IPM Corn

Insect, Disease, Nematode, and Weed Control Recommendations for 2008

INSECT PEST MANAGEMENT

There are more than twenty common insect pests of field corn. The potential for at least one of them to cause problems makes it worthwhile to scout cornfields for insect damage to determine if control tactics are needed.

Scout cornfields weekly from seedling emergence until the corn is knee-high. Thereafter, scout fields periodically until tasselling, at tasselling, and during ear formation.

How to Scout Corn for Insect Pests

To scout corn, walk across the field in a zigzag or a "U" pattern. Look for any areas where there has been poor emergence, where the seedlings appear to be unhealthy (yellowed, stunted, or deformed plants), where there is evidence of insect chewing, or where plants appear to have been cut off at ground levels. Look for patterns in the field. For example, perhaps poor emergence occurs in a regular pattern, such as in low spots where growing conditions are poor, at the end of each row, or in every eighth row. Maybe the damage occurs only on the edges of the field.

Insect damage tends to occur in patches. Use a shovel or trowel to dig in the affected area and at the margins of the patch. Look for the insects themselves or for damaged plants. When the corn is small, insects cause injury by eating out seeds, pruning roots, and feeding on the growing point, causing plant death or deformation. As the plants grow, look for insects and insect damage in the leaf whorl, at the base of the leaf sheath, on the tassels, silks, and the developing ear, and in the stalk. "Identifying Caterpillars in Field, Forage, and Horticultural Crops," ANR-1121, may be useful in identifying insect pests.

Insects to Look for

Corn insect pests can be divided into five categories related to the corn plant's growth stage:

- Insects that feed on seedlings, reducing plant stand and health in the first few weeks;
- Insects that feed in the whorl;
- Insects that feed on tassels and silks, interfering with pollination;
- Insects that feed on ears and individual kernels; and
- Insects that attack the stalk, causing lodging and ear loss.

Insects That Feed on Seedlings

Seedlings are the most easily damaged corn plant stage. Protecting them from insect feeding is important because the farmer must achieve an adequate plant population during this stage to realize full yield potential. When damage has been caused by billbugs, wireworms, sugarcane beetles, or white grubs, there is little that can be done in the current year. Fields with a history of damage by these insects may need an at-planting insecticide in future years. (See When to Use At-Planting Soil Treatments, further in this discussion.)

Billbugs are robust, reddish-brown or black beetles with long, curved snouts. They are about 0.5 inch long and often covered with mud. They attack corn at the base of the stalk or just below the soil's surface. Billbugs feeding on unfurled leaves result in rows of circular to elliptical holes across the leaf when it expands. Billbugs are worse in no-till systems. They usually cause economic damage in corn following corn (not rotated), corn in fields adjacent to the past year's corn, or in fields seriously infested with nutsedges and crabgrass. Rotation is an effective management tool for billbugs because the insect has only one generation per year, moves by crawling, and has a limited host range. Rotation is particularly effective when large blocks are rotated, maximizing isolation. In no-till systems, subsoiling can help enhance the vigor of corn and increase tolerance for billbug infestations. Good fertilization and irrigation can increase the plant's tolerance to billbugs. Billbugs are very difficult to control with insecticides.

Wireworms are yellow-brown, wire-like insects. Their bodies are hard and feel slick. Wireworms vary in size from 0.5 to 2 inches long. They live in the larval stage for several years, depending on the species, and grow up to become click beetles. Wireworms prune roots and burrow in the base of seedlings, causing stunting or death of plants. They also will feed on germinating seed. Wireworms are more common in certain conservation tillage situations.

Wireworms are likely where corn has been double cropped after grain, pasture, or clover, or when it has been planted after weedy fallow. Wireworms can inhabit the soil to a depth of up to 5 feet, and they are very difficult to find. They may be even worse in corn planted early in cold soil. Since the oldest larvae cause the greatest amount of damage, it is possible to scout for these wireworms in the soil before planting. Use bait consisting of 0.5 cup of mixed wheat and corn seed soaked overnight in water. Place the bait in a little hole in the soil; then cover it with soil. Place 10 traps per acre in fields, especially those that have been in grass fallow. After seeds have germinated, dig out the soil in a 12- x 12-

inch soil core surrounding the bait. Examine the soil for wireworms. If one or two traps are infested, use an at-planting insecticide or seed treatment.

White grubs are occasional pests of corn. Plant damage is caused by the grubs' feeding on the roots of the plant. White grubs are the immature feeding stage of May beetles. They live one to three years as grubs in the soil, depending on the species.

Sugarcane beetle adults are black and about 0.5 inch long; they gouge holes in stalks just below the ground's surface. Infestations are worse in reduced tillage systems following grass, fallow, or small grains. Corn planted into a field that has been in pasture for several years is at risk regardless of tillage practices.

Sugarcane beetle adults are active at the time corn is planted. Certain at-planting insecticides may be useful in controlling this beetle. Fields that are at risk for sugarcane beetle should be scouted frequently (at least twice weekly) from crop emergence until the plants are 8 to 12 inches tall. If sugarcane beetles and/or damaged plants are found, a foliar spray with Lorsban or one of the registered pyrethroids may kill the adult beetles before they cause further damage. Do not replant corn into an infested area while adult beetles are still present.

Cutworms can actually cut small corn plants off at the base. Cutworm damage is largely confined to plants less than the eight-leaf stage. Damage is most likely to occur when seedlings are growing slowly because of adverse environmental conditions. Cutworms can usually be monitored by the damage they do. "Window-pane" feeding is a sign of young cutworms. Larger worms cut plants off near the soil line. If cut plants are found, check the top 2 inches of soil extending 4 inches from both sides of the row where the plants have been cut. Cutworms normally spend the day just under the soil surface or under debris close to their feeding sites. There are several different kinds of cutworms. The mature larva is a plump, smooth, greasy-looking, dark gray, spotted or striped caterpillar.

Consider control measures for cutworms if more than 10 percent of seedlings are cut and the worms are present. Cutworms tend to be associated with no-till corn and/or with fields where there was a substantial cover of green weeds in the previous year or just prior to planting. Burn down cover crops and/or weeds four weeks before planting to reduce problems with cutworms.

Chinch bugs overwinter on the edges of fields in wild grasses like big bluestem and broom sedge. Weather conditions in the winter can cause many chinch bugs to die on the overwintering hosts. In spring, they move into transition hosts like wheat. Later, they may invade corn. Invasion can occur at any time, but corn is most susceptible when it is less than a foot tall.

Chinch bugs congregate at the base of plants and thrive in cracks and crevices that develop as the soil dries. They suck sap from roots, leaves, and stems of plants, causing stunting, deformation, wilting, and plant death. The plants may be purpled at the base. Chinch bug wounds may be invaded by soft rots, causing further damage. Plants with severely damaged roots may lodge.

The adult chinch bug is black with white wing covers. It is about 0.2 inch long. Immature chinch bugs are reddish brown with a white band running horizontally around their bodies. They can be hard to find because they hide in the leaf sheaths, under residue, or in cracks in the soil.

A plant damaged by chinch bugs is often brittle and will break off if it is moved from side to side. Vigorously growing corn can often outgrow potentially damaging insect situations. However, stresses such as cold temperatures, too much or too little water, and herbicide injury will cause the corn to grow less vigorously.

Chinch bugs almost always occur in patches, starting near the edges of a field. They usually congregate on isolated plants and then move out. Chinch bugs tend to be worse in fields with the most surface residue. Therefore, corn in fields with reduced tillage or with grassy weeds is prone to chinch bug damage. Some of the worse damage occurs in heavy clay soil because the soil tends to crack, allowing the bugs to get down to feed on the roots.

If infestations are detected early enough, a corrective insecticide treatment may be applied. At-planting insecticides or seed treatments can protect young plants from chinch bugs, up to about 25 days after emergence (V1-V3). Otherwise, use a directed spray of a foliar insecticide. Treat for chinch bugs when three to five bugs per plant are found in 20 percent of the corn in a field and when the plants are under water stress or are growing slowly due to herbicide stress or cool temperatures. It is important to aim the insecticide at the base of the plant where the bugs congregate. If the chinch bugs are still migrating into a field, a second application of insecticide may be necessary.

Flea beetles are shiny black bugs that jump instantly when they are disturbed. Look for their characteristic feeding "scratch marks." Flea beetles seldom cause economic damage to cornfields in Alabama. Plants are more susceptible when temperatures are cold, causing seedling growth to slow down. However, the growing point stays below ground level until about the time that the fifth leaf emerges, so plants are usually able to recover from flea beetle injury. Consider treatment only when 75 percent of plants are infested or when more than five beetles per plant are found. Beetles are more numerous during cold springs following mild winters.

Thrips are tiny, fast-crawling, yellow or black insects found in the young plant. They cause "sandblasting" on the leaves. The leaf mottling caused by thrips looks silvery in severely damaged plants. Thrips seldom cause economic damage to corn. Consider treatment only if more than 80 percent of the leaf area is affected or if the plants are severely deformed.

Leafhoppers are small, wedge-shaped, green or brownish bugs that suck sap from buds and leaves of corn. Damage by this insect is seldom great enough to justify control. However, two leafhopper species are responsible for spreading corn stunt virus disease. This disease can cause severe stunting and a subsequent reduction in yield. Try to plant virus-resistant corn to minimize the impact of this virus. If corn that is susceptible to corn stunt virus is to be planted, an at-planting systemic insecticide will help control the leafhopper vectors and, hence, the disease.

Southern corn rootworms can make a circular tunnel through the young seedling, causing severe damage if the growing point is eaten.

Stink bugs are major pests of young corn, particularly in South Alabama. Three species—southern green stinkbug, brown stinkbug, and green stinkbug—occur in Alabama. The brown stinkbug is generally hardest to control with insecticides. Stink bugs overwinter as adults under plant residue, tree bark, or culverts in drainage areas. At least two generations occur each year. Parasites and predators, including fire ants, contribute to stink bug control. Certain conditions predispose a cornfield to stink bug problems, including excessive weeds in winter or spring prior to planting, double cropping, and conservation tillage. Corn planted near wheat fields may also be more likely to have problems with stink bugs. Stink bugs have a wide host range, including wheat, corn, cotton, and soybeans. Stinkbugs will move from one field to another during the season. Plants on field borders may be more severely affected than those further into the field. Stink bug infestations are very clumped and are hard to scout for.

Stink bugs have sucking mouthparts, which they insert into the plant in order to feed. On young corn plants, stink bugs feed at the base of the plant and injure the growing point. Extreme feeding leads to the death of plants.

If the growing point is badly damaged, the plant may develop multiple stems. Moderate feeding results in a buggy whip symptom, where one side of the plant grows faster than the other and the tips of the leaves are entangled in the whorl. If more than 10 percent of plants show a buggy whip symptom, or if there are more than one or two stink bugs per plant, an insecticide treatment may be justified. As the corn gets older, stink bugs can damage the developing ears.

Insects That Feed in the Whorl

Fall armyworms, corn earworms, European corn borers, cereal leaf beetle adults, and grasshoppers can feed on corn leaves, particularly in the whorl stage. Use Table 1 to determine if the potential amount of damage from these leaf-feeding insects justifies using a corrective treatment.

Fall armyworms, corn earworms, and European corn borers cause damage in more than one category. They are general feeders that feed in the whorl and attack the corn ear as well. Also, European corn borers can cause plant lodging by boring into the cornstalks. Each of these insects has alternate hosts and each one has several generations per year. It may be economically feasible to use an insecticide to control these pests if they are causing excessive damage in the whorl stage. But, it is not usually economically feasible to control them in the ear stage.

Grasshopper outbreaks are likely to occur during a drought and for the next 1 to 2 years. There are numerous grasshopper species that attack corn. They lay eggs in the soil at field preparation time. Best control is achieved when grasshoppers are still young. It is very difficult to kill nearly mature grasshoppers of most species and almost impossible to kill lubber grasshoppers (black with yellow markings). Infestation of grasshoppers is highest in no-tillge situations, along field margins.

Table 1. Yield Loss Potential in Bushels per Acre

Stage of Growth	Percent Leaf Area Destroyed				
	20	40	60	80	100
7 leaf	0	1	4	6	9
9 leaf	0	2	6	9	13
11 leaf	1	5	9	14	22
13 leaf	1	6	13	22	34
15 leaf	2	9	20	34	51
17 leaf	4	12	27	45	69
Tassel	7	21	42	68	100
Silks Brown	6	18	38	60	90
Blister	5	16	30	50	73
Milk	3	12	24	41	59
Soft Dough	2	8	17	29	41
Dent	0	4	10	17	23

Source: van Duyn, North Carolina State University.

Cereal leaf beetles are pests of wheat, oats, and other small grains. Adults emerge as the grain crop is drying and migrate to other areas, including cornfields, in search of food. Cereal leaf beetles make long, narrow feeding scars between leaf veins. Leaf feeding by these beetles is usually cosmetic. They do not stay very long in cornfields. Therefore, damage is a single, short-term event that rapidly developing corn plants usually outgrow.

Insects That Feed on Tassels and Silks

Japanese beetles, corn earworm larvae, corn rootworm adults, and grasshoppers may all clip corn silks. When these insects feed on the silks and clip them off, the result can be incomplete pollination. Silk clipping has to be severe to affect pollination. Therefore, it is very important to determine when silk clipping is occurring relative to the pollination process. Pollination occurs 3 to 8 days after full tasselling, and it takes 12 to 24 hours for a pollen grain to move down the silk. Poor pollination results in ears that are only partially filled, ears that are smaller than normal, and barren stalks. An insecticide treatment to protect the silks may be justified if (1) less than 75 percent of the ears have silks; AND (2) there are five or more rootworm beetles or two or more Japanese beetles on each ear, or there are corn earworm larvae on each ear; AND (3) silks are being clipped to within 0.5 inch of the ear tip.

Corn leaf aphids are small, blue-green, soft-bodied insects with dark blue “tail pipes.” They usually colonize the upper leaves and tassels of corn plants. Numerous white cast skins are usually seen on the plant and on the ground around the plant. Aphids excrete a sticky substance that may coat nearby plant parts. Microorganisms use this “honeydew” as a food source, resulting in a blackened condition called “sooty mold.” High populations on the tassels and silks can interfere with pollination. Treatment may be justified when there are 50 or more aphids on 50 percent or more of the plants when plants are tasselling.

Insects That Feed on Ears

Stink bugs feed on all plant parts but prefer the high liquid content in developing grain. Ears moderately damaged by stink bugs will typically crook away from the plant stem. Kernels are aborted at and near the feeding site.

Stink-bug feeding on young ears, prior to pollination, often results in the destruction of those ears. Best results are obtained if corn is treated while the ear is forming (less than 1 inch long), around the V15 growth stage. At that time, two stink bugs per plant can reduce yields by 40 percent. At this stage, treat if 5 percent of plants have stink bugs. At kernel fill, treat if 10 percent of the plants have stink bugs. At the V18 stage, ears approximately 2 inches long, through the R1 stage, stink-bug feeding can also result in reduced yields. Therefore, continue to protect corn plants from stink bugs through the silking stage. After silking, losses due to stink bugs are usually not as significant.

Corn earworm caterpillars (second generation) feed on corn ears. Feeding is usually confined to the tip end of the ear. When corn earworms feed on kernels, they open the husks and provide an entry for disease and bird feeding. The female lays her eggs one at a time, usually on the developing silks. Small larvae feed on the silks and then enter the tip of the ear where they will feed on developing kernels. Corn earworm larvae will reach 1.5 inches in length in about 14 to 21 days. Because the larvae are cannibalistic, there will usually be only one earworm larva per ear.

Ear feeding is common in most cornfields, with 60 to 100 percent of the ears having a single caterpillar in years of high populations. Also, secondary ears may be infested. Yield loss in typical field corn, though, is usually not more than 3 percent. Since chemical control requires multiple applications, spraying to reduce ear infestation is seldom economically justified in field corn.

Fall armyworm larvae also feed on developing kernels. The caterpillar generally enters the ear from the sides as well as from the tip of the ear. When populations are heavy, it is not unusual to find several worms within a single ear. It is difficult to control the ear-attacking phase of the fall armyworm. Early-planted corn is less likely to be damaged.

European corn borer larvae (also see below) bore into kernels and cobs. If the corn borer damages the ear shank, the entire ear can fall to the ground. Early-planted, early- maturing corn is recommended in order to escape the heavier pest populations that occur as the weather becomes warmer. Chemical control is effective only when the timing of the application kills the larvae before they enter the ear.

Insects That Attack the Stalk

European corn borers (second generation) usually infest corn during the silking stage. Silks make the field more attractive to the female corn borer moths. Average grain loss from the second generation corn borer is about 6 percent per tunnel per plant, but actual losses may be higher or lower. European corn borers also may interact with stalk rot organisms to enhance the effect of these plant pathogens. European corn borers are an occasional problem in north Alabama.

Common stalk borers are easily recognized by the transverse purple band occurring near the legs. They migrate out of field edges and waterways. Look for severe plant damage and feeding deep in the whorl. Later, they move inside the stalk.

Southwestern corn borers have several generations per year; the most serious is that which enters the stalk a few inches above the ground and girdles the inside of each stalk until it topples over. Recently this has been a severe pest in north Alabama.

Overall losses from serious infestation of southwestern corn borers can be considerable (i.e., 25 to 50 percent) if yield potential of the crop is high. They are difficult to manage because there are few cultural control options. Also, the second generation is hard to scout for, and insecticide treatments are effective only against small caterpillars before they bore into the stalk. Bt corn for corn borer is the most effective way to manage this pest.

Southern corn stalk borer is a similar insect, but it does not girdle the stem.

Insects That Attack the Roots

Corn rootworms (several species). Southern corn rootworm is most likely to be a problem in fields that were weedy before spring planting. Adults are attracted to lay eggs in the weedy areas. Southern corn rootworm overwinters as adults, and the larvae attack corn early in the season, causing the young plants to die.

Recently, western corn rootworms moved into Alabama. They are now found in the northern part of Alabama. Western corn rootworm larvae can destroy most of a plant's root system, causing the plant to fall over. The plant may straighten as it recovers, giving it a goosenecked appearance. Western corn rootworm larvae hatch in May and continue to occur through late June. Injury will not appear until mid to late season, if western corn rootworm is the problem.

In summer western corn rootworms lay their eggs in the soil of cornfields. The eggs overwinter and hatch the following May. Because the eggs overwinter in the soil and the larvae feed on corn but not other major crops, this pest can be controlled by rotation with soybeans or some other crop.

Rootworms can be controlled with insecticides. The insecticides must be applied in or incorporated into the soil at planting or shortly thereafter as a cultivation treatment.

Bt corn is available for control of rootworms. Several brands of rootworm active Bt corn are available: YieldGard for Rootworm, YieldGard II, AgraTech CRW, and Herculex RW hybrids. Be sure to choose a hybrid with good agronomic characteristics for your region. More information on Bt corn hybrids is available from the National Corn Growers Association: (http://lepton.marz.com/ncga/search_hybrids/know_where.asp)

The adults of both species–southern corn rootworm and western corn rootworm–can feed on the silks and reduce pollination.

Effects of Weather on Corn Pest Incidence

Cool temperatures delay seed germination and early-season growth. This increases the risk of insect damage

because the young corn plants are exposed to a longer feeding period by insects. Fall armyworms, chinch bugs, and lesser cornstalk borers are usually more abundant in dry years.

When to Use At-Planting Soil Treatments

A field's history should help determine whether to use an at-planting insecticide. Rotated, conventionally tilled corn has the least problems with early-season insects. At-planting insecticides may be warranted in cornfields following pasture or conservation tillage, in non-rotated corn, and in no-till corn. Corn planted in fields that have had problems with billbugs, white grubs, and wireworms in the past may benefit from an at-planting insecticide.

Because of the cost and possible negative environmental impact, an at-planting insecticide should not be used unless there is a reasonable assurance of an early-season, stand-reducing insect population. If soil insects are not present, using a soil insecticide will result in lost profits.

Research in the Tidewater area of North Carolina has shown an average yield benefit of 5.7 bushels per acre for using soil insecticide in typical corn growing conditions. In situations more favorable to insects, greater benefit would be expected. For example, an increase of 12 bushels per acre was observed in no-tillage situations. Studies conducted in Louisiana showed that an insecticide applied at planting pays off almost every year in no-till corn.

Bt Corn for Corn Borers

Corn has been genetically engineered to produce Bt toxins that are effective against caterpillar insects such as European corn borer, Southwestern corn borer, and lesser cornstalk borer. Bt corn can also help protect corn against attack by corn earworm and fall armyworm. It is marketed under such names as YieldGard for corn borers (Cry1Ab protein), "Bt" (Cry1Ab protein), CB YieldGard (Cry1Ab protein) and Herculex I (Cry 1F protein). All of the above hybrids express the Bt protein throughout the plant.

More information on Bt corn hybrids is available from the National Corn Growers Association:
http://lepton.marz.com/ncga/search_hybrids/know_where.asp

Results from tests in Alabama show that Bt corn for corn borers is most likely to pay off in two situations:
(1) in North Alabama, in areas where there are chronic problems with stalk borers such as the Southwestern corn borer (Yields of Bt corn were approximately 9 bushels per acre greater than yields of non-Bt corn in 2004); and
(2) in years when corn must be planted after recommended planting dates (Tests in Baldwin County indicated that fall armyworm pressure is sufficiently high for Bt corn to be profitable when planted in March) .

Bt corn for corn borers can be planted on up to 50 percent of the total corn acreage. There must be a 50 percent non-Bt corn refuge.

Bt Corn for Rootworms

Corn has been genetically engineered to produce Bt toxins that are effective against the root-feeding larvae of certain beetles called corn rootworms, particularly the western corn rootworm. It is marketed under various trade names including Yieldgard for Rootworm, YieldGard II, AgraTech CRW, and Herculex RW hybrids (Mon 863 or DAS 59122-7).

The genes in this genetically engineered corn are different from those conferring resistance to corn borers and other caterpillar pests. Sometimes the two types of genes are stacked in a hybrid –like in Herculex Xtra or YieldGard Plus, for example–in order to give the plant resistance to rootworms and caterpillars such as corn borer.

Western corn rootworm is a pest of continuous corn in the northern half of Alabama. This is where planting a hybrid with a rootworm Bt gene will be most likely to pay off.

When to Plant or Replant Corn

When planting corn, follow the recommended planting dates for your area of the state. Planting date recommendations are available at the Alabama Cooperative Extension System office in your county.

Damage from early-season soil insect pests, cutworms, and armyworms may look drastic. However, if the cutting damage by these insects occurs above the growing point and there is no additional feeding by these insects, the plants should recover.

Recommended plant stands for Alabama are from 16,000 to 24,000 plants per acre.

Before replanting corn, consider the time the damage occurs. Oftentimes, insect damage occurs too late to replant. If 50 percent of a stand is lost during the first four weeks after the first recommended planting date in your area, immediate replanting should result in yields of 85 to 90 percent of the original estimates. However, if 50 percent or more of the stand is lost after the fourth week, replanting is not profitable. At this point, more is lost due to the late replanting date than because of the poor stand. However, a 50-percent stand reduction will usually result in severe yield reduction and is not likely to return production costs. Also, weed problems in the thinned stand will likely be severe.

Considerations for Late-Planted Corn

Certain pest insects and pathogens reach high levels in late July and August and may severely infest late-maturing corn. Late-planted corn is vulnerable to attack by the lesser cornstalk borers, fall armyworms, and the European corn borers. Also, late-planted corn is attractive to adult rootworm beetles and may have excessive silk clipping.

Table 2. Suggestions for Preplant or At-Planting Insecticides for Common Soil Insects in Corn (See Table 3 also.)

Insecticide	Application Method	Ounces of Formulated Product per 1000 Feet of Row						
		Billbug	Chinch-bug	Corn Root-worms[1]	Cut-worm	Lesser Cornstalk Borer	White Grub	Wire-worm
beta-cyfluthrin BAYTHROID XL [2]	In furrow						0.14-0.16[5]	0.12-0.16
bifenthrin [9] CAPTURE 2EC [2,7]	Broadcast, pre-emergence				2.56[6]			
	T-band, 5-7"			0.30	0.15-0.30		0.15-0.30	0.15-0.30
	Broadcast, incorporate 4"				3-4[6]		3-4[6]	3-4[6]
bifenthrin [9] CAPTURE 1.15G[2,7]	T-band, incorporate 1"			6.4-8.0	6.4-8.0		6.4-8.0	6.4-8.0
	In furrow			8	3.2-8.0		3.2-8.0	3.2-8.0
carbofuran FURADAN 4F[2]	In furrow, at-plant			2.5				2.5
	Band, at-plant			2.5				
	Soil injection, each side of row			2.5				
chlorpyrifos LORSBAN 4E (Rates in pt./A)	Broadcast, conservation tillage				1-2[3]			
	Broadcast, pre-plant, incorporate 2-4" same day	4[3]		6[3]	2-4[3]	6[3]	4[3]	4[3]
	T-band, at plant			2.4[6.]	2.4[6.]		2.4[6.]	
chlorpyrifos [9] LORSBAN 75 WG (Rates in lb./A)	Broadcast, conservation tillage				0.7-1.3[4]			
	Broadcast, pre-plant, incorporate 2-4" same day	2.7[4]		4[4]	1.3-2.7[4]	4[4]	2.7[4]	2.7[4]
	T-band, at plant			1.6	1.6		1.6	
chlorpyrifos LORSBAN 15G	In furrow, at-plant		8[5]	8	8[5]		8	8
	T-band, at-plant	8	8	8	8	8	8	8[5]
cyfluthrin [9] BAYTHROID 2 [2]	In furrow						0.14-0.16[5]	0.12-0.16
esfenvalerate [9] ASANA XL[2]	Broadcast: preplant or at-plant				3.2-9.6[6]			
fipronil REGENT 4 SC[2]	In furrow	0.24	0.24	0.24			0.24	0.24

Insecticide	Application Method	Ounces of Formulated Product per 1000 Feet of Row						
		Billbug	Chinch-bug	Corn Root-worms[1]	Cut-worm	Lesser Cornstalk Borer	White Grub	Wire-worm
gamma-cyhalothrin PROAXIS[2]	T-band or in furrow, at plant			0.66	0.66	0.66	0.66	0.66[5]
lambda-cyhalothrin [9] WARRIOR with Zeon Technology[2]	T-band or in furrow, at plant			0.66	0.66	0.66	0.66	0.66
	Surface-banded behind the press wheel				1.28-1.92[6]			
permethrin [9] POUNCE 1.5G[2]	Broadcast: preplant, incorporate at-plant, or preemerge				6.7-13.3[4]			
	Band: preplant incorporate, or preemerge				8-16			8
	In furrow, band, or T-band at plant				8			8
permethrin [9] POUNCE 25WP[2]	Broadcast: preplant, incorporate at-plant, or pre-emerge				6.4-12.8[6]			
	Band: preplant incorporate, or pre-emerge				0.5-1.0			
	In furrow, band or T-band at plant				0.5			
phorate [9] THIMET 20G[2]	Band, at-plant, lightly incorporate			4.5-6			4.5-6	4.5-6
terbufos COUNTER 15G[2]	Band or in furrow	6-8	6-8	6-8[8]	6-8[5]	6-8[5]	6-8	6-8
zeta-cypermethrin [9] MUSTANG MAX[2]	In furrow, band, or T-band				0.16			

[1] Western corn rootworms have developed resistance to certain insecticides. If control is difficult, use terbufos.
[2] These are RESTRICTED USE pesticides.
[3] Rates given are pints per acre.
[4] Rates given are pounds per acre.
[5] At this rate, the treatment gives suppression only.
[6] Rates given are fluid ounces per acre.
[7] Do not use in coastal counties.
[8] Use the 6-ounce rate for first-year corn only; use high rate for second-year corn.
[9] See Table 5 for other trade names.

Table 3. Seed Treatments or Seed-Applied Coatings for Control of Seedling Insect Pests in Corn

Insecticide	Application Method	Common Insect Pests that Are Included on the Label							
		Billbug	Chinch-bug	Western Corn Rootworm	Cutworm	Southern Green Stinkbug	Southern Corn Rootworm	White Grub	Wireworm
clothianidin									
PONCHO 250	Seed applied coating[1]		X		X[2]	X	X	X	X
PONCHO 1250	Seed applied coating[1]	X	X	X	X	X	X	X	X
fipronil	Seed treat,emt								
REGENT TS	1-2 fl.oz/100 lb. Seed (0.05-0.1 lb. a.i./100 lb.)							X[2]	X
thiomethoxam	Seed treatment								
CRUISER 5FS	0.125-0.8 mg a.i./kernel		X		X[2]	X		X	X
	Seed treatment 1.25 mg a.i./kernel	X	X	X[2]	X[2]	X	X[2]	X	X

[1] See http://www.gustafson.com/Poncho/where.asp for authorized seed suppliers.
[2] For light to moderate infestations or for suppression only.

Table 4. Suggestions for Postemergence Corn Insect Control [1]

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient Per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Armyworms, Fall and True					
General Comments: *Populations of fall armyworm may be resistant to some insecticides. If control difficulties have occurred in the past, try bifenthrin, lambda-cyhalothrin, methomyl, or zeta-cypermethrin.*					
beta-cyfluthrin	BAYTHROID XL	1.6-2.8 fl.oz.	0.0125-0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide. Use highest rate for fall armyworms.
bifenthrin [2]	CAPTURE	2.1-6.4 fl.oz.	0.03-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
Bt-resistant corn *cry 1Ab Bt protein* *cry 1F Bt protein*		---	---	---	See Bt Corn for Corn Borers section in the opening discussion for more details.
carbaryl [2]	SEVIN 80S	1.25-2.5 lb.	2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	Apply a minimum of 20 gallons water per acre for best control. Observe bee caution.
chlorpyrifos [2]	LORSBAN 4E	1-2 pt.	0.5-1	21 (harvest)	Use on true armyworms only. See label for detailed instructions.
	LORSBAN 75WG	0.67-1.33 lb.	0.5-1	21 (harvest)	
cyfluthrin [2]	BAYTHROID 2EC	1.6-2.8 fl.oz.	0.025-0.044	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide. Use high rate for fall armyworm.
deltamethrin [2]	DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
esfenvalerate [2]	ASANA 0.66 EC	5.8-9.6 fl.oz.	0.03-0.05	21	Use on true armyworms. Asana is a **RESTRICTED USE** pesticide.
gamma-cyhalothrin	PROAXIS	2.56-3.84 fl.oz.	0.01-0.015	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
lambda-cyhalothrin [2]	WARRIOR with Zeon Technology	2.6-3.8 fl.oz.	0.02-0.03	21 (harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
methomyl [2]	LANNATE 2.4LV	0.75-1.5 pt.	0.22-0.45	21 (ears) 3 (green) 21 (fodder)	Lannate is a **RESTRICTED USE** pesticide.
methoxyfenozide	INTREPID 2F	4-8 fl.oz.	0.06-0.12	21	Use on true armyworms **ONLY**.
methyl parathion [2]	PENNCAP-M 2FM	2-3 pt.	0.5-0.75	12	Penncap-M is a **RESTRICTED USE** pesticide.

[1]See Table 5 for a list of insecticides, formulations, restricted entry intervals, days to grazing or harvest, and maximum amount to apply.
[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Armyworms, Fall and True (cont.)					
	permethrin [2] POUNCE 25 WP	6.4-12.8 fl.oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	Pounce is a **RESTRICTED USE** pesticide.
	spinosad [2] TRACER 4SC	2-3 fl.oz.	0.062-0.094	28 (harvest) 7 (grazing)	Use higher rates for heavier infestations. Time applications to peak egg hatch.
	zeta-cypermethrin [2] MUSTANG MAX 0.8E	3.2-4 fl.oz.	0.02-0.025	30 (harvest) 60 (grazing)	Control may be variable. Mustang Max is a **RESTRICTED USE** pesticide.
Billbugs					
	General Comments: *Billbug damage often shows up after the insects are through feeding. See Tables 2 and 3 for at-plant suggestions for billbug control.*				
	chlorpyrifos [2] LORSBAN 4E LORSBAN 75 WG	 2 pt. 1.33 lb.	 1 1	 21 (harvest) 21 (harvest)	See label for detailed instructions.
	terbufos COUNTER 15G	6-8 oz./1000 row ft.	1.3 lb. a.i./A maximum	60 (harvest) 30 (grazing)	Apply in a 7-inch band over the seedling corn plants and lightly incorporate into the soil when billbug damage is observed. Counter is a **RESTRICTED USE** pesticide.
Chinch Bugs					
	General Comments: *Apply insecticide as a directed spray to the base of plants in at least 15 to 20 gallons of water per acre. See Tables 2 and 3 for at-plant suggestions for chinch bug control.*				
	beta-cyfluthrin BAYTHROID XL	1.6-2.8 fl.oz.	0.0125-0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
	bifenthrin [2] CAPTURE	2.1-6.4 fl.oz.	0.03-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
	carbaryl [2] SEVIN 80S	1.25-2.5 lb.	1-2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	Repeat applications as needed up to a total of four times but not more often than once every 14 days.
	carbofuran FURADAN 4F	1 pt.	0.5	30	Furadan is a **RESTRICTED USE** pesticide.
	chlorpyrifos [2] LORSBAN 4E LORSBAN 75 WG	 1-2 pt. 0.67-1.33 pt.	 0.5-1 0.5-1	 21 (harvest) 21 (harvest)	See label for detailed instructions.
	cyfluthrin [2] BAYTHROID 2EC	1.6-2.8 fl.oz.	0.025-0.044	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.
	deltamethrin [2] DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Chinch Bugs (cont.)					
esfenvalerate [2]					Asana is a **RESTRICTED USE** pesticide.
	ASANA XL	5.8-9.6 fl.oz.	0.03-0.5	21 (harvest) ---	
gamma-cyhalothrin					Proaxis is a **RESTRICTED USE** pesticide.
	PROAXIS	3.84 fl.oz.	0.015	21 (harvest) 1 (green) 21 (fodder)	
lambda-cyhalothrin [2]					Warrior is a **RESTRICTED USE** pesticide.
	WARRIOR with Zeon Technology	3.8 fl.oz.	0.03	21 (harvest) 1 (green) 21 (fodder)	
zeta-cypermethrin [2]					Mustang Max is a **RESTRICTED USE** pesticide.
	MUSTANG MAX 0.8E	3.2-4 fl.oz.	0.02-0.025	30 (harvest) 60 (grazing)	
Corn Earworms					
General Comments: *Preventing this insect from attacking ears is usually not practical; early planting may reduce damage from this pest. Corn earworm is also known as the bollworm. Some populations may be resistant to some insecticides.*					
beta-cyfluthrin					Baythroid XL is a **RESTRICTED USE** pesticide.
	BAYTHROID XL	1.6-2.8 fl.oz.	0.0125-0.022	21 (harvest) 21 (fodder) 0 (green forage)	
bifenthrin [2]					
	CAPTURE 2EC	2.1-6.4 fl.oz.	0.03-0.1	30	**DO NOT** apply more than 0.3 pound active ingredient per acre per season. Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
Bt-resistant corn					See Bt Corn for Corn Borers section in the opening discussion for more details.
	cry 1Ab Bt protein	---	---	---	
	cry 1F Bt protein				
carbaryl [2]					Make applications directly onto the plant so that the spray will run onto the whorls.
	SEVIN 80S	1.25-2.5 lb.	1-2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	
chlorpyrifos [2]					See label for detailed instructions.
	LORSBAN 4E	1.5-2 pt.	0.75-1	21 (harvest)	
	LORSBAN 75 WG	1-1.33 pt.	0.75-1	21 (harvest)	
cyfluthrin [2]					Baythroid is a **RESTRICTED USE** pesticide.
	BAYTHROID 2EC	1.6-2.8 fl.oz.	0.025-0.044	21 (harvest) 0 (green) 21 (fodder)	
deltamethrin [2]					Delta Gold is a **RESTRICTED USE** pesticide.
	DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Corn Earworms (cont.)					
esfenvalerate [2]	ASANA XL 0.66EC	5.8-9.6 fl.oz.	0.03-0.05	21 (harvest) — (grazing)	Use if excessively high numbers occur at silking. First application should be at or before silking. Subsequent applications should be made at 3- to 5-day intervals until silking is complete. Asana is a **RESTRICTED USE** pesticide.
gamma-cyhalothrin	PROAXIS	1.9-3.2 fl.oz.	0.0075-0.0125	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
lambda-cyhalothrin [2]	WARRIOR with Zeon Technology	1.9-3.2 fl.oz.	0.015-0.025	21 (harvest) 1 (green) 21 (fodder)	For control of corn earworm before it has entered the stalk or ear.Warrior is a **RESTRICTED USE** pesticide.
methomyl [2]	LANNATE 2.4LV	0.75-1.5 pt.	0.22-0.45	21 (ears) 3 (green) 21 (fodder)	Apply a minimum of 20 gallons water per acre for best results. Lannate is a **RESTRICTED USE** pesticide.
permethrin [2]	POUNCE 25 WP	6.4-12.8 oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	Pounce is a **RESTRICTED USE** pesticide.
spinosad [2]	TRACER 4SC	2-3 fl.oz.	0.062-0.094	28 (harvest) 7 (grazing)	Use higher rates for heavier infestations. Time applications to peak egg hatch.
zeta-cypermethrin [2]	MUSTANG MAX 0.8E	1.76-4 fl.oz.	0.011-0.025	30 (harvest) 60 (grazing)	Mustang Max is a **RESTRICTED USE** pesticide.
Cutworms	*See Table 2 for pre-plant and at-plant suggestions for cutworm control.*				
beta-cyfluthrin	BAYTHROID XL	0.8-1.6 fl.oz.	0.007-0.013	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
bifenthrin [2]	CAPTURE	2.56 fl.oz.	0.04	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
carbaryl [2]	SEVIN 80S	2.5 lb.	2	48 (ears) 14 (green) 48 (fodder)	Most effective when applied in a 12-inch band over the row.
chlorpyrifos [2]	LORSBAN 4E	1-2 pt.	0.5-1	21 (harvest)	See label for detailed instructions.
	LORSBAN 75 WG	0.67-1.33 lb.	0.5-1	21 (harvest)	
cyfluthrin [2]	BAYTHROID 2EC	0.8-1.6 fl.oz.	0.013-0.025	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days frrom Last Application to Harvest or Grazing	Comments
Cutworms (cont.)					
deltamethrin [2]	DELTA GOLD 1.5 EC	0.8-1.5	0.01-0.018	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
esfenvalerate [2]	ASANA XL 0.66EC	5.8-9.6 fl.oz.	0.03-0.05	21	Asana is a **RESTRICTED USE** pesticide.
gamma-cyhalothrin	PROAXIS	1.9-3.2 fl.oz.	0.0075-0.0125	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
lambda-cyhalothrin [2]	WARRIOR with Zeon Technology	1.3-1.9 fl.oz.	0.01-0.015	21 (harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
methomyl [2]	LANNATE 2.4LV	1.5 pt.	0.45	21(ears) 3 (green) 21 (fodder)	Apply for variegated cutworms. Lannate is a **RESTRICTED USE** pesticide.
methyl parathion [2]	PENNCAP-M 2FM	4 pt.	2	12	Penncap-M is a **RESTRICTED USE** pesticide. Do not apply during pollen shed if bees are foraging in the area to be treated.
permethrin [2]	POUNCE 25 WP	6.4-12.8 oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	Pounce is a **RESTRICTED USE** pesticide.
zeta-cypermethrin [2]	MUSTANG MAX 0.8E	1.28-2.8 fl.oz.	0.008-0.0175	30 (harvest) 60 (grazing)	Mustang Max is a **RESTRICTED USE** pesticide.
European Corn Borers, Southwestern Corn Borers *See text at beginning for discussion of corn borers.*					
beta-cyfluthrin	BAYTHROID XL	1.6-2.8 fl.oz.	0.0125-0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
bifenthrin [2]	CAPTURE 2EC	2.1-6.4 fl.oz.	0.03-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
Bt-resistant corn *cry 1Ab Bt protein* *cry 1F Bt protein*		---	---	---	See Bt Corn for Corn Borers section in the opening discussion for more details.
carbaryl [2]	SEVIN 80S, 80WSP	1.875-2.5 lb.	1.5-2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	Apply in the whorls in 20 gallons of water per acre for best control.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
European Corn Borers, Southwestern Corn Borers (cont.)					
	chlorpyrifos [2]				See label for detailed instructions.
	LORSBAN 75 WG	1-1.33 lb.	0.75-1	21 (harvest)	
	LORSBAN 15G	3.5-8 oz./ 1000 row ft.	---	21 (harvest)	
	LORSBAN 4E	1.5-2 pt.	0.75-1	21 (harvest)	Use 1 to 2 pints for chemigation. See label for detailed instructions.
	cyfluthrin [2]				Baythroid is a **RESTRICTED USE** pesticide.
	BAYTHROID 2EC	1.6-2.8 fl.oz.	0.013-0.025	21 (harvest) 0 (green) 21 (fodder)	
	deltamethrin [2]				Delta Gold is a **RESTRICTED USE** pesticide.
	DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	
	esfenvalerate [2]				Apply just before egg hatch (blackhead stage) or before larvae enter the whorls. Asana is a **RESTRICTED USE** pesticide.
	ASANA XL 0.66EC	7.8-9.6 fl.oz.	0.04-0.05	21 (harvest)	
	gamma-cyhalothrin				Proaxis is a **RESTRICTED USE** pesticide.
	PROAXIS	2.56-3.84 fl.oz.	0.01-0.015	21 (harvest) 1 (green) 21 (fodder)	
	lambda-cyhalothrin [2]				Apply in whorl before borers have entered stalk or ear. Warrior is a **RESTRICTED USE** pesticide.
	WARRIOR with Zeon Technology	2.6-3.8 fl.oz.	0.02-0.03	21 (harvest) 1 (green) 21 (fodder)	
	methoxyfenozide				Apply at first sign of egg hatch or when infestation reaches threshold level.
	INTREPID 2F	4-8 fl.oz.	0.06-0.12 12 a.i./A	21	
	methyl parathion [2]				Penncap-M is a **RESTRICTED USE** pesticide.
	PENNCAP-M 2FM	2-4 pt.	0.5-1	12	
	permethrin [2]				Apply Pounce 1.5G into the whorl when eggs begin to hatch. Pounce is a **RESTRICTED USE** pesticide.
	POUNCE 25 WP	6.4-12.8 oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	
	spinosad [2]				Use higher rates for heavier infestations. Time applications to peak egg hatch. Apply as a broadcast or a directed spray to whorl stage corn; otherwise, apply as a broadcast spray. Use 2 to 3 fluid ounces for southwestern corn borers.
	TRACER 4SC	1-3 fl.oz. (European corn borer)	0.031-0.094	28 (harvest) 7 (grazing)	
		2-3 fl.oz. (Southwestern corn borer)	0.062-0.094		
	zeta-cypermethrin [2]				Mustang Max is a **RESTRICTED USE** pesticide.
	MUSTANG MAX 0.8E	2.72-4 fl.oz.	0.017-0.025	30 (harvest) 60 (grazing)	
Flea Beetle Adults					
	beta-cyfluthrin				Baythroid XL is a **RESTRICTED USE** pesticide.
	BAYTHROID XL	0.8-1.6 fl.oz.	0.0065-0.0125	21 (harvest) 21 (fodder) 0 (green forage)	

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Flea Beetle Adults (cont.)					
	bifenthrin [2]				
	CAPTURE 2EC	2.1-6.4 fl.oz.	0.03-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
	carbaryl [2]				
	SEVIN 80S	1.25-2.5 lb.	1-2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	
	chlorpyrifos [2]				
	LORSBAN 4E	1-2	0.5-1	21 (harvest)	Use a minimum of 20 to 40 gallons per acre and 40 p.s.i. with ground equipment. See label for detailed instructions.
	LORSBAN 75 WG	1.33 lb.	1	21 (harvest)	
	cyfluthrin [2]				
	BAYTHROID 2EC	1.6-2.8 fl.oz.	0.013-0.025	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.
	deltamethrin [2]				
	DELTA GOLD 1.5 EC	1-1.5 fl.oz.	0.012-0.018	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
	esfenvalerate [2]				
	ASANA 0.66 EC	5.8-9.6 fl.oz.	0.03-0.05	21 (harvest)	Asana is a **RESTRICTED USE** pesticide.
	gamma-cyhalothrin				
	PROAXIS	2.56-3.84 fl.oz.	0.01-0.015	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
	lambda-cyhalothrin [2]				
	WARRIOR with Zeon Technology	2.56-3.84 fl.oz.	0.02-0.03	21 (harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
	methomyl [2]				
	LANNATE 2.4LV	0.75-1.5 pt.	0.22-0.45	21(ears) 3 (green) 21 (fodder)	Lannate is a **RESTRICTED USE** pesticide.
	methyl parathion [2]				
	PENNCAP-M 2FM	2-3 pt.	0.5-0.75	12	Penncap-M is a **RESTRICTED USE** pesticide.
	permethrin [2]				
	POUNCE 25 WP	6.4-12.8 oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	Pounce is a **RESTRICTED USE** pesticide.
	zeta-cypermethrin [2]				
	MUSTANG MAX 0.8E	2.72-4 fl.oz.	0.017-0.025	30 (harvest) 60 (grazing)	Mustang Max is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Grasshoppers					
beta-cyfluthrin	BAYTHROID XL	2.1-2.8 fl.oz.	0.0165-0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
bifenthrin [2]	CAPTURE	2.1-6.4 fl.oz.	0.033-0.10	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
carbaryl [2]	SEVIN 80S	0.6-1.9 lb.	0.5-1.5	14 (silage) 48 (ears) 14 (green) 48 (fodder)	Use lower rate of Sevin for young grasshoppers or sparse vegetation; use higher rate for larger grasshoppers or thicker vegetation.
chlorpyrifos [2]	LORSBAN 4E	0.5-1 pt.	0.25-0.5	21 (harvest)	See label for detailed instructions.
	LORSBAN 75 WG	0.33-0.67 lb.	0.25-0.5	21 (harvest)	
cyfluthrin [2]	BAYTHROID 2EC	2.1-2.8 fl.oz.	0.033-0.044	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.
deltamethrin [2]	DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
esfenvalerate [2]	ASANA 0.66 EC	5.8-9.6 fl.oz.	0.03-0.05	21 (harvest)	Asana is a **RESTRICTED USE** pesticide.
gamma-cyhalothrin	PROAXIS	2.56-3.84 fl.oz.	0.01-0.015	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
lambda-cyhalothrin [2]	WARRIOR with Zeon Technology	2.6-3.8 fl.oz.	0.02-0.03	21 (harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
methyl parathion [2]	PENNCAP-M 2FM	2-3 pt.	0.5-0.75	12	Penncap-M is a **RESTRICTED USE** pesticide.
zeta-cypermethrin [2]	MUSTANG MAX 0.8E	2.72-4 fl.oz.	0.017-0.025	30 (harvest) 60 (grazing)	Mustang Max is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Japanese Beetle Adults, Corn Rootworm Adults, Other Silk Feeders					
	beta-cyfluthrin BAYTHROID XL	1.6-2.8 fl.oz.	0.0125- 0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
	bifenthrin [2] CAPTURE	2.1-6.4	0.03-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
	carbaryl [2] SEVIN 80S, 80WSP	1.25-2.5 lb.	1-2	14 (silage) 48 (ears) 14 (green) 48 (fodder)	Apply when silks first appear and continue until silks dry.
	chlorpyrifos [2] LORSBAN 4E LORSBAN 75 WG	 1-2 pt. 0.67-1.33 lb.	 0.5-1 0.5-1	 21 (harvest) 21 (harvest)	See label for detailed instructions.
	cyfluthrin [2] BAYTHROID 2EC	1.6-2.8 fl.oz.	0.025- 0.044	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.
	deltamethrin [2] DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018- 0.022	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
	esfenvalerate [2] ASANA 0.66 EC	5.8-9.6 fl.oz.	0.03-0.05	21	Asana is a **RESTRICTED USE** pesticide.
	gamma-cyhalothrin PROAXIS	2.56-3.84 fl.oz.	0.01- 0.015	21 (harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
	lambda-cyhalothrin [2] WARRIOR with Zeon Technology	2.56-3.84 fl.oz.	0.02-0.03	21 (harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
	methomyl [2] LANNATE 2.4LV	0.75-1.5 pt.	0.22-0.45	21(ears) 3 (green) 21 (fodder)	Lannate is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Japanese Beetle Adults, Corn Rootworm Adults, Other Silk Feeders (cont.)					
	methyl parathion [2]				Penncap-M is a **RESTRICTED USE** pesticide.
	PENNCAP-M 2FM	2-4 pt. Japanese beetle 1-2 pt. corn rootworm	0.25-1	12	
	permethrin [2]				Pounce is a **RESTRICTED USE** pesticide.
	POUNCE 25 WP	6.4-12.8 oz.	0.1-0.2	30 (ears) 0 (green) 30 (fodder)	
	zeta-cypermethrin [2]				Mustang Max is a **RESTRICTED USE** pesticide.
	MUSTANG MAX 0.8E	2.72-4 fl.oz.	0.017-0.025	30 (harvest) 60 (grazing)	
Leafhoppers					
	See Comments.				Leafhoppers are vectors of corn stunt and other plant viruses. Plant virus- resistant varieties, if possible. An at-plant soil systemic insecticide may be beneficial if a variety that is susceptible to corn stunt is planted.
Lesser Cornstalk Borers	*See Table 2 for at-plant suggestions.*				
	Bt-resistant corn				See Bt Corn for Corn Borers section in the opening discussion for more details.
	cry 1Ab Bt protein *cry 1F Bt protein*	---	---	---	
	chlorpyrifos [2]				Apply as a broadcast spray. See label for detailed instructions.
	LORSBAN 4E	2 pt.	1	21 (harvest)	
	LORSBAN 75WG	1.33 lb.	1	21 (harvest)	
	lambda-cyhalothrin [2]				**DO NOT** apply more than 0.12 pound active ingredient per acre per season. Apply as soon as infestation is detected, before borers have entered the stalk. Warrior is a **RESTRICTED USE** pesticide.
	WARRIOR 1CS	2.6-3.8 fl.oz.	0.02-0.03	21 1 (green) 21 (fodder)	
Southern Cornstalk Borers					
	Bt-resistant corn				See Bt Corn for Corn Borers section in the opening discussion for more details. Destroy over-wintering larvae by turning under old stalks and stubble to a depth of 6 inches before moths emerge in spring. Chemical control is not advisable.
	cry 1Ab Bt protein *cry 1F Bt protein*	---	---	---	
Southwestern Corn Borers	*See European Corn Borers.*				

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Stink Bugs					
See discussion of stink bugs in introduction; see Tables 2 and 3 for at-plant suggestions.					
	beta-cyfluthrin BAYTHROID XL	1.6-2.8 fl.oz.	0.0125-0.022	21 (harvest) 21 (fodder) 0 (green forage)	Baythroid XL is a **RESTRICTED USE** pesticide.
	bifenthrin [2] CAPTURE	2.1-6.4 fl.oz.	0.033-0.1	30	Capture is a **RESTRICTED USE** pesticide. Do not use Capture in coastal counties.
	cyfluthrin [2] BAYTHROID 2EC	1.6-2.8 fl.oz.	0.025-0.044	21 (harvest) 0 (green) 21 (fodder)	Baythroid is a **RESTRICTED USE** pesticide.
	deltamethrin [2] DELTA GOLD 1.5 EC	1.5-1.9 fl.oz.	0.018-0.022	21 (harvest) 12 (green) 21 (fodder)	Delta Gold is a **RESTRICTED USE** pesticide.
	gamma-cyhalothrin PROAXIS	2.56-3.84 fl.oz.	0.01-0.015	21(harvest) 1 (green) 21 (fodder)	Proaxis is a **RESTRICTED USE** pesticide.
	lambda-cyhalothrin [2] WARRIOR with Zeon Technology	2.56-3.84 fl.oz.	0.02-0.03	21(harvest) 1 (green) 21 (fodder)	Warrior is a **RESTRICTED USE** pesticide.
	methyl parathion CHEMINOVA METHYL 4EC	0.5 pt.	0.25	12	All formulations of methyl parathion are **RESTRICTED USE** pesticides. Do not apply Cheminova Methyl during the pollen shed period. Do not apply Penncap-M during pollen shed if bees are foraging in the area to be treated.
	PENNCAP-M 2FM	1-3 pt.	0.25-0.75	12	
	zeta-cypermethrin [2] MUSTANG MAX 0.8E	2.72-4 fl.oz.	0.017-0.025	30 (harvest) 60 (grazing)	Mustang Max is a **RESTRICTED USE** pesticide.
Sugarcane Beetles					
See discussion of sugarcane beetles in introduction.					
Western Corn Rootworm Larvae					
See Table 2 for at-planting suggestions.					
	Bt resistant corn for rootworms				See Insects that Attack the Roots, Corn rootworms section.
	carbofuran FURADAN 4F	2.5 fl.oz. /1000 row ft.	1 lb./A with 40-inch row spacing	30	Apply as a post-emergence spray by banding over the row or by side-dressing or basal spraying. Incorporating into soil will improve control. Furadan is a **RESTRICTED USE** pesticide.

[2] See Table 5 for other trade names.

Insect	Insecticide and Formulation	Amount of Formulation per Acre	Lb. Active Ingredient per Acre	Minimum Days from Last Application to Harvest or Grazing	Comments
Western Corn Rootworm Larvae (cont.)					
chlorpyrifos [2]					
	LORSBAN 75 WG	1.33 lb.	1	21 (harvest)	Apply granules to base of plants at time of cultivation just ahead of cultivator shovel.
	LORSBAN 15G	8 oz./1000 row ft.	---	21 (harvest)	Apply 75 WG as a water emulsion to base of plants on both sides of the row just ahead of cultivator shovel.
	LORSBAN 4E	2 pt./A	1	21 (harvest)	See label for detailed instructions.
phorate [2]					
	THIMET 20G	4.5-6 oz. /1000 row ft.	no more than 1.3 lb.a.i./A	30	Apply granules at time of cultivation to base of plants just ahead of cultivator shovels. Phorate is a **RESTRICTED USE** pesticides.
terbufos					
	COUNTER 15G	8 oz./1000 row ft.	1.3 lb. a.i./A maximum	60 (harvest) 30 (grazing)	Apply to base of plants just ahead of cultivator shovels. Counter is a **RESTRICTED USE** pesticide.
White Grubs					
See Tables 2 and 3 for at-planting suggestions for control of white grubs.					
Wireworms					
See Tables 2 and 3 for at-planting suggestions for control of wireworms.					

NOTE: Read manufacturer's label carefully for specific information for all product use restrictions and safety instructions.
[2] See Table 5 for other trade names.

Table 5. Insecticides Labeled for Use on Field Corn

Insecticide and Trade Name	A.I./ Formulated Product	Formulation	Restricted Entry Interval (hr)	Minimum Days from Last Application to Harvest or Grazing	Maximum Amount per Crop
beta-cyfluthrin					
BAYTHROID XL (Restricted Use)	1 lb./gal.	emulsifiable concentrate	12	21 (grain, fodder) 0 (grazing)	2.8 fl.oz.(0.022 lb. a.i.)/7-day interval 11.2 fl.oz./A/crop Max. rate beta-cyfluthrin + cyfluthrin = 0.175 lb. a.i./A/crop
bifenthrin					
BIFENTHRIN 2EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
BIFENTURE EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
CAPTURE 2EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
CAPTURE 1.15G (Restricted Use)	0.18 oz./lb.	granular	24 [1]	30	0.1 lb. a.i./A/crop at-planting; 0.3 lb. a.i./A/crop; do not use in coastal counties; do not apply if >30% cover of crop residue present
DISCIPLINE 2 EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
EMPOWER (Restricted Use)	0.18 oz./lb.	granular	12	30	0.1 lb. a.i./A/crop at-planting; 0.3 lb. a.i./A/crop; do not use in coastal counties; do not apply if >30% cover of crop residue present
FANFARE 2 EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
TUNDRA EC (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	30	0.3 lb. a.i./A/crop Do not use in coastal counties
carbaryl					
SEVIN 4F	4 lb./gal.	liquid suspension	12	48 (grain, fodder) 14 (grazing, silage)	8 qt./A/crop
SEVIN XLR PLUS	4 lb./gal.	liquid suspension	12	Same as above.	8 qt./A/crop
CARBARYL 4L	4 lb./gal.	liquid suspension	12	Same as above.	8 qt./A/crop
SEVIN 80S	12.8 oz./lb.	wettable powder	12	Same as above.	10 lb./A/crop
CARBARYL 80S	12.8 oz./lb.	wettable powder	12	Same as above.	10 lb./A/crop
SEVIN 80WSP	12.8 oz./lb.	water soluble packet	12	Same as above.	10 lb./A/crop
carbofuran					
FURADAN 4F (Restricted Use)	4 lb./gal.	liquid suspension	14 days	30	Two foliar applications or one foliar and one soil application; see label if soil is >90% sand

[1] REI for detasseling and roguing is 18 days.

Insecticide and Trade Name	A.I./ Formulated Product	Formulation	Restricted Entry Interval (hr)	Minimum Days from Last Application to Harvest or Grazing	Maximum Amount per Crop
chlorpyrifos					
LORSBAN 4E (Restricted Use)	4 lb./gal.	emulsifiable concentrate	24	21 (grain)	6 pt. (3 lb. a.i.)/A/season, three applications/year, min. 10 days between applications
CHLORPYRIFOS 4E AG (Restricted Use)	4 lb./gal.	emulsifiable concentrate	24	35 (grain, fodder) 14 (grazing, silage)	Same as above.
NUFOS 4E (Restricted Use)	4 lb./gal.	emulsifiable concentrate	24	21 (grain)	Same as above.
WARHAWK (Restricted Use)	4 lb./gal.	emulsifiable concentrate	24	35 (grain, fodder) 14 (grazing, silage)	Same as above.
WHIRLWIND (Restricted Use)	4 lb./gal.	emulsifiable concentrate	24	Same as above.	Same as above.
LORSBAN 75WG	12 oz./lb.	water dispersable granule	24	21 (grain)	2 lb. (1.5 lb. a.i.)/A/season, two applications/year; max. three chlorpyrifos applications/year, min. 10 days between applications
LORSBAN 15G	2.4 oz./lb.	granular	24	21 (grain)	2 lb. a.i./A/year; see label for further restrictions
clothianidin					
PONCHO 600	5 lb./gal.	seed treatment	n/a	n/a	1.25 mg a.i./kernel; for commercial treatment of seed
cyfluthrin					
BAYTHROID 2 (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	21 (grain, fodder) 0 (grazing, silage)	11.2 fl.oz.(0.175 lb.a.i.) /A/crop, 2.8 fl.oz./7-day interval; four applications/year Max. rate cyfluthrin + beta-cyfluthrin = 0.175 lb. a.i./A/crop
TOMBSTONE (Restricted Use)	2 lb./gal.	emulsifiable concentrate	12	Same as above.	Same as above.
deltamethrin					
DECIS.5 EC (Restricted Use)	1.5 lb./gal.	emulsifiable concentrate	12	Same as above.	8.1 fl.oz.(0.095 lb. a.i.)/A/season; five applications/season; min. 21 days between applications
DELTA GOLD 1.5 EC (Restricted Use)	1.5 lb./gal.	emulsifiable concentrate	12	Same as above	8.1 fl.oz.(0.095 lb. a.i.)/A/season; five applications/season; min. 21 days between applications
esfenvalerate					
ASANA XL (Restricted Use)	0.66 lb./gal.	emulsifiable concentrate	12	21	48 fl.oz. (0.25 lb. a.i.)/A/season
ADJOURN (Restricted Use)	0.66 lb./gal.	emulsifiable concentrate	12	21	48 fl.oz. (0.25 lb. a.i.)/A/season

Insecticide and Trade Name	A.I./ Formulated Product	Formulation	Restricted Entry Interval (hr)	Minimum Days from Last Application to Harvest or Grazing	Maximum Amount per Crop
fipronil					
REGENT 4SC (Restricted Use)	4 lb./gal.	soluble concentrate	0	90	One in-furrow appl./crop; do not plant small grains within 12 mos. of application; do not use if seed treated with Regent TS
REGENT TS	6.2 lb./gal.	seed treatment	n/a	n/a	2 fl.oz./100 lb. seed for commercial treatment of seed
gamma-cyhalothrin					
PROAXIS (Restricted Use)	0.5 lb./gal.	microencapsulated suspension	24	21 (grain, fodder) 1 (grazing)	15.3 fl.oz.(0.06 lb. a.i.)/A/crop Max. rate gamma-cyhalothrin +lambda-cyhalothrin = 0.12 lb. a.i./A/crop; see label for additional restrictions
lambda-cyhalothrin					
TAIGA-Z	1 lb./gal.	capsule suspension	24	21 (grain, fodder) 1 (grazing)	15.3 fl.oz.(0.012 lb. a.i.)/A/crop Max. rate gamma-cyhalothrin +lambda-cyhalothrin = 0.12 lb. a.i./A/crop; see label for additional restrictions
WARRIOR with ZEON TECHNOLOGY (Restricted Use)	1 lb./gal.	capsule suspension	24	Same as above.	
LAMBDA-T (Restricted Use)	1 lb./gal.	capsule suspension	24	Same as above.	Same as above
SILENCER (Restricted Use)	1 lb./gal.	liquid	24	Same as above.	Same as above
KARATE with ZEON TECHNOLOGY	2.08 lb./gal.	capsule suspension	24	Same as above	7.65 fl.oz. (0.012 lb. a.i.)/A/crop Max. rate gamma-cyhalothrin +lambda-cyhalothrin = 0.12 lb. a.i./A/crop; see label for additional restrictions
methomyl					
LANNATE LV (Restricted Use)	2.4 lb./gal.	water soluble liquid	48	21 (grain, fodder) 3 (grazing)	7.5 pt. (2 lb. a.i.)/A/crop, 10 applications/ crop
LANNATE SP (Restricted Use)	14.4 oz./lb.	water soluble powder	48	Same as above.	2.25 lb. (2 lb. a.i.)/A/crop, four applications/ crop
methoxyfenozide					
INTREPID 2F	2 lb./gal.	liquid	4	21	64 fl.oz. (1 lb. a.i.)/A/season, 16 fl. oz/A/application
methyl parathion					
CHEMINOVA METHYL 4EC (Restricted Use)	4 lb./gal.	emulsifiable concentrate	96	12	
PENNCAP M (Restricted Use)	2 lb./gal.	microencapsulated insecticide	96	12	12 pt.(3 lb. a.i.)/A/year

Insecticide and Brand Name	A.I./ Formulated Product	Formulation	Restricted Entry Interval (hr)	Minimum Days from Last Application to Harvest or Grazing	Maximum Amount per Crop
permethrin					
ARCTIC 3.2EC (Restricted Use)	3.2 lb./gal.	emulsifiable concentrate	12	30 (grain, fodder) 0 (forage)	24 fl.oz. (0.6 lb. a.i.)/A/season, min. 6 days between applications
PERMETHRIN 3.2EC (Restricted Use)	3.2 lb./gal.	emulsifiable concentrate	12	Same as above.	24 fl.oz. (0.6 lb. a.i.)/A/season, min. 6 days between applications
PERM-UP 25 WP (Restricted Use)	4 oz./lb.	wettable powder	12	Same as above.	2.4 lb. (0.6 lb. a.i.)/A/season, min. 6 days between applications
PERM-UP 3.2EC (Restricted Use)	3.2 lb./gal.	emulsifiable concentrate	12	Same as above.	24 fl.oz. (0.6 lb. a.i.)/A/season, min. 6 days between applications
POUNCE 25 WP (Restricted Use)	4 oz./lb.	wettable powder	12	Same as above.	2.4 lb. (0.6 lb. a.i.)/A/season, min. 6 days between applications
POUNCE 1.5 G (Restricted Use)	0.24 oz./lb.	granular	12	Same as above.	39.9 lb. (0.6 lb. a.i)/A/season, min. 6 days between applications
POUNCE WSB	4 oz./lb.	water soluble bag	12	Same as above	2.4 lb. (0.6 lb. a.i.)/A/season, min. 6 days between applications
phorate					
PHORATE 20G (Restricted Use)	3.2 oz./lb.	granular	48	30	One application/season over plant, one application/season soil applied
THIMET 20-G (Restricted Use)	3.2 oz./lb.	granular	48	30	One application/season
spinosad					
ENTRUST	12.8 oz./lb.	wettable powder	4	28 (grain, fodder) 7 (forage)	3.75 oz.(0.19 lb. a.i.)/A/year
SUCCESS	2 lb./gal.	liquid	4	Same as above.	12 fl.oz.(0.19 lb. a.i.)/A/year
TRACER	4 lb./gal.	liquid	4	Same as above.	6 fl.oz.(0.19 lb. a.i.)/A/year
terbufos					
COUNTER 15G (Restricted Use)	2.4 oz./lb.	granular	48	30	8.7 lb. (1.3 lb. a.i.)/A/year one application/year
thiamethoxam					
CRUISER 5FS	5 lb./gal.	seed treatment	12	n/a	1.25 mg/kernel
zeta-cypermethrin					
MUSTANG MAX (Restricted Use)	0.8 lb./gal.	emulsifiable concentrate	12	30 (grain, fodder) 60 (forage)	16 fl.oz. (0.1 lb. a.i.)/A/season, min. 14 days between applications
RESPECT (Restricted Use)	0.8 lb./gal.	emulsifiable concentrate	12	Same as above.	16 fl.oz. (0.1 lb. a.i.)/A/season, min. 14 days between applications

Other products may be available. Always read the label to make sure the specific crop is listed and to determine what rate to use.

Table 6. Properties of Insecticides Used on Corn That May Affect Worker Protection and Water Quality[1]

Common Name	Time to Wait to Enter Field	Surface-Loss Potential[2]	Leaching Potential[3]
beta-cyfluthrin	12 hours	Large	Small
bifenthrin	24 hours	Small	Small
carbaryl	12 hours	Medium	Small
carbofuran	2-14 days[5]	Small	Large
chlorpyrifos	12 hours	Medium	Small
cyfluthrin	12 hours	Large	Small
deltamethrin	12 hours	Large	Small
esfenvalerate	12 hours	Large	Small
fipronil	0 hours	n/a	
gamma-cyhalothrin	24 hours	Large	Small
lambda-cyhalothrin	24 hours	Large	Small
methomyl	48 hours	Small	Medium
methoxyfenozide	4 hours	n/a	n/a
methyl parathion	48 hours	Medium	Small
permethrin	12 hours	Large	Small
phorate	48 hours	Large	Medium
spinosad	4 hours	Small	Small
terbufos	48 hours[6]	Medium	Small
zeta-cypermethrin	12 hours	Large	Small

[1] Read manufacturer's label carefully for specific information for all product use restrictions and safety.
[2] The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.
[3] The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.
[4] Use of Capture is prohibited in all coastal counties.
[5] Two days for soil application; 14 days for a foliar application.
[6] Zero hours if soil injected or soil incorporated, under certain circumstances. See label for details.
NOTE: Differences in formulation, application mode (e.g., bare ground versus crop canopy), and soil type will affect how these ratings are used.
SOURCE: Ratings are based primarily on information obtained from USDA-ARS Interim Pesticide Database, Version 1.0, by R.D. Wauchope, August 5, 1988.

Insect Pest Management section prepared by Kathy L. Flanders, *Extension Entomologist,* Associate Professor, Entomology and Plant Pathology, Auburn University.

DISEASE AND NEMATODE CONTROL

In general, diseases cause minimal damage to corn most years. Rusts, ear rots, and storage rots are the most widespread and important diseases of corn. Mycotoxin contamination, primarily aflatoxin on rotted grain, is of particular concern to farmers. Stalk rots and viruses may also cause significant losses on limited acreage across the state. Common smut, southern corn leaf blight, and crazy top are reported every year but are of little economic importance. For a more detailed description of corn diseases, see Extension Circular ANR-601, "Corn Diseases."

Most corn diseases can be controlled through the use of good management practices.

- Plant recommended varieties with resistance to viruses and diseases common to your region.
- Select high-quality seed treated with a fungicide.
- Plant only on well-drained and well-prepared seedbeds. Avoid arid or poorly drained soils.
- Deep plow to turn under crop residue and weeds.
- Maintain balanced fertility levels. Nitrogen and potassium imbalances can increase leaf diseases and stalk rot and cause lodging.
- Rotate corn with non-grass crops. Rotating crops will reduce diseases and nematodes that attack corn.
- Plant early to avoid buildup of aphids and other virus-transmitting insects.
- Maintain plant populations at recommended levels to reduce stalk rots and lodging.

Fungicides (see Table 8) may partially control fungal leaf blights and rust, but in most cases they are not economical. Corn producers should carefully weigh the potential return before deciding to apply fungicides.

Several species of plant-parasitic nematodes can reduce corn yields sufficiently to cause economic losses. Sting, stubby root, and lesion nematodes are known to be the most damaging species on corn. Southern or cotton root-knot nematodes also attack, damage, and reproduce on many corn hybrids grown in the state. Problems with root-knot nematodes occur where corn is rotated with cotton. Crop rotation with non-host crops will often prevent the buildup of nematode populations to damaging levels. Corn is immune to the reniform nematode.

Although nematicides are effective against nematodes that attack corn, they are too expensive to use on field corn in most situations. Consequently, they are not recommended for general use in nematode-infested cornfields. Only in rare cases where soil insects and nematodes are a problem would nematicides/insecticides be cost effective.

Table 7. Properties of Nematicides Used on Corn That May Affect Water Quality

Common Name	Trade Name	Surface-Loss Potential[1]	Leaching Potential[2]
Ethoprop	Mocap	Medium	Large
Terbufos	Counter	Medium	Small

[1]The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.
[2]The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

Table 8. Fungicides Labeled for Controlling Helminthosporium Leaf Spots, Gray Leaf Spot, and Rust

Chemical Name	Rate Per Acre	Comments
Bumper 41.8 EC PropiMax Tilt 3.6E	2-4 fl.oz. 2-4 fl.oz. 2-4 fl.oz.	For controlling diseases listed above. Apply when disease first appears. Continue at 7- to 14-day intervals. **DO NOT** apply to field or seed corn after silking. **DO NOT** exceed 16 fluid ounces per acre per season. **DO NOT** harvest corn for forage within 30 days of application. Refer to label for recommended treatment rate for each disease.
Dithane DF Dithane F-45 Dithane M-45 Manzate Pro Stick Penncozeb 80W Penncozeb 4F	1.2 qt. 1.2 qt. 1.5 lb. 1.5 lb. 1.5 lb. 0.8-1.2 qt.	For control of common rust, gray leaf spot, and leaf blight diseases of corn. Begin applications when disease first appears. Use with a spray adjuvant. **DO NOT** exceed 12 pounds active ingredient mancozeb or maneb-related product per acre per season.
Headline 2.09E	6-9 fl.oz.	For control of southern rust and gray leaf spot, apply when conditions favor disease and repeat application 7 to14 days later as needed to control disease. Apply at higher rate and shorter intervals when weather patterns favor disease.
	9-12 fl.oz.	For control of anthracnose, northern and southern corn leaf blight, and yellow leaf spot. Apply when conditions favor disease and repeat application 7 to 14 days later as needed to control disease. Apply at higher rate and shorter intervals when weather patterns favor disease. See label for application and resistance management instructions.
Quadris Flowable	6-15 fl.oz.	For control of common rust, northern corn leaf blight, southern corn leaf blight, gray leaf spot, and anthracnose on field corn. Apply when symptoms first appear on lower leaves and repeat 7 to 14 days later as needed.
Quilt	7-14 fl.oz.	For control of northern and southern corn leaf blight. Apply when disease first appears on leaves and make a second applicaiton 7 to 14 dyas later as needed to control disease.
	10.5-14 fl.oz.	For control of southern rust, gray leaf spot, and eyespot. Apply when disease appears on leaves. If conditions favoring disease persist, make a second application 14 days later. See label for use restrictions and resistance management instructions.
Stratego 250EC	7-10 fl.oz.	For control of common rust on field corn. Apply at milk stage. **DO NOT** apply to corn grown for seed. **DO NOT** harvest corn for forage or silage within 30 days of application.
	10-12 fl.oz.	For control of northern and southern corn leaf blight, eyespot, and gray leaf spot on field corn. Apply at silking or milk stage and repeat 7 to 14 days later when conditions favor further disease development. **DO NOT** apply to corn grown for seed. **DO NOT** harvest corn for forage or silage within 30 days of application.

Table 9. Corn Nematode Control

Nematicide	Amount of Formulation: Per 1000 Ft. Row	Amount of Formulation: Per Acre	Comments
ethoprop			**FIELD AND SWEET CORN:** Apply at planting on 6- to 7-inch band *over seed furrow* and lightly incorporate. Rate depends on row spacing. See label for applicator settings and application instructions.
MOCAP 10G LOCK'N LOAD	18-21.5 oz.	---	
MOCAP 15G LOCK'N LOAD	12-16 oz.	10-13 lb.	
terbufos			**FIELD, SWEET, AND POPCORN:** Apply on 7-inch band directly behind planter shoe and in front of press wheel. Incorporate with drag chains or tines. See label for other use restrictions.
COUNTER LOCK'N LOAD 15G	6-8 oz.	---	
	6-8 oz.	---	Place in *seed furrow* behind the planter shoe.

Disease and Nematode Control section prepared by Austin K. Hagan, *Extension Plant Pathologist,* Alumni Professor, Entomology and Plant Pathology, Auburn University; and Paul Mask, *Extension Agronomist,* Professor, Agronomy and Soils, Auburn University.

WEED CONTROL

Table 10. Corn Weed Control

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Preplant Incorporated	
ERADICANE 6.7E (4.75 pt.)	EPTC (4 lb.) + safener + extender	Gives good control of annual grasses. It should be incorporated according to label directions immediately after application. Failure to do so will result in loss of the chemical by volatilization. Provides good control of annual grasses and nutsedge. It is weak on many broadleaf weeds. Risk of corn injury on coarse soils is greater where heavy rainfall and cold weather follow treatment. May be mixed with fertilizers (see label) for simultaneous application. **DO NOT** use on hybrid corn grown for seed. ***See johnsongrass control section for rates to control nutsedge, wild cane, Texas panicum (buffalograss), bermudagrass, and johnsongrass.***
SUTAN + 6.7E (4.75-7.33 pt.)	butylate (4-6.14 lb.) + protectant	Gives good control of annual grasses. It should be incorporated according to label directions immediately after application. Failure to do so will result in loss of the chemical by volatilization. Provides good control of annual grasses and nutsedge. It is weak on many broadleaf weeds. Risk of corn injury on coarse soils is greater where heavy rainfall and cold weather follow treatment. May be mixed with fertilizers (see label) for simultaneous application. **DO NOT** use on hybrid corn grown for seed. ***See johnsongrass control section for rates to control nutsedge, wild cane, Texas panicum (buffalograss), bermudagrass, and johnsongrass.***
	Preemergence	
AATREX/ATRAZINE 4L (1.6-2 qt.) or AATREX/ATRAZINE 90WDG (1.8-2.2 lb.)	atrazine (1.6-2 lb.)	Controls many annual broadleaf weeds and few grasses. Atrazine does not provide adequate control of panicum, signalgrass, some species of crabgrass, and certain other annual grasses. It may be applied to the soil surface immediately after planting or delayed for up to 3 weeks after planting but before weeds are 1.5 inches tall. Corn has excellent tolerance to atrazine. It may be mixed with liquid fertilizer for simultaneous application. **DO NOT** apply atrazine combined with liquid fertilizer if corn has emerged. Use the low rate on highly erodible soils (as classed by NRCS) if conservation tillage is not utilized. Use the high rate on highly erodible soils where conservation tillage practices are utilized (more than 30-percent plant residue) or on soils that are not highly erodible. **DO NOT** exceed 2 pounds active ingredient per acre as a preemergence treatment. **DO NOT** apply within 50 feet of any well, pond, stream, or sinkhole. Wear protective clothing, boots, and rubber gloves when mixing or loading herbicide. Atrazine is a **RESTRICTED USE** pesticide.
DUAL II MAGNUM 7.64 DUAL MAGNUM 7.62 CINCH 7.64E (1-1.67 pt.)	s-metolachlor (0.95-1.59 lb.)	Controls many annual grasses but is weak on broadleaf weeds. Herbicide is very similar to Micro-Tech for control of most weeds but is more effective on yellow nutsedge. Best results are obtained when rainfall occurs within 4 to 6 days after application.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Preemergence (cont.)	
HARNESS 7EC (1.5-3 pt.)	acetochlor (1.3-2.6 lb.) + safener	Controls most annual grasses and some broadleaf weeds in corn. It can be applied preplant incorporated or preemergence, but before corn emerges. Apply in a minimum of 10 gallons of spray mix per acre, using a spray pressure of 15 to 40 psi. Use the low rate on coarse-textured soils that are low in organic matter and the high rate on fine-textured soils with organic matter less than 3 percent. To control large-seeded broadleaf weeds such as sicklepod, morninglories, and cocklebur, atrazine should be added to the spray mix. See label for rotational crop restrictions. Harness is a **RESTRICTED USE** pesticide.
MICRO-TECH (2-2.75 qt.)	alachlor (2-2.75 lb.)	Controls most annual grasses including fall panicum and some small-seeded broadleaf weeds. It does not effectively control Texas panicum, common cocklebur, or morningglory. Apply to the soil surface during or immediately after planting. Best results are obtained when rainfall occurs within 7 days after application. Under dry conditions, shallow cultivation or rotary hoeing may improve control. Corn has good tolerance to alachlor. Use low rate on coarse soils and high rate on medium- to fine-textured soils. Micro-Tech is a **RESTRICTED USE** pesticide.
OUTLOOK 6L (12-18 fl.oz.)	dimethenamid (0.56-0.84 lb.)	Controls most annual grasses and some broadleaf weeds in field corn. It can be applied preplant incorporated, preemergence, or early postemergence, but before weeds emerge. Incorporation should be in the top 1 to 2 inches of soil. Use lower rates on coarse-textured soils, the intermediate rate on medium soils, and higher rates on fine-textured (heavy) soils. See label for use rate for yellow nutsedge control. Outlook can be tank mixed with other herbicides. **DO NOT** apply more than 21 fluid ounces of Outlook per acre per season.
PRINCEP 4L SIMAZINE 4L (2-3 qt.) or PRINCEP CALIPER 90 SIMAZINE 90WDG (2.2-3.3 lb.)	simazine (2-3 lb.)	Controls some annual broadleaf weeds and grasses. It provides adequate control of signalgrass, some species of crabgrass, and certain other annual grasses. It must be applied to the soil surface immediately after planting before weeds emerge. Corn has excellent tolerance to simazine. **DO NOT** apply within 50 feet of any well, pond, stream, or sinkhole. Wear protective clothing, boots, and rubber gloves when mixing or loading herbicide. Simazine requires more rainfall than atrazine for activation.
SURPASS 6.4EC (1.5-2.75 pt.)	acetochlor (1.2-2.2 lb.) + safener	Controls most annual grasses and some broadleaf weeds in corn. It can be applied preplant, preplant incorporated, preemergence, or early postemergence, but before weeds emerge. Apply in a minimum of 10 gallons of spray mix per acre, using a spray pressure of 15 to 40 psi. Use the low rate on coarse-textured soils that are low in organic matter, the intermediate rate on medium soils, and the high rate on fine-textured soils with organic matter less than 3 percent. See label for higher permissible rates in reduced till or no-till corn. To control large-seeded broadleaf weeds such as sicklepod, morninglories, and cocklebur, atrazine should be added to the spray mix. See label for rotational crop restrictions. Surpass is a **RESTRICTED USE** pesticide.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Postemergence	
2,4-D AMINE (0.5-1 pt.)	2,4-D amine (0.25-0.5 lb.)	Provides excellent control of most annual broadleaf weeds. Broadcast over-the-top when corn is 4 to 8 inches tall and weeds are small. Use the high rate when weeds are larger and weather is cool. After corn is more than 8 inches tall, apply 1 pint per acre on a broadcast basis using drop nozzles to direct spray to base of plants. Corn may be injured by over-the-top applications when it is silking or tasseling. Corn stalks often become brittle after application; therefore, cultivation should be delayed at least 1 week after application. Prevent spray drift from contacting susceptible crops during application. **CAUTION:** Use ester formulations carefully because vapors may rise in hot weather after application and may drift considerable distances. Certain corn hybrids may be more susceptible to injury than others.
AATREX/ATRAZINE 4L (2 qt.) or AATREX/ATRAZINE 90WDG (2.2 lb.)	atrazine (2 lb.)	Apply before weeds exceed 1.5 inches in height. **DO NOT** apply atrazine in combination with liquid fertilizer if corn has emerged. **DO NOT** apply more than 2.5 pounds active ingredient per acre total of Atrazine or AAtrex in one season. Atrazine is a **RESTRICTED USE** pesticide.
AATREX/ATRAZINE 4L (1.25-2 qt.) or AATREX/ATRAZINE 90WDG (1.4-2.2 lb.) + Crop Oil Concentrate (2 pt.)	atrazine (1.25-2 lb.) + crop oil concentrate	Same as for atrazine, above. Addition of crop oil concentrate to postemergence sprays of atrazine speeds the activity and provides quicker kill of weeds; it also allows the use of lower atrazine rates. Use the low rate where broadleaf weeds are the only problem and high rate where broadleaf weeds and grasses are a problem. The addition of crop oil to atrazine sprays may result in crop damage. To minimize risk of injury, follow special precautions and application methods given on the product label. Atrazine is a **RESTRICTED USE** pesticide.
ACCENT 75 WDG (0.67 oz.) + Non-ionic Surfactant (1 qt./100 gal. spray mix) or Crop Oil Concentrate (1 qt./25 gal. spray mix)	nicosulfuron (0.031 lb.) + non-ionic surfactant crop oil concentrate	Provides postemergence control of some annual grasses, johnsongrass, and some broadleaf weeds. Apply over-the-top of field corn from the two-leaf (V2 stage) to 20 inches in height (but before V6 stage). Apply over-the-top of popcorn or field corn grown for seed up to 20 inches in height. Postemergence directed application can be made to field corn up to 36 inches tall (ten-leaf stage). Weeds should be small and actively growing at time of treatment. Apply in a minimum of 10 gallons of water per acre with a spray pressure of 25 to 40 psi. Avoid overlapping or doubling application at row ends or along field borders. Cultivation 10 to 14 days after application will improve control. **DO NOT** apply to sweet corn. A repeat treatment 14 to 28 days after treatment can be applied for hard-to-control grasses. **DO NOT** apply more than 1.3 ounces per acre per year. **DO NOT** apply to corn previously treated with Counter insecticide. Corn previously treated with a soil-applied organo-phosphate insecticide (Lorsban, Dyfonate, Thimet) may develop temporary corn injury. Severe corn injury may also occur if Accent application is made within 7 days of a foliar application of 2,4-D, Basagran, Lorsban, malathion, or parathion. There is a 10-month recropping restriction for most crops planted in treated soils with a pH less than 6.5; there is an 18-month restriction for most crops planted in treated soils with a pH greater than 6.5. In johnsongrass-infested fields, apply only to virus-tolerant hybrids. Accent does not control crabgrass.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Postemergence (cont.)	
BANVEL 4 (0.5 pt.) or CLARITY 4 (0.5-1 pt.)	dicamba (0.25 lb.) (0.25-0.5 lb.)	Controls most annual broadleaf weeds, including some difficult to control with low rates of 2,4-D. It will not control mustards as well as 2,4-D. Banvel can be applied any time from the corn seedling stage until corn is 36 inches high. Over-the-top sprays are generally more effective when corn is small; drop-nozzle application is better when corn is taller than 8 inches. Clarity can only be used postemergence on corn less than 8 inches tall. Use the low rate of Clarity on coarse-textured soils. **DO NOT** allow spray drift to contact susceptible plants during application; soybeans and most vegetables are very sensitive to minute amounts of dicamba.
BASAGRAN 4 (1.5-2 pt.)	bentazon (0.75-1 lb.)	Apply early postemergence when corn has one to five leaves for control of certain broadleaf weeds and yellow nutsedge suppression. Corn is tolerant to Basagran at all stages, but larger weeds are not as easy to kill. **DO NOT** apply to corn which is showing stress from drought, cold weather, or other herbicide injury. A crop oil concentrate may be added to the spray mix at a rate of one quart per acre to control certain weeds. Two applications, 7 to 10 days apart, are required for yellow nutsedge control.
BEACON 75 WDG (0.75 oz.) + Non-ionic Surfactant (1 qt./100 gal. spray mix) or Crop Oil Concentrate (1 qt./25 gal. spray mix)	primisulfuron (0.57 oz.) + non-ionic surfactant crop oil concentrate	Provides postemergence control of johnsongrass and some broadleaf weeds. Apply Beacon over-the-top or semi-directed to corn when plants are 4 to 20 inches tall but before corn reaches 20 inches in height. **DO NOT** apply Beacon as a band application directly over the corn rows. If a second split application is made to corn, it can be applied up to the tassel emergence stage if the application is directed. **DO NOT** exceed 0.75 ounce per acre per year. Weeds must be small and actively growing at time of treatment. Application should be made with ground equipment using 10 to 20 gallons of water per acre at 40 psi spray pressure. Always use water as the carrier. **DO NOT** use a crop oil concentrate or nitrogen solution when applying Beacon with any other postemergence herbicide (such as dicamba or 2,4-D). **DO NOT** apply Beacon where Counter has been previously applied to corn. When other soil-applied insecticides have been applied to corn, delay Beacon application for 20 days to reduce possibility of corn injury. **DO NOT** apply Beacon within 10 days after an organo-phosphate insecticide application or with herbicides containing bentazon or 2,4-D. See label for recropping restrictions. Some corn hybrids are sensitive to Beacon; check with company representatives for current list. In johnsongrass-infested fields, apply only to virus-tolerant hybrids.
BUCTRIL 2EC (1-1.5 pt.) or BUCTRIL 4EC (0.5-0.75 pt.)	bromoxynil (0.25-0.375 lb.)	A contact postemergence herbicide that is effective in controlling a number of seedling broadleaf weeds. Use the low rate on susceptible weeds. Apply in a minimum of 20 gallons water per acre and with a minimum spray pressure of 30 psi. Apply over-the-top, beginning when corn is in the three-leaf stage. When corn is 12 inches tall or more, use drop nozzles to direct the spray solution toward the base of the corn plant. **DO NOT** mix with liquid fertilizer, surfactants, or oils. Observe all precautions.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Postemergence (cont.)	
DISTINCT 70WDG (4-6 oz.) + Non-ionic Surfactant (1 qt./100 gal.)	dicamba (0.125-0.189) + diflufenzopyr (0.05-0.075) + non-ionic surfactant	Will control many annual broadleaf weeds and will suppress the growth of some annual grasses. Apply 6 ounces per acre when corn is 4 to 10 inches tall and 4 ounces per acre when corn is 10 to 24 inches tall. Must be applied with a non-ionic surfactant (1 quart per 100 gallons of spray mix) and a nitrogen source such as urea ammonium nitrate (UAN) or spray-grade ammonium sulfate (AMS). Use 5 quarts of UAN or 5 pounds of AMS per 100 gallons of spray mix. **DO NOT** use petroleum-based or methylated seed oils. **DO NOT** tank mix with Banvel, Clarity, 2,4-D, Poast, Poast Plus, Lorsban, Ambush, or Warrior. Any crop can be planted 120 days after application. **DO NOT** apply within 15 days of tassel emergence. **DO NOT** apply more than 10 ounces of Distinct per acre per season.
OPTION 35WDG (1.5-1.75 oz.)	foramsulfuron (0.033-0.038)	Provides good to excellent control of many annual grasses and johnsongrass. Can be applied over-the-top of corn from emergence to 16 inches tall (V5 stage). Application can be made to corn 16 to 36 inches tall using drop nozzles. Option **MUST** be applied with a methylated or ethylated seed oil (1.5 pints per acre) and a nitrogen fertilizer (urea ammonium nitrate [UAN]—1.5-2 quarts per acre OR spray-grade ammonium sulfate [AMS]—1.5-3 pounds per acre). See label for approved tank mixes. **DO NOT** use Option if soil insecticide (Counter, Dyfonate, or Thimet) was used previously. Any crop can be planted in treated area after 60 days.
PERMIT 75DF (0.66-1.33 oz.) or SANDEA 75DF (0.66-1.33 oz.) + Non-ionic Surfactant (1-2 qt./100 gal.) or Crop Oil Concentrate (1 gal./100 gal.)	halosulfuron (0.032-0.063 lb.) + non-ionic surfactant crop oil concentrate	Controls many annual broadleaf weeds and nutsedge. Use higher rates for nutsedge and larger weeds. Can be applied over-the-top of corn from spike to layby stages. Can be tank mixed with other postemergence herbicides. See label. **DO NOT** apply more than 2.67 ounces per acre per year. **DO NOT** plant wheat for 3 months or soybeans for 10 months following application.
	Postemergence (Herbicide-Tolerant Varieties)	
LIBERTY 1.67 (28-34 fl.oz.)	glufosinate (0.37-0.44 lb.)	USE ONLY ON “LIBERTY-LINK” OR “GLUFOSINATE-RESISTANT” CORN HYBRIDS. APPLYING LIBERTY TO NON-TOLERANT VARIETIES WILL RESULT IN SEVERE CROP INJURY OR CROP DEATH! Can be applied from time of emergence until corn has reached 24 inches in height (V-7 with seven developed collars). A broad-spectrum material with limited systemic activity, it has no soil residual activity. Effective on a number of annual grasses and broadleaf weeds. Use rate is dependent on the weeds present and their size. Most annual grasses are controlled by the medium and high use rate. Thorough coverage is essential. **DO NOT** add a surfactant or crop oil concentrate. Liberty can be tank mixed with atrazine. It is rainfast in 4 hours. Make only two applications per season and **DO NOT** exceed 62 ounces of Liberty per acre per season. No rotation restrictions exist with Liberty. **DO NOT** apply within 70 days of harvesting corn grain or within 60 days of harvesting corn forage. Requires the use of spray grade ammonium sulfate at 3 pounds per acre or 17 pounds per 100 gallons of spray mix.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
Postemergence (Herbicide-Tolerant Varieties) (cont.)		
LIGHTNING 70DG (1.28 oz.) + Non-ionic Surfactant (1 pt./100 gal. spray mix)	imazethapyr (0.042 lb.) + imazapyr (0.014 lb.) + non-ionic surfactant	USE ONLY ON "CLEARFIELD" HYBRIDS. APPLYING LIGHTNING TO NON-TOLERANT VARIETIES WILL RESULT IN SEVERE CROP INJURY AND/OR CROP DEATH! Application requires adding a surfactant and liquid fertilizer solution to the spray mix. Liquid fertilizer solution (such as 28% N, 32% N, or 10-34-0) at the rate of 1 to 2 quarts per acre is recommended. Spray-grade ammonium sulfate may be used at the rate of 2.5 pounds per acre instead of the fertilizer solution. Make postemergence application from the spike stage until corn is 12 inches tall. Can be tank mixed with other herbicides, but observe all size limitations. **DO NOT** use crop oil concentrates or seed oils with spray mix. Make only one application per season. Application is rainfast within 1 hour. **DO NOT** apply to "IMI-Corn" hybrids treated with Counter or Thimet insecticides due to severe crop injury or death. **DO NOT** tank mix with Accent or Beacon. **DO NOT** feed or harvest for grain for at least 45 days after application. Recropping restrictions can be significant. Consult label before use to determine compatibility with production plans.
ROUNDUP WEATHERMAX (22 oz.) Others (See label)	glyphosate (0.94) (See label)	Apply over-the-top in Roundup Ready (RR) Corn hybrids up to the V8 stage or until corn height reaches 30 inches, whichever comes first. Sequential applications can be made, but **DO NOT** exceed a total of 2 pounds active ingredient glyphosate per acre per season over-the-top. Sequence is a pre-mix of glyphosate + s-metolachlor. Expert is a pre-mix of glyphosate + s-metolachlor + atrazine. See label for use rates. See label for other tank mixes.
Postemergence Directed		
EVIK 80DF (1.25-2.5 lb.) + Non-ionic Surfactant (1 pt./25 gal. spray mix)	ametryn (1-2 lb.) + non-ionic surfactant	Provides excellent control of annual grasses and broadleaf weeds. May temporarily burn back perennials. Evik **MUST** be applied as a directed spray after corn plants are at least 12 inches tall. **DO NOT** apply within 3 weeks of tasseling. **CAUTION:** Over-the-top sprays will kill corn. May be applied in water or liquid nitrogen solutions. Use low rates on small, easily killed weeds and higher rates on larger, hard-to-kill weeds as specified on the product label. Evik is particularly effective on Texas panicum and broadleaf signalgrass. The highest rate will control 6-inch-tall signalgrass.
GRAMOXONE INTEON 2.0 (1-2 pt.) or FIRESTORM 3 (0.75-1.3 pt.) + Non-ionic Surfactant	paraquat (0.25-0.5 lb.) (0.25-0.5 lb.) + non-ionic surfactant	For use as a postemergence directed spray after corn is at least 18 inches tall. Spray no higher than the lower 3 inches on the corn stalk. For control of broadleaf weeds and some grasses less than 4 inches tall, a non-ionic surfactant should be added to the spray mixture at the rate of 1 quart per 100 gallons of spray mix. **DO NOT** mix with liquid fertilizer. **DO NOT** spray on windy days. Gramoxone and Firestorm are **RESTRICTED USE** pesticides.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Postemergence Directed (cont.)	
LOROX 50DF (1.25-3 lb.) + Non-ionic Surfactant (1 pt./25 gal. spray mix)	linuron (0.6-1.5 lb.) + non-ionic surfactant	Provides excellent control of annual grasses and broadleaf weeds. May temporarily burn back perennials. Lorox **MUST** be applied as a directed spray after corn plants are at least 15 inches tall. **CAUTION:** Over-the-top sprays will kill corn. May be applied in water or non-pressure nitrogen solution. Use low rate on weeds 2 inches or less and on coarse soils low in organic matter. Use high rate for weeds up to 5 inches and on fine-textured soils.
PENDIMAX 3.3E (1.2-3.6 pt.) Others (See label)	pendimethalin (0.5-1.5 lb.)	Apply as a directed spray after corn is 12 inches tall. Cultivate first with sweep or rolling cultivators to throw at least 1 inch of soil over the base of the corn plants prior to application. Must be incorporated using cultivators or irrigation water. Set cultivators to provide maximum soil mixing; move treated soil into the crop rows. This herbicide is effective on late-emerging problem grasses such as fall panicum and Texas panicum.
TREFLAN HFP (1-2 pt.) Others (See label)	trifluralin (0.5-1 lb.)	Apply as a directed spray after corn is 12 inches tall and incorporate with a sweep-type or rolling cultivator. Cultivate first to cover the base of the corn plants with soil prior to application. Apply herbicide and then set cultivators to provide maximum soil mixing, to move treated soil into the crop row, and to avoid exposing untreated soil. This herbicide is effective on late-emerging problem grasses such as fall panicum and Texas panicum.
	Harvest Aid	
AIM 2EC (1.9 fl.oz.) + Crop Oil Concentrate	carfentrazone-ethyl (0.031 lb.) + crop oil concentrate	Apply after corn is mature and the grain has begun to dry down. Apply as a broadcast spray in sufficient spray volume to give complete coverage of crop and weeds such as morningglories, pigweed, and velvetleaf. Use a crop oil concentrate at rate of 1 gallon per 100 gallons of spray solution. A minimum of 3 days must be allowed between Aim application and grain harvest.
SODIUM CHLORATE (2 gal. of 3-lb. material) or SODIUM CHLORATE (1 gal. of 6-lb. material)	sodium chlorate (6 lb.) sodium chlorate (6 lb.)	Apply after corn is in black layer stage. Apply at least 14 days before anticipated harvest date on a bright, sunny day when temperature is above 75°F. Apply in 5 to 7 gallons of water by air. Grasses (such as johnsongrass) will be desiccated. Broadleaf weeds will probably be only defoliated.
	Johnsongrass Control	
Johnsongrass causes yield reductions in corn by competing with the crop for plant nutrients. In addition, johnsongrass serves as an alternate host to virus diseases.		The diseases are then transmitted to the corn by insects. Control of johnsongrass in fields and along field borders is essential for optimum production.
ACCENT 75 WDG (0.67 oz.) + Non-ionic Surfactant (1 qt./100 gal. spray mix) or Crop Oil Concentrate (1 qt./25 gal. spray mix)	nicosulfuron (0.5 oz.) + non-ionic surfactant crop oil concentrate	Same as Comments for Accent in the Postemergence section. Apply over-the-top of corn when rhizome johnsongrass is 8 to 12 inches tall and seedling johnsongrass is 4 to 10 inches tall. A second application can be made 14 to 28 days later when johnsongrass regrowth is 8 to 10 inches tall. **DO NOT** apply later than the ten-leaf stage of corn. **DO NOT** apply more than 1.33 ounces of Accent per acre per year.

Herbicide Trade Name (Rate/Acre Broadcast)	Herbicide Common Name (Active Herbicide/Acre)	Comments
	Johnsongrass Control (cont.)	
BEACON 75 WDG (0.75 oz.) + Non-ionic Surfactant (1 qt./100 gal. spray mix) or Crop Oil Concentrate (1 qt./25 gal. spray mix)	primisulfuron (0.57 oz.) + non-ionic surfactant crop oil concentrate	Same as Comments for Beacon in the Postemergence section. Seedling johnsongrass should be 4 to 12 inches tall, and rhizome johnsongrass should be 8 to 16 inches tall at time of first application. Two applications at half the labeled rate are permitted to control johnsongrass and subsequent regrowth. The second application should be made 10 to 20 days after the first application. **DO NOT** apply more than 0.75 ounce of Beacon per acre per year. **DO NOT** use a crop oil concentrate or nitrogen solution when applying Beacon with any other postemergence herbicide (such as dicamba or 2,4-D).
ROUNDUP WEATHERMAX (1.4-2 qt.) or Generics (See label.)	glyphosate (1.9-2.75 lb.)	Apply as a foliar treatment after harvest while johnsongrass is still growing and has produced at least 12 inches of regrowth (after mowing or plowing). Apply in 10 to 30 gallons of water per acre. Allow at least 7 days after application before tillage. Additional fall tillage will increase control: it chops rhizomes into small pieces. Use preplant or preemergence herbicide application in following year's crop to control seedling johnsongrass. See label for non-ionic surfactant use rate.

Table 11. Estimated Effectiveness of Recommended Herbicide Treatments for Corn on Common Weeds in Alabama and Properties That May Affect Water Quality[1]

WEEDS	HERBICIDES					
	AAtrex, Atrazine (PRE)	Dual (PRE)	Micro-Tech (PRE)	Outlook (PRE)	Princep (PRE)	Surpass, Harness (PRE)
GRASSES						
Broadleaf Signalgrass	2	8	8	8	6	8
Crabgrass	6	9	9	9	8	9
Crowfootgrass	7	9	9	9	8	9
Fall Panicum	3	9	9	9	7	9
Goosegrass	6	9	9	9	8	9
Johnsongrass (rhizomes)	0	0	0	0	0	0
Johnsongrass (seedlings)	4	5	5	5	5	7
Texas Panicum	0	4	4	5	2	4
SEDGES						
Purple Nutsedge	0	1	1	0	0	1
Yellow Nutsedge	0	7	5	7	0	5
BROADLEAF WEEDS						
Bristly Starbur	7	0	0	0	8	0
Cocklebur	7	0	0	0	7	0
Florida Beggarweed	8	5	5	4	9	5
Florida Pusley	8	9	9	9	9	9
Morningglory	7	0	0	0	7	0
Pigweed	8	9	9	9	9	9
Prickly Sida	9	4	4	4	9	4
Sicklepod	7	5	6	5	8-9	4
Surface-Loss Potential[2]	M	M	M	--	M	M
Leaching Potential[3]	M	M	M	--	M	M

continued

[1] Effectiveness ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama. Leaching and surface-loss potential ratings are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.
[2] The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.
[3] The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

KEY TO CONTROL RATINGS AND ABBREVIATIONS
Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control.
PRE = Preemergence.
M = Medium. -- = Information not available.

Table 11. Estimated Effectiveness of Recommended Herbicide Treatments for Corn on Common Weeds in Alabama and Properties That May Affect Water Quality[1] (cont.)

WEEDS	HERBICIDES					
	2,4-D amine (POST)	AAtrex, Atrazine (POST)	Accent (POST)	Banvel/ Clarity (POST)	Basagran (POST)	Beacon (POST)
GRASSES						
Broadleaf Signalgrass	0	2	8-9	0	0	0
Crabgrass	0	6	4	0	0	0
Crowfootgrass	0	6	0	0	0	0
Fall Panicam	0	3	8	0	0	7
Goosegrass	0	5	0	0	0	0
Johnsongrass (rhizomes)	0	0	8	0	0	8
Johnsongrass (seedlings)	0	2	8	0	0	8
Texas Panicum	0	0	7	0	0	3
SEDGES						
Purple Nutsedge	3	0	0	0	0	0
Yellow Nutsedge	3	0	0	0	7	0
BROADLEAF WEEDS						
Bristly Starbur	7	7	0	7	5	0
Cocklebur	9	8	5	9	9-10	8
Florida Beggarweed	7	8	0	8	0	7
Florida Pusley	8	8	0	6	0	0
Morningglory	9	8	7	9	4	7
Pigweed	9	8	8	9	4	8
Prickly Sida	7	7	0	7	7	8
Sicklepod	8	7	0	9	0	0
Surface-Loss Potential[2]	M	M	--	S	S	--
Leaching Potential[3]	M	M	--	L	M	--

continued

[1] Effectiveness ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama. Leaching and surface-loss potential ratings are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.
[2] The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.
[3] The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.
KEY TO CONTROL RATINGS AND ABBREVIATIONS
Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control.
POST = Postemergence Over-The-Top.
S = Small; M = Medium; L = Large. -- = Information not available.

Table 11. Estimated Effectiveness of Recommended Herbicide Treatments for Corn on Common Weeds in Alabama and Properties That May Affect Water Quality[1] (cont.)

WEEDS	HERBICIDES				
	Buctril (POST)	Distinct (POST)	Liberty (POST)	Lightning (POST)	Option (POST)
GRASSES					
Broadleaf Signalgrass	0	3	8	7	8
Crabgrass	0	3	8	7	6
Crowfootgrass	0	--	--	--	0
Fall Panicam	0	3	7	6	0
Goosegrass	0	0	5	3	8
Johnsongrass (rhizomes)	0	0	4	5	8
Johnsongrass (seedlings)	0	3	8	7	8
Texas Panicum	0	0	7	--	7
SEDGES					
Purple Nutsedge	0	3	7	5	0
Yellow Nutsedge	0	3	7	5	0
BROADLEAF WEEDS					
Bristly Starbur	4	0	8	--	0
Cocklebur	9	9	8	9	6
Florida Beggarweed	4	--	8	--	0
Florida Pusley	6	0	7	--	0
Morningglory	7	9	9	8	5
Pigweed	8	--	8	9	8
Prickly Sida	6	9	9	3	0
Sicklepod	0	7	8	2	0
Surface-Loss Potential[2]	M	--	--	--	--
Leaching Potential[3]	S	--	--	--	--

continued

[1] Effectiveness ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama. Leaching and surface-loss potential ratings are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.
[2] The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.
[3] The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

KEY TO CONTROL RATINGS AND ABBREVIATIONS
Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control.
POST = Postemergence Over-The-Top.
S = Small; M = Medium. -- = Information not available.

Table 11. Estimated Effectiveness of Recommended Herbicide Treatments for Corn on Common Weeds in Alabama and Properties That May Affect Water Quality[1] (cont.)

WEEDS	HERBICIDES				
	Sandea, Permit (POST)	Evik (PDS)	Firestorm Gramoxone (PDS)	Lorox (PDS)	Aim (HAR)
GRASSES					
Broadleaf Signalgrass	0	8	8	7	0
Crabgrass	0	4	4	8	0
Crowfootgrass	0	7	8	7	0
Fall Panicum	0	8	8	8	0
Goosegrass	0	8	8	8	0
Johnsongrass (rhizomes)	0	0	3	4	0
Johnsongrass (seedlings)	0	6	8	7	0
Texas Panicum	0	7	8	7	0
SEDGES					
Purple Nutsedge	8	5	4	5	0
Yellow Nutsedge	8	5	4	5	0
BROADLEAF WEEDS					
Bristly Starbur	0	8	5	8	0
Cocklebur	9	7	4	7	5
Florida Beggarweed	3	9	8-9	9	0
Florida Pusley	0	8	5	8	0
Morningglory	7	8	6-8	8	8
Pigweed	8	9	8-9	9	8
Prickly Sida	3	9	5	9	6
Sicklepod	2	9	8-9	9	0
Surface-Loss Potential[2]	--	M	S	L	--
Leaching Potential[3]	--	M	S	M	--

[1] Effectiveness ratings are based on observations of research plots and field use under average weather conditions for several years by weed control workers in Alabama. Leaching and surface-loss potential ratings are based in part on herbicide chemical characteristics and pesticide behavior models developed by USDA scientists as well as on field experience.

[2] The surface-loss potential indicates the tendency of the pesticide to move with sediment in runoff.

[3] The leaching potential indicates the tendency of the pesticide to move in solution with water and to leach below the root zone.

KEY TO CONTROL RATINGS AND ABBREVIATIONS

Ratings on a scale of 0 to 10: 0 = No control; 10 = 100% control.

POST = Postemergence Over-The-Top; PDS = Postemergence Directed Spray; HAR = Harvest Aid.

S = Small; M = Medium; L = Large. -- = Information not available.

Table 12. Herbicide Classification by Mode of Action

Mode of Action	Herbicide
AMINO ACID SYNTHESIS INHIBITORS	Accent, Beacon, Liberty, Lightning, Option, Permit, Roundup, Sandea
CELL MEMBRANE DISRUPTER	Firestorm, Gramoxone Inteon
GROWTH REGULATORS	2,4-D, Banvel/Clarity, Distinct
PHOTOSYNTHETIC INHIBITORS	Atrazine/AAtrex, Basagran, Buctril, Evik, Lorox, Princep
ROOT/SHOOT GROWTH INHIBITORS	Dual, Harness, Micro-Tech, Outlook, Prowl/Pendimax, Surpass, Treflan

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For more information, call your county Extension office. It is listed in your telephone directory under your county's name.

Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency or the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply **any** pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

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