Lannate SP Nudrin SP	(a) ¾ - 1½ pints (a) ¼ - ½ pints	a		a	a	a			a			a		21 grain 3 forage 21 stover	• Check label for Bee Warning
methoxyfenozide Intrepid 2F Invertid 2F	(a) 4 - 16 oz			a								a	a	21	• Unique mode of action causes caterpillars to molt prematurely. Only controls larvae. Apply when first signs of feeding damage appear. Needs uniform coverage • Endangered species warning for use in these Michigan counties: Allegan, Monroe, Montcalm, Muskegon, Newaygo, Oceana. Visit EPA's Bulletins Live! Two

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
methoxyfenozide + spinetoram Intrepid Edge	(a) 4 – 12 oz			a								a	a	28	• Unique modes of action. Only controls larvae. Apply when first signs of feeding damage appear. Needs uniform coverage • Endangered species warning for use in these Michigan counties: Allegan, Monroe, Montcalm, Muskegon, Newaygo, Oceana. Visit EPA's Bulletins Live! Two
permethrin Perm-Up 25DF Pounce 25WP Arctic 3.2EC Permastar Ag Perm-Up 3.2EC	(a) 6.4 - 9.6 oz (b) 3.2 - 6.4 oz (a) 4 - 6 oz (b) 2 - 4 oz		a	a	a	a			a			a	b	30 grain 0 forage	
permethrin (granular) Pounce 1.5G	(a) 6.7 - 10 lbs		a	a	a							a		30 grain 0 forage	• Broadcast by air or with ground equipment, directing granules into the whorl
pyrethrins Evergreen EC 60-6 PyGanic EC 1.4 II PyGanic 5.0	(a) 2.0 - 12.6 oz (a) 16 - 64 oz (a) 4.5 - 15.6 oz	a	a	a	a	a	a	a	a		a	a	a	0 when sprays dry	• Plant-derived insecticides that knock down insects quickly but have very short residual control. Coverage is critical • PyGanic is OMRI listed for organic use, Evergreen is not • Highly toxic to bees exposed to direct treatment. Do not apply on or drift onto blooming crops or weeds
spinetoram Radiant SC	(a) 3 - 6 oz			a	a							a	a	28 grain 3 forage 1 seed	• For resistance management, no more than 2 consecutive applications of spinetoram or spinosad
spinosad/ spinosyns Blackhawk Entrust Entrust SC Tracer	(a) 1.67 - 3.3 oz (b) 2.2 - 3.3 oz (a) 0.5 – 2 oz (b) 1-2 oz (a) 1.5 -6 oz (b) 3-6 oz (a) 1 - 3 oz (b) 2 - 3 oz			a	a							a	b	28 grain 7 forage 1 seed	• Time sprays with peak egg hatch. Frequent retreatments may be needed every few days, but for resistance management, rotate to other modes of action. See labels for specific recommendations • PHI for forage is 7 days (Blackhawk) or 3 days (Tracer)

Active ingredient Trade Names	**Use rate(s)** per acre (unless specified)	**aphids**	**cutworm**	**Euro corn borer**	**fall armyworm**	**flea beetle**	**grasshoppers**	**Japanese beetle**	**rootworm adults**	**spider mite**	**stink bugs**	**true armyworm**	**western bean cutworm**	**Pre-harvest interval (PHI) in days**	**Precautions and Remarks**
spiromesifen Oberon 2SC	(a) 5.7 - 16 oz									a				5 silage 30 grain	• Max 17 oz per acre and 2 applications per year • Make applications at least 14 days apart • Active against all mite stages, including eggs • Complete coverage is important. Adjuvants may be used to improve coverage
sulfoxaflor Transform WG	(a) 0.75 - 1.5 oz	a												14 grain 7 grazing 7 forage	• Translaminar product, moves in leaf to target sucking pests • "Do not apply product 3 days before bloom or until after seed set"

Table 7: Shortened version of the Handy Bt Trait Table with efficacy ratings for Michigan and Ohio

- Control ratings reflect the situation only in Michigan and Ohio, which may differ from other states
- The full national version of the Bt Trait Table is at https://www.texasinsects.org/bt-corn-trait-table.html

Trait packages	Bt proteins in the trait package regular text = caterpillar Bts *italics text = corn rootworm Bts*	Efficacy ratings by species (as of Nov. 2025) X = effective (marketed as very good/ excellent control) R = potential for resistance in local population or southern migrants						
		black cut-worm	ear-worm	Euro. corn borer	fall army-worm	true army-worm	western bean cutworm	corn root-worm
AcreMax	Cry1Ab Cry1F	x	R	x	R		R	
AcreMax Leptra	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	
AcreMax Xtra	Cry1Ab Cry1F *Cry34/35Ab1*	x	R	x	R		R	R
AcreMax Xtreme	Cry1Ab Cry1F *Cry34/35Ab1 mCry3A*	x	R	x	R		R	R
Agrisure Above	Cry1Ab Cry1F	x	R	x	R		R	
Agrisure Total	Cry1Ab Cry1F *Cry34/35Ab1 mCry3A*	x	R	x	R		R	R
Agrisure Viptera 3110	Cry1Ab Vip3A	x	x	x	x	x	x	
Agrisure Viptera 3111	Cry1Ab Vip3A *mCry3A*	x	x	x	x	x	x	R
Duracade	Cry1Ab Cry1F *eCry3.1Ab mCry3A*	x	R	x	R		R	R
Duracade Viptera	Cry1Ab Cry1F Vip3A *eCry3.1Ab mCry3A*	x	x	x	x	x	x	R
Duracade Viptera Z3	Cry1Ab Cry1A.105 Cry2Ab2 Vip3A *eCry3.1Ab mCry3A*	x	x	x	x	x	x	R
Durastak	Cry1Ab Cry1F *Cry34/35Ab1 eCry3.1Ab mCry3A*	x	R	x	R			R
Durastak Viptera	Cry1Ab Cry1F Vip3A *Cry34/35Ab1 eCry3.1Ab mCry3A*	x	x	x	x	x	x	R
Intrasect	Cry1Ab Cry1F	x	R	x	R		R	
Leptra	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	
PowerCore	Cry1A.105 Cry2Ab2 Cry1F	x	R	x	x		R	
PowerCore Ultra	Cry1A.105 Cry2Ab2 Cry1F Vip3A	x	x	x	x	x	x	
QROME	Cry1Ab Cry1F *Cry34/35Ab1 mCry3A*	x	R	x	R		R	R
SmartStax	Cry1A.105 Cry2Ab2 Cry1F *Cry3Bb1 Cry34/35Ab1*	x	R	x	x		R	R
SmartStax PRO	Cry1A.105 Cry2Ab2 Cry1F *Cry3Bb1 Cry34/35Ab1 dvSnf7*	x	R	x	x		R	x
Trecepta RIB Complete	Cry1A.105 Cry2Ab2 Vip3A	x	x	x	x	x	x	
Viptera	Cry1Ab Cry1F Vip3A	x	x	x	x	x	x	
Viptera Z3	Cry1Ab Cry1A.105 Cry2Ab2 Vip3A	x	x	x	x	x	x	
Vorceed Enlist	Cry1A.105 Cry2Ab2 Cry1F *Cry3Bb1 Cry34/35Ab1 dvSnf7*	x	R	x	x		R	x
VT Double PRO/ VT2	Cry1A.105 Cry2Ab2		R	x	x			
VT Triple PRO/ VT3	Cry1A.105 Cry2Ab2 *Cry3Bb1*		R	x	x			R
VT4 PRO	Cry1A.105 Cry2Ab2 Vip3A *Cry3Bb1 dvSnf7*	x	x	x	x	x	x	x