CORN INSECTS

Other Resources Available Through NDSU Extension Service:

Publications	E493	Aphid Management in Small Grains, Corn and Sorghum (1993)
	E631	Corn Insects in North Dakota (1990)
	E830	The Armyworm and the Army Cutworm (2000)
	E272	Grasshopper Management (1997)
	E188	Wireworm Control (2001)

APHID

Corn Leaf and Greenbug

The greenbug and corn leaf aphid are the most common species causing problems in corn and sorghum. The greenbug is the most injurious because it injects a toxin with its saliva during feeding.

Threshold:

The critical period for injury by corn leaf aphid is during tassel emergence through pollination. Treatment is suggested only when 50% of the corn plants have 100+ aphids per plant during tassel emergence and plants are drought stressed.

Natural Controls:

Lady beetles, aphid lions, syrphid fly and parasitic wasps play a major role in reducing aphid populations. When natural enemies are present in large numbers, and the crop is well developed, farmers are discouraged from spraying fields.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin Tundra EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin + zeta-cypermethrin Hero *RUP*	0.04 - 0.103	4.0 - 10.3 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
chlorpyrifos Lorsban 4E *RUP*	0.5 - 1	1 - 2 pts	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.5 - 1	1 - 2 pts	
chlorpyrifos Yuma 4E *RUP*	0.5 - 1	1 - 2 pts	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.25 - 0.51 + 0.004 - 0.009	13 - 26 fl oz	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
deltamethrin Delta Gold *RUP*	0.018 - 0.022	1.5 - 1.9 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season.
dimethoate Digon 400, Dimethoate 400 Dimethoate 2.67 EC	0.25 - 0.75	½ - 1½ pt	PHI = 14 days of harvest or grazing. Do not make more than 3 applications per season. Do not apply to corn during pollen shed.
disulfoton Di-Syston *RUP*	0.5 - 1	0.5 - 1 pt	Aerial application only. PHI = 28 days of corn harvest.
lambda-cyhalothrin Lambda-Cy *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz (suppression)	PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz (suppression)	
lambda-cyhalothrin Warrior *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz (suppression)	
methomyl Lannate LV *RUP*	0.225 - 0.45	12 - 24 fl oz	Do not harvest within 7 days or feed treated forage within 10 days of application. Field re-entry interval is 2 days for corn.
methyl parathion Penncap-M *RUP*	0.5 - 0.75	2 - 3 pts	PHI = 12 days, cut for forage, or use for grazing. Do not apply during pollen shed if bees are visiting the areas. Do not apply more than 12 pts/A per year. Do not enter treated fields within 48 hours after application.
methyl parathion *RUP*	0.5	8 fl oz	Do not use within 12 days of corn harvest. Do not enter treated fields within 48 hours after application.

RUP - Restricted use pesticide

ARMYWORMS

Armyworm outbreaks in North Dakota can occur when large migrations of moths from Southern states occur in late spring and early summer. Moths prefer to lay eggs in moist, shady areas where small grains or grasses have lodged or been damaged by hail or wind. Armyworms feed at night and hide under vegetation or in loose soil during the day. To scout for armyworms in grains, part the plants and inspect the soil for fecal pellets. If pellets or feeding damage are found, look for larvae under plant trash, soil clods or in soil cracks.

Threshold:

Treat when 25% to 30% of the plants have 2 or more worms **or** 75% of the plants have 1 worm.

Migrating Armyworms:

Treat a couple of swaths ahead of the infestation in the direction of movement to form a barrier strip.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Bacillus thuringiensis Agree Biobit Condor G DiPel DF Javelin M-peril MVP For Organic Production	see specific labels for rate recommendations		No preharvest interval. Non-toxic to man or wildlife. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and /or raise spray volume to improve spray coverage.
beta-cyfluthrin Baythroid XL *RUP*	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin + zeta-cypermethrin Hero *RUP*	0.04 - 0.103	4.0 - 10.3 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Capture LFR *RUP*	0.04 - 0.08 0.0023 - 0.0046 lb active per 1000 linear feet of row	3.4 - 6.8 fl oz 0.20 - 0.39 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band over the row on the soil surface, a 5-7 inch band over the open furrow (T-band), in-furrow with the seed, or broadcast over the entire acre on the soil surface. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products (such as Capture 2EC).
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin Tundra EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
carbaryl Sevin	1 - 1.5	rate varies by formulation	PHI = 48 days of grain harvest, or 14 days for silage or grazing.
chlorpyrifos Lorsban 4E *RUP*	0.5 - 1	1 - 2 pts	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.5 - 1	1 - 2 pts	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
chlorpyrifos Yuma 4E *RUP*	0.5 - 1	1 - 2 pts	
chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.25 - 0.51 + 0.004 - 0.009	13 - 26 fl oz	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin Tombstone Tombstone Helios *RUP*	0.025 - 0.044	1.6 - 2.8	
deltamethrin Delta Gold *RUP*	0.018 - 0.022	1.5 - 1.9 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season.
esfenvalerate Asana XL *RUP*	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days.
gamma-cyhalothrin Proaxis *RUP*	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Lambda-Cy *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
lambda-cyhalothrin Warrior *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
methomyl Lannate LV *RUP*	0.225 - 0.45	12 - 24 fl oz	Do not harvest within 7 days or feed treated forage within 10 days of application. Field re-entry interval is 2 days for corn.
methoxyfenozide Intrepid	0.06 - 0.12	4 - 8 fl oz	PHI = 21 days. Do not apply more than 16 fl oz per acre per application or 64 fl oz per acre per season. Apply at first sign of egg hatch or when infestations reach threshold levels.
methyl parathion Penncap-M *RUP*	0.5 - 0.75	2 - 3 pts	PHI = 12 days, cut for forage, or use for grazing. Do not apply during pollen shed if bees are visiting the areas. Do not apply more than 12 pts/A per year. Do not enter treated fields within 48 hours after application.
methyl parathion *RUP*	0.25	8 fl oz	PHI = 12 days of corn harvest. Do not enter treated fields within 48 hours or application.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
permethrin Ambush 2E Pounce 3.2E Arctic 3.2E Permethrin 3.2EC Perm-Up 25 WP Perm-Up 3.2 EC *RUP*	0.1 - 0.2	 6.4 - 12.8 fl oz 4 - 8 fl oz 4 - 8 fl oz 4 - 8 fl oz 6.4 - 12.8 fl oz 4 - 8 fl oz	PHI = 30 days. Do not apply more than 0.6 pound ai per acre per season. Apply a minimum of 2 gal of finished spray per acre by air and 10 gals per acre by ground equipment.
spinosad (microbial) Success	0.047 - 0.094	3 - 6 fl oz	PHI = 28 days of grain or fodder harvest or within 7 days of forage harvest. Do not apply more than a total of 12 fl oz per acre per season.. Treat when pests appear, targeting eggs at hatch or small larvae. Use a higher rate in the rate range for larger larvae or moderate to severe infestations.
spinosad (microbial) Tracer	0.062 - 0.094	2 - 3 fl oz	PHI = 28 days of grain or fodder harvest or 7 days of forage harvest.
zeta-cypermethrin Mustang Max *RUP*	0.02 - 0.025	3.2 - 4 fl oz	PHI = 30 days for grain, 60 days for forage (silage). Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

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CORN ROOTWORM LARVAE

Rootworm larvae injure the root system of the corn plant. Yield potential may be reduced and/or lodging of plants may occur. Annual crop rotation from corn should prevent serious damage and losses. Early planting of corn allows for better root development prior to the late June hatch of rootworm eggs.

Threshold:

The decision to rotate from corn or to use an insecticide may be based on field scouting for adult beetles during a three week period after pollination. Record the number of corn rootworm beetles on the foliage and silk of 100 plants. When the adult population averages 1 beetle per plant in continuous corn or 0.5 beetles per plant in first-year corn fields, the potential for larval root damage the next summer is sufficient to rotate from corn or to apply an insecticide.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Bifenture EC-CA *RUP*	0.0046 lb ai per 1,000 ft of row	0.3 fl oz/1,000 ft of row	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.1lb AI per acre per season as an at plant application. Apply as a 5- to 7-inch T-band over an open seed furrow. Position spray nozzle behind the planter shoe, in front of press wheel. Apply in a min. of 3 gals finished spray per acre.
bifenthrin Capture 2EC *RUP*	0.0046 lb ai per 1,000 ft of row	0.3 fl oz/1,000 ft of row	
bifenthrin Sniper *RUP*	0.0046 lb ai per 1,000 ft of row	0.3 fl oz/1,000 ft of row	
bifenthrin Tundra EC *RUP*	0.0046 lb ai per 1,000 ft of row	0.3 fl oz/1,000 ft of row	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Capture LFR *RUP*	0.08 - 0.10 0.0046 - 0.0057 lb active per 1000 linear feet of row	6.8 - 8.5 fl oz 0.39 - 0.49 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band (T-band) over the open furrow, or in-furrow with the seed. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products (such as Capture 2EC).
chlorethoxyfos Fortress 2.5 G Fortress 5 G *RUP*		2.5 G: 6 oz/1,000 ft of row - any row spacing 5 G: 3 oz/1,000 ft of row - any row spacing	Apply as a T-band or in-furrow at planting. Do not apply as a surface band behind the press wheel. Granules exposed on the soil surface must be incorporated. Crop rotational intervals: corn - anytime; other crops - 30 days.
chlorpyrifos Lorsban 15 G *RUP*	1	8 oz/1,000 ft of row - any row spacing	Apply in a T-band or in-furrow in front of press wheels at planting time or at time of cultivation. Not more than 1 application per season. Incorporate into top 0.5 to 1 inch of soil using chains or tines behind press wheel.
chlorpyrifos Lorsban 4E *RUP*	-	2.4 fl oz/1,000 ft of row	Apply in a T-band or in-furrow in front of press wheels at planting time or at time of cultivation with no more than 30% cover of crop residue remaining on the soil surface. Use a minimum of 5 GPA. Not more than 1 application per season. Incorporate into top 0.5 to 1 inch of soil using chains or tines behind press wheel. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	-	2.4 fl oz/1,000 ft of row - any row spacing	
chlorpyrifos Yuma 4E *RUP*	-	2.4 fl oz/1,000 ft of row - any row spacing	
Chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.74 - 0.82 + 0.013 - 0.015	38 - 42 fl oz Apply at cultivation or through chemigation.	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin + tebupirimiphos Aztec 2.1 G *RUP*	0.12 - 0.15	6.7 oz/1,000 ft of row - any row	May be applied at planting as band, T-band or in furrow treatment. Cover or incorporate spills (including end-row spillage). Do not use on other crops grown for food or forage.
fipronil Regent 4SC *RUP*		See label for correct rate. 4.16 fl oz per acre or 0.24 fl oz per 1,000 row feet for 30 inch row spacing	PHI = 90 days. Do not plant small grains or other rotational crops within 12 months following application. Make one in-furrow application at planting time only. Do not apply this product through any kind of irrigation system.
gamma-cyhalothrin Proaxis *RUP*		0.66 fl oz per 1,000 ft of row	May be applied as a 5- to 7-inch T-band or in the seed furrow. **For Suppression Only.**

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin Lambda-Cy *RUP*	0.005 (at plant)	0.66 fl oz (at plant)	PHI = 21 days. Do not harvest or graze livestock or cut treated crop for feed within 21 days of at plant application. Do not apply more than 0.09 lb ai (0.72 pt) per acre per crop at plant. Do not apply more than 0.12 lb ai per acre per crop from at plant and foliar application. For banded application - Make application at planting as a 5-7 inch T-band sprayed across the open seed furrow between the furrow openers and the press wheel. For In-furrow application - Make application into the seed furrow through spray nozzle or microtubes, behind the planter furrow openers and in front of the press wheel. Apply a minimum of 3 GPA.
phorate Thimet 20 G *RUP*	1	6 oz/1,000 ft of row - any row spacing	Place granules in a 7-inch band over the row directly behind the planter shoe in front of or behind the press wheel and lightly incorporate. Do not use in-furrow application.
tefluthrin Force 1.5 G Force 3 G *RUP*	0.1 - 0.125	1.5 G: 8 - 10 oz /1,000 ft - any row spacing 3 G: 4 - 5 oz/1,000 ft of row - any row spacing	Apply in a 7-inch band or in-furrow behind the planter shoe in front of the press wheel. Do not rotate to another crop within 30 days after application.
terbufos Counter 15 G *RUP*	1	8 oz/1,000 ft of row - any row spacing	May be applied in a 7-inch band at planting or in the seed furrow behind the planter shoe. Do not apply Accent or Beacon herbicide to corn treated with Counter 15 G.

RUP - Restricted use pesticide

CORN ROOTWORM ADULTS

Rootworm beetles feed on the leaves, silk and pollen of corn. Occasionally, the beetles congregate and feed on silks during early pollen shed. If silks are chewed back to the tips of ears (less than 1/2 inch of silks protruding) during the period of maximum pollen shed, poor pollination and grain set can occur. Adult injury very seldom occurs in North Dakota.

Threshold:

When an average of 5 or more beetles per silk mass are found during the first week of pollen shed, control may be necessary. Another management threshold uses silk clipping. When silk clipping is occurring on 25% to 50% of the plants during pollen shed, control would be justified.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
beta-cyfluthrin Baythroid XL *RUP*	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin + zeta-cypermethrin Hero *RUP*	0.04 - 0.103	4.0 - 10.3 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
carbaryl Sevin	1	rate varies by formulation	PHI = 48 days of grain harvest, or 14 days for silage or grazing.
chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.25 - 0.51 + 0.004 - 0.009	13 - 26 fl oz	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
chlorpyrifos Lorsban 4E *RUP*	0.5 - 1	1 - 2 pts	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.5 - 1	1 - 2 pts	
chlorpyrifos Yuma 4E *RUP*	0.5 - 1	1 - 2 pts	
cyfluthrin Tombstone Tombstone Helios *RUP*	0.025 - 0.044	1.6 - 2.8 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold *RUP*	0.018 - 0.022	1.5 - 1.9 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season.
dimethoate Dimethoate 2.67 EC	0.5 - 0.75	1- 1½ pt	PHI = 14 days of harvest or grazing. Do not make more than 3 applications per season. Do not apply to corn during pollen shed.
esfenvalerate Asana XL *RUP*	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin Lambda-Cy *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
lambda-cyhalothrin Warrior *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
methomyl Lannate LV *RUP*	0.225 - 0.45	12 - 24 fl oz	Do not harvest within 7 days or feed treated forage within 10 days of application. Field re-entry interval is 2 days for corn.
methyl parathion Penncap-M *RUP*	0.25 - 0.5	1 - 2 pts	PHI = 12 days, cut for forage, or use for grazing. Do not apply during pollen shed if bees are visiting the areas. Do not apply more than 12 pts/A per year. Do not enter treated fields within 48 hours after application.
permethrin	0.1 - 0.2		PHI = 30 days. Do not apply more than 0.6 pound ai per acre per season. Apply a minimum of 2 gal of finished spray per acre by air and 10 gals per acre by ground equipment.
Ambush 2E		6.4 - 12.8 fl oz	
Pounce 3.2E		4 - 8 fl oz	
Arctic 3.2E		4 - 8 fl oz	
Permethrin 3.2EC		4 - 8 fl oz	
Perm-Up 25 WP		6.4 - 12.8 fl oz	
Perm-Up 3.2 EC		4 - 8 fl oz	
RUP			
zeta-cypermethrin Mustang Max *RUP*	0.017 - 0.025	2.72 - 4 fl oz	PHI = 30 days for grain, 60 days for forage (silage). Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

CUTWORMS

Several cutworm species affect regional crops. The dingy cutworm, *Feltia jaculifera*, overwinters as a partially grown larva and is one of the first cutworm species to cause problems during crop emergence from early to mid-May. The moth of the dingy cutworm is known to lay her eggs on sunflower heads from mid-July through September. Crops following sunflowers in rotation are at greatest risk of injury by this cutworm. Other cutworms, the red-backed, *Exoa ochregaster*, and the darksided, *Exoa messoria*, overwinter as eggs which hatch in mid to late May. Eggs are laid in the fall and survive in weedy, wet, and reduced tillage areas. Feeding injury by these cutworms normally occurs in late May to early June.

Some criteria that may help predict cutworm problems are: 1) field history of cutworm damage; 2) surface crop residue from reduced or minimum tillage; 3) bottom land or low spots in field; 4) fair to poor drainage; 5) near shelterbelts with grassy ground cover. Because eggs of the important cutworms are laid during late summer in North Dakota, soil moisture at this time is important for their winter survival. Growers should be cautious when planting corn following pasture, alfalfa, or clover sites; survival may be greater at these locations.

Thresholds:

Begin scouting for cutworms when corn is up to a stand and continue until mid-June. Treat when 3% to 6% of the plants are cut and small larvae (<3/4 inch) are present. Application rate of 15 to 20 gallons of water per acre by ground application is suggested.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
beta-cyfluthrin Baythroid XL *RUP*	0.0065 - 0.0125	0.8 - 1.6 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin + zeta-cypermethrin Hero *RUP*	0.025 - 0.06	2.6 - 6.1 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.033 - 0.1 0.0023 - 0.0046 lb ai per 1,000 ft of row	2.1 - 6.4 fl oz 0.15 - 0.3 fl oz/1,000 ft of row	
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin Capture LFR *RUP*	0.04 - 0.08 0.0023 - 0.0046 lb active per 1000 linear feet of row	3.4 - 6.8 fl oz 0.20 - 0.39 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band over the row on the soil surface, a 5-7 inch band over the open furrow (T-band), in-furrow with the seed, or broadcast over the entire acre on the soil surface. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products (such as Capture 2EC).
carbaryl Sevin 5% bait	1 - 2	20 - 40 lbs	Broadcast treatment. No limitation on forage. Do not incorporate bait.
chlorpyrifos Lorsban 4E *RUP*	0.5 - 1	1 - 2 pts	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.5 - 1	1 - 2 pts	
chlorpyrifos Yuma 4E *RUP*	0.5 - 1	1 - 2 pts	

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.25 - 0.51 + 0.004 - 0.009 (postemerge) 0.04 + 0.0001 (at-plant, T-band)	13 - 26 fl oz (postemerge) 1.89 fl oz per 1,000 ft of row (at-plant, T-band)	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions. Apply when soil is moist and cutworms are active.
cyfluthrin Tombstone Tombstone Helios *RUP*	0.013 - 0.025	0.8 - 1.6	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold *RUP*	0.012 - 0.018	1.0 - 1.5 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season.
esfenvalerate Asana XL *RUP*	0.03 - 0.05	5.8 - 9.6 fl oz	PHI = 21 days.
gamma-cyhalothrin Proaxis *RUP*	0.0075 - 0.015	1.92 - 3.2 fl oz	PHI = 21 days. When applying by air, apply in a minimum of 2 gals of water per acre.
lambda-cyhalothrin Lambda-Cy *RUP*	0.005 (at plant)	0.66 fl oz (at plant)	PHI = 21 days. Do not harvest or graze livestock or cut treated crop for feed within 21 days of at plant application. Do not apply more than 0.09 lb ai (0.72 pt) per acre per crop at plant. Do not apply more than 0.12 lb ai per acre per crop from at plant and foliar application. For banded application - Make application at planting as a 5-7 inch T-band sprayed across the open seed furrow between the furrow openers and the press wheel. For In-furrow application - Make application into the seed furrow through spray nozzle or microtubes, behind the planter furrow openers and in front of the press wheel. Apply a minimum of 3 GPA.
lambda-cyhalothrin Lambda-Cy *RUP*	0.015 - 0.025	1.92 - 3.2 fl oz	In corn, may be applied before, during, or after planting for cutworm control. PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.015 - 0.025	1.92 - 3.20 fl oz	
methomyl Lannate LV *RUP*	0.45	24 fl oz	Do not harvest within 7 days or feed treated forage within 10 days of application. Field re-entry interval is 2 days for corn.
methoxyfenozide Inteprid	0.06 - 0.12	4 - 8 fl oz	PHI = 21 days. Do not apply more than 16 fl oz per acre per application or 64 fl oz per acre per season. Apply at first sign of egg hatch or when infestations reach threshold levels.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
permethrin	0.1 - 0.2		PHI = 30 days. Do not apply more than 0.6 pound ai per acre per season. Apply a minimum of 2 gal of finished spray per acre by air and 10 gals per acre by ground equipment.
Ambush 2E		6.4 - 12.8 fl oz	
Pounce 3.2E		4 - 8 fl oz	
Arctic 3.2E		4 - 8 fl oz	
Permethrin 3.2EC		4 - 8 fl oz	
Perm-Up 25 WP		6.4 - 12.8 fl oz	
Perm-Up 3.2 EC		4 - 8 fl oz	
RUP			
zeta-cypermethrin	0.008 - 0.025	1.28 - 4 fl oz	PHI = 30 days for grain, 60 days for forage (silage). Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.
Mustang Max			
RUP			

RUP - Restricted use pesticide

EUROPEAN CORN BORER - *Field corn, popcorn and sweet corn*

Managing corn borer in North Dakota is a challenge due to the lengthy emergence interval of the moths from overwintering. In North Dakota, borers have the potential for one or two generations during the season. The two generation borers are present in the southern region of the state. They begin emerging in early June and represent the first flush of larval feeding. The single-generation borer is present throughout North Dakota, emerging from mid-June to August. The challenge of the crop manager is to distinguish when egg laying and larval populations can be tolerated or if they need to be controlled. Corn should be monitored weekly for ***at least* five weeks** once plants exceed an extended leaf height of 17 inches. At this point, corn borer larvae will be able to survive on the plant. Inspect plants for the presence of egg masses, whorl feeding, and active larvae. Observing moth activity around field margins or within the field may alert you to developing infestations. Recent corn borer infestations in North Dakota developed in mid to late July and August as a result of the late emergence of the numerous single-generation type borers. In other years, the two-generation borers emerging first may contribute more to significant infestations.

Field scouting for corn borers:

Whorl stage corn . . . . Pull the whorls from 10 plants at 5 locations across the field. Select whorls at random, avoiding damaged plants. Unwrap the whorl leaves; count and record the number of live larvae found.

Worksheet for whorl stage corn -- You fill in the blanks

1. __ % of plants infested	x __ Avg no. borers/plant	=	__ Borers per plant
2. __ borers per plant	x __ percent yield loss per borer*	=	__ percent yield loss
3. __ percent yield loss	x __ expected yield (bu. per acre)	=	__ bushels per acre loss
4. __ bushel loss per acre	x __ price per bushel	= $	__ loss per acre
5. __ loss per acre	x __ percent control**	= $	__ preventable loss/a
6. __ preventable loss/acre	- __ cost of control per acre	= $	__ profit (loss)/acre

*5% for corn in the early whorl stage; 4% for late whorl; 6% for pretassel
**80% for granules; 75% for sprays.

Tassel stage or older corn . . . . Examine the underside of the middle 7 leaves (3 leaves above and 3 leaves below the ear leaf) on 20 plants from 5 locations in the field. Multiply the number of egg masses found by 1.1 (correction factor for eggs on other leaves). Complete worksheet to determine the need for treatment.

Worksheet for tassel stage or older corn -- You fill in the blanks

1. __ egg masses per plant*	x 4.5 borers per egg mass	=	___ borers per plant
2. __ borers per plant	x __ percent yield loss per borer**	=	___ percent yield loss
3. __ percent yield loss	x __ expected yield (bu. per acre)	=	___ bushels per acre loss
4. __ bushel loss per acre	x __ price per bushel	= $	___ loss per acre
5. __ loss per acre	x 80 percent control	= $	___ preventable loss/acre
6. __ preventable loss/acre	- __ cost of control per acre	= $	___ profit (loss) / acre

*Cumulative counts taken five to seven days later can be added here
**Use 0.04 for pollen-shedding corn, 0.03 if kernels are initiated

Economic Threshold (Corn Borer/plant) When Factoring Crop Value and Control Costs

Control Costs[2] ($/acre)	Value of Corn Crop[1] ($/acre)								
	200	250	300	350	400	450	500	550	600
6	0.75	0.60	0.50	0.43	0.38	0.34	0.30	0.27	0.25
7	0.88	0.70	0.58	0.50	0.44	0.39	0.35	0.32	0.29
8	1.00	0.80	0.67	0.57	0.50	0.45	0.40	0.37	0.34
9	1.12	0.90	0.75	0.64	0.56	0.50	0.45	0.41	0.38
10	1.25	1.00	0.83	0.71	0.63	0.56	0.50	0.46	0.42
11	1.38	1.10	0.92	0.79	0.69	0.61	0.55	0.50	0.46
12	1.50	1.20	1.00	0.86	0.75	0.67	0.60	0.55	0.50
13	1.63	1.30	1.08	0.93	0.81	0.72	0.65	0.59	0.54
14	1.75	1.40	1.17	1.00	0.88	0.78	0.70	0.64	0.59
15	1.88	1.50	1.25	1.07	0.94	0.84	0.75	0.68	0.63
16	2.00	1.60	1.33	1.14	1.00	0.89	0.80	0.73	0.68

[1] *Crop value = expected yield (bu/acre) X projected price ($/bu)*
[2] *Control costs = insecticide price ($/acre) + application costs ($/acre)*

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
Bacillus thuringiensis For Organic Production	see specific labels for rate recommendations		No preharvest interval. Non-toxic to man or wildlife. Worker Restricted Entry Interval (REI) is 4 hours. Treat when larvae are young (early instars) before crop is damaged. Larvae must be actively feeding on treated, exposed plant surfaces. Under heavy pest population pressure, use the higher label rates, shorten the spray interval (3-14 days), and /or raise spray volume to improve spray coverage. Currently labeled are: Agree®, Biobit®, Condor G®, Dipel®, Javelin®, M-Peril®, MVP®.
beta-cyfluthrin Baythroid XL *RUP*	0.0125 - 0.022	1.6 - 2.8 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin + zeta-cypermethrin Hero *RUP*	0.04 - 0.103	4.0 - 10.3 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
carbaryl Sevin	1 - 2	rate varies by formulation	PHI = 48 days of grain harvest, or 14 days for silage or grazing. The sweet corn postharvest interval is 0 days.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
carbofuran Furadan 4F *RUP*	0.75 - 1	1.5 - 2 pts	PHI = 30 days of grain harvest or cut for forage. The sweet corn postharvest interval is 7 days. Do not make more than 2 foliar applications per season.
chlorpyrifos Lorsban 15 G *RUP*	0.66 - 1 (at plant)	4 - 6 oz/1,000 ft of row (at plant)	Restrictions same as above. May be broadcast aerially or banded with suitable ground application equipment prior to tassel emergence. Use high rate (6.5 lb product per acre) when applying broadcast. If directed carefully by ground equipment into whorls, use rates of 4 to 6 oz product per 1,000 ft of row.
chlorpyrifos Lorsban 4E *RUP*	0.5 - 1	1 - 2 pts	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.5 - 1	1 - 2 pts	
chlorpyrifos Yuma 4E *RUP*	0.5 - 1	1 - 2 pts	
Chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.37 - 0.74 + 0.007 - 0.013	19 - 38 fl oz	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin Tombstone Tombstone Helios *RUP*	0.025 - 0.044	1.6 - 2.8	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold *RUP*	0.018 - 0.022	1.5 - 1.9 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season. Apply to early instar larvae prior to boring into the ear or stalk.
esfenvalerate Asana XL *RUP*	0.04 - 0.05	7.8 - 9.6 fl oz	PHI = 21 days of grain. The sweet corn postharvest interval is 1 day.
gamma-cyhalothrin Proaxis *RUP*	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. When applying by air, apply in a minimum of 2 gals of water per acre.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
lambda-cyhalothrin Lambda-Cy *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. When applying by air, apply in a minimum of 2 gals of water per acre. The sweet corn postharvest interval is 1 day. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
lambda-cyhalothrin Warrior *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
methoxyfenozide Inteprid	0.06 - 0.12	4 - 8 fl oz	PHI = 21 days. Do not apply more than 16 fl oz per acre per application or 64 fl oz per acre per season. Apply at first sign of egg hatch or when infestations reach threshold levels.
methyl parathion Penncap-M *RUP*	0.5 - 1	2 - 4 pts	Apply when first eggs begin to hatch. May be applied by center pivot irrigation according to label restrictions. Observe label precautions for bees. Do not harvest, cut for forage, or graze within 12 days of application. The sweet corn postharvest interval is 5 days. Do not enter treated fields within 48 hours after application.
permethrin Ambush 2E Pounce 3.2E Pounce 1.5G Arctic 3.2E Permethrin 3.2EC Perm-Up 25 WP Perm-Up 3.2 EC *RUP*	0.1 - 0.2	 6.4 - 12.8 fl oz 4 - 8 fl oz 6.7 - 13.3 lbs 4 - 8 fl oz 4 - 8 fl oz 6.4 - 12.8 fl oz 4 - 8 fl oz	PHI = 30 days for grain. Do not apply more than 0.6 pounds ai per acre per season. The sweet corn postharvest interval is 1 day. Apply a minimum of 2 gals of finished spray per acre by air and 10 gals per acre by ground equipment.
phorate Phorate 20G *RUP*	1	5 lbs	Apply granules into whorl of plant prior to tassel emergence with air or ground equipment. PHI = 30 days of grazing or cutting for forage. Do not enter treated fields within 7 days after application.
spinosad (microbial) Success	0.047 - 0.094	3 - 6 fl oz	PHI = 28 days of grain or fodder harvest or within 7 days of forage harvest. Do not apply more than a total of 12 fl oz per acre per season.. Treat when pests appear, targeting eggs at hatch or small larvae. Use a higher rate in the rate range for larger larvae or moderate to severe infestations.
spinosad (microbial) Tracer	0.031 - 0.094	1 - 3 fl oz	PHI = 28 days of grain or fodder harvest or 7 days of forage harvest.
zeta-cypermethrin Mustang Max *RUP*	0.017 - 0.025	2.72 - 4 fl oz	PHI = 30 days for grain, 60 days for forage (silage). Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

GRASSHOPPERS

In the Northern Plains, grasshopper egg hatch normally begins in late April to early May. Peak hatch occurs about mid-June. Heavy infestations typically occur in areas of low rainfall or during drought years. Outbreaks are usually preceded by several years of hot, dry summers and warm autumns. Cool, wet weather increases disease occurrence and delays development of grasshoppers, reducing the overall population.

For more information on grasshopper management and treatment thresholds, refer to discussion under Small Grain Insects.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
beta-cyfluthrin Baythroid XL *RUP*	0.0165 - 0.022	2.1 - 2.8 fl oz	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
bifenthrin + zeta-cypermethrin Hero *RUP*	0.025 - 0.06	2.6 - 6.1 fl oz	PHI = 30 for grain, PHI = 60 days for forage. Do not apply more than 0.4 lb ai per acre per season. Do not graze livestock in treated area or cut treated crops for feed within 30 days of the last application.
bifenthrin Bifenture EC-CA *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
bifenthrin Capture 2EC *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.3 lb AI per acre per season.
bifenthrin Sniper *RUP*	0.033 - 0.10	2.1 - 6.4 fl oz	
carbaryl Sevin	0.5 - 1.5	rate varies by formulation	PHI = 48 days of grain harvest, or 14 days for silage or grazing. The lower rate range is suggested for nymphs on small plants or sparse vegetation. The higher rate range is suggested for mature grasshoppers or when material is applied to crops requiring greater coverage.
carbofuran Furadan 4F *RUP*	0.125 - 0.25	4 - 8 fl oz	PHI = 30 days of grain harvest or cut for forage. Do not make more than 2 foliar applications per season.
chlorpyrifos Lorsban 4E *RUP*	0.25 - 0.5	0.5 - 1 pt	PHI = 35 days. Do not feed treated corn fodder to meat or dairy animals within 35 day after last treatment. Do not allow meat or dairy animals to graze in treated areas nor harvested treated corn silage as feed for meat or dairy animals within 14 days after last treatment. Do not apply more than 6 pints per acre per season or more than 3 applications per season of any product containing chlorpyrifos. Apply by air, ground or chemigation (treatment through irrigation systems) in sufficient water for adequate coverage. REI = 24 hours.
chlorpyrifos Warhawk *RUP*	0.25 - 0.5	0.5 - 1 pt	

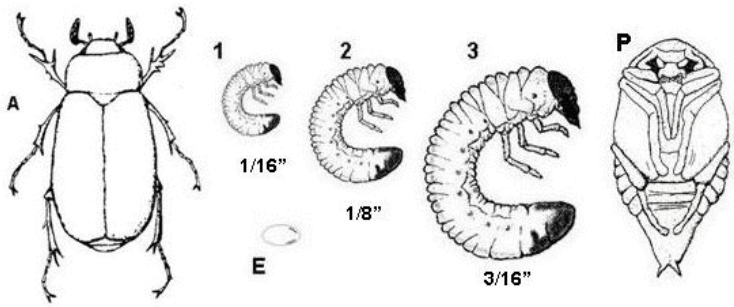
INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
chlorpyrifos Yuma 4E *RUP*	0.25 - 0.5	0.5 - 1 pt	
Chlorpyrifos + gamma-cyhalothrin Cobalt *RUP*	0.14 - 0.25 + 0.003 - 0.004	7 - 13 fl oz	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin Tombstone Tombstone Helios *RUP*	0.033 - 0.044	2.1 - 2.8	PHI = 21 days for grain or fodder; Green forage may be fed 0 days after last application. Maximum of 11.2 fl oz per acre per season. Maximum of 2.8 fl oz per acre between 7-day interval. Maximum number of applications per season = 4. Minimum application volume is 10 GPA by ground and 2 GPA by air.
deltamethrin Delta Gold *RUP*	0.012 - 0.018	1.0 - 1.5 fl oz	Apply a minimum of 2 GPA of water by air and 5 GPA of water by ground. PHI = 21 days, or within 12 days of cutting or grazing field corn for forage. Avoid application in the heat of day. Do not apply more than 8.1 fl oz per acre per season. Do not make more than 5 applications per season.
dimethoate Digon 400, Dimethoate 400	0.38	0.75 pt	PHI = 14 days of harvest or grazing. Do not make more than 3 applications per season. Do not apply to corn during pollen shed.
esfenvalerate Asana XL *RUP*	0.02 - 0.03 0.03 - 0.05	Low Rate: 3.9 - 5.8 fl oz High Rate: 5.8-9.6 fl oz	PHI = 21 days. A **reduced rate** has been issued as a state 2 (ee) label. The lower rates are for control of first- and second-stage grasshoppers ONLY. The reduced-rate application has a range of 3.9 - 5.8 fl oz. Asana XL may be used in bordering, non-crop areas not hayed or grazed. The higher rates are for control of grasshopper nymphs larger than 2nd instar.
gamma-cyhalothrin Proaxis *RUP*	0.01 - 0.015	2.56 - 3.84 fl oz	PHI = 21 days. When applying by air, apply in a minimum of 2 gals of water per acre. Proaxis may be used in bordering, non-crop areas that are not hayed or grazed.
lambda-cyhalothrin Lambda-Cy *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	PHI = 21 days. Do not allow livestock to graze in treated areas or harvest treated corn forage as feed for meat or dairy animals within 1 day after last treatment. Do not feed corn fodder or silage to meat or dairy animals within 21 days after last treatment. When applying by air, apply in a minimum of 2 gals of water per acre. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season. Do not apply more than 0.06 lb ai (7.68 fl oz) per acre after silk initiation. Do not apply more than 0.03 lb ai (3.84 fl oz) per acre after corn has reached milk stage (yellow kernels with milky fluid).
lambda-cyhalothrin Taiga Z *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	
lambda-cyhalothrin Warrior *RUP*	0.02 - 0.03	2.56 - 3.84 fl oz	Warrior may be used in bordering, non-crop areas that are not hayed or grazed (24 c label).
methyl parathion *RUP*	0.5	1 pt	PHI = 12 days of corn harvest. Do not enter treated fields within 48 hours after application. Fields must be posted.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
methyl parathion Penncap-M *RUP*	0.5 - 0.75	2 - 3 pts	PHI = 12 days, cut for forage, or grazing. Do not apply during pollen shed if bees are visiting the areas. Do not apply more than 12 pts/A per year. Do not enter treated fields within 48 hours after application.
zeta-cypermethrin Mustang Max *RUP*	0.017 - 0.025	2.72 - 4 fl oz	PHI = 30 days for grain, 60 days for forage (silage). Apply by air or by ground using sufficient water to obtain full coverage. Use a minimum of 2 gals per acre by air and 10 gals per acre by ground.

RUP - Restricted use pesticide

WHITE GRUBS (LARVAE)

White grubs that are destructive to field crops in North Dakota have a three-year life cycle. In southeast North Dakota, the most common white grub pest occurs in continuous cropping situations at sites where willow and cottonwood trees are present. In other areas of the state, white grubs are most likely to be found when rotation from grassland, pasture, or grassy weed sites occur. Most root feeding occurs in the second year of the life cycle. In most cases, the number of second-year grubs will only be great enough to justify control once every three years.



Life stages of Phyllophaga implicita: A - adult June beetle; E - egg; grub stages with their head width in inches, 1 - first; 2 - second; 3 - third; and P - pupa.

Thresholds:

Treatment is recommended when sampling indicates an average of one or more white grubs per square foot are found. The following sampling procedure provides treatment decisions based on this guideline.

Soil sampling . . . Sampling in late summer or early fall, before a freeze, provides a more reliable estimate of populations than spring sampling just before planting. Take soil samples, 1 square foot in size to a depth of 8 inches. Begin taking samples 45 yards from shelterbelts. A total of 30 samples per field, randomly spaced along the shelterbelts, are necessary. If at least a single grub is found in less than 40% of the samples, treatment may be required only out 20 yards from the tree line. If 40% to 60% of the samples are infested, treatment is needed to this distance and maybe as far as 65 yards. If greater than 60% of the samples are infested, treatment may be needed out to 90 yards from the tree line.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Bifenture EC-CA *RUP*	0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	

INSECTICIDE		DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Capture 2EC	*RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.1lb AI per acre per season as an at plant application. Apply as a 5- to 7-inch T-band over an open seed furrow. Position spray nozzle behind the planter shoe, in front of press wheel. Apply in a min. of 3 gals finished spray per acre.
bifenthrin Sniper	*RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	
bifenthrin Capture LFR	*RUP*	0.04 - 0.08 0.0023 - 0.0046 lb active per 1000 linear feet of row	3.4 - 6.8 fl oz 0.20 - 0.39 fl oz per 1000 linear feet of row	Apply as a 5-7 inch band over an open furrow (T-band), or in-furrow with the seed. Do not apply more than 0.1 lb ai per acre per season as an at-plant application. Do not apply more than 0.3 lb ai per acre per season including at-plant plus foliar application of other bifenthrin products (such as Capture 2EC).
chlorethoxyfos Fortress 2.5 G Fortress 5 G	*RUP*		2.5 G: 6 oz/1,000 ft of row - any row spacing 5 G: 3 oz/1,000 ft of row - any row spacing	Apply as a T-band or in-furrow at planting. Do not apply as a surface band behind the press wheel. Granules exposed on the soil surface must be incorporated. Crop rotational intervals: corn - anytime; other crops - 30 days.
chlorpyrifos Lorsban 4E	*RUP*	-	2.4 fl oz/1,000 ft of row	Apply in a T-band or in-furrow in front of press wheels at planting time or at time of cultivation with no more than 30% cover of crop residue remaining on the soil surface. Use a minimum of 5 GPA. Not more than 1 application per season. Incorporate into top 0.5 to 1 inch of soil using chains or tines behind press wheel. REI = 24 hours.
chlorpyrifos Warhawk	*RUP*	-	2.4 fl oz/1,000 ft of row - any row spacing	
chlorpyrifos Yuma 4E	*RUP*	-	2.4 fl oz/1,000 ft of row - any row spacing	
chlorpyrifos Lorsban 15 G	*RUP*	1 - 2	8-16 oz/1,000 ft of row - any row spacing	Apply in-furrow at planting time. (NDSU research indicates that Lorsban aids in white grub suppression. With heavy white grub infestation, some stand reduction may still occur.)
Chlorpyrifos + gamma-cyhalothrin Cobalt	*RUP*	0.06 + 0.0001	2.87 fl oz per 1,000 ft of row	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin + tebupirimiphos Aztec 2.1 G	*RUP*	6.7 oz	6.7 oz/1,000 ft of row - any row spacing	May be applied at planting as band, T-band or in furrow treatment. Cover or incorporate spills. Do not use on other crops grown for food or forage.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
fipronil Regent 4SC *RUP*		See label for correct rate. 4.16 fl oz per acre or 0.24 fl oz per 1,000 row feet for 30 inch row spacing	PHI = 90 days. Do not plant small grains or other rotational crops within 12 months following application. Make one in-furrow application at planting time only. Do not apply this product through any kind of irrigation system.
lambda-cyhalothrin Lambda-Cy *RUP*	0.005 (at plant)	0.66 fl oz (at plant)	PHI = 21 days. Do not harvest or graze livestock or cut treated crop for feed within 21 days of at plant application. Do not apply more than 0.09 lb ai (0.72 pt) per acre per crop at plant. Do not apply more than 0.12 lb ai per acre per crop from at plant and foliar application. For banded application - Make application at planting as a 5-7 inch T-band sprayed across the open seed furrow between the furrow openers and the press wheel. For In-furrow application - Make application into the seed furrow through spray nozzle or microtubes, behind the planter furrow openers and in front of the press wheel. Apply a minimum of 3 GPA.
tefluthrin Force 1.5 G Force 3 G *RUP*	0.1 - 0.125	1.5 G: 8-10 oz *or* 3 G: 4 - 5 oz/1,000 ft of row - any row spacing	Apply in a 7-inch band or in-furrow behind the planter shoe in front of the press wheel.
terbufos Counter 15 G *RUP*	1 - 2	8-16 oz/1,000 ft of row spacing - any row spacing	Apply in a 7-inch band (1 to 2 lb rate). Do not apply Accent or Beacon herbicide to corn treated with Counter 15 G.

RUP - Restricted use pesticide

WIREWORMS

Wireworms are most likely to be problems when corn follows pasture or grassland. Continuous corn has developed problems in the past, also. Infestations often are found in coarse textured soils (sandy loam) where moisture is abundant, perhaps in low spots of fields.

Thresholds:

There is no easy way to estimate wireworm infestations. Two methods are currently used.

Soil Sampling . . . Sample 20, well spaced, 1 square foot sites to a depth of 4 to 6 inches for every 40 acres being planted. If an average of 1 wireworm per square foot is found, treatment would be justified.

Solar Baiting . . . In September, establish bait stations for 2 to 3 weeks before freeze. Place bait stations randomly through the field, but representing all areas of the field. There should be 10 - 12 stations per 40 acre field. Place one cup wheat and one cup shelled corn in a 4- to 6-inch deep hole. Cover grain with soil and then an 18-inch square piece of clear plastic. Dig up the grain. If an average of one or more wireworm larvae are found per station, treatment would be justified.

Seed Treatment . . . Seed treatments and/or planter box treatment available for use on corn for managing wireworm. Please the seed treatment section in the introduction for more information.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Bifenture EC-CA *RUP*	0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	Do not apply more than 0.2 lb AI per acre per season.
bifenthrin Tundra EC *RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	

INSECTICIDE		DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
bifenthrin Capture 2EC	*RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	PHI = 30 days. Do not graze livestock in treated areas or cut treated crops for feed within 30 days of last application. Do not apply more than 0.1lb AI per acre per season as an at plant application. Apply as a 5- to 7-inch T-band over an open seed furrow. Position spray nozzle behind the planter shoe, in front of press wheel. Apply in a min. of 3 gals finished spray per acre.
bifenthrin Sniper	*RUP*	0.0023 - 0.0046 lb ai per 1,000 ft of row	0.15 - 0.3 fl oz/1,000 ft of row	
bifenthrin Capture LFR	*RUP*	0.04 - 0.08 0.0023 - 0.0046 pounds active per 1000 linear feet of row	3.4 - 6.8 fl oz 0.20 - 0.39 fl oz per 1000 linear feet of row	Do not apply more than 0.1 pound active per acre per season as an at-plant application. Do not apply more than 0.3 pound active per acre per season including at-plant plus foliar applications of other bifenthrin products (such as Capture 2EC). Apply as a 5-7 inch ban d over the open furrow (T-band), or in-furrow with the seed.
chlorethoxyfos Fortress 2.5 G and 5 G	*RUP*		2.5 G: 6 oz/1,000 ft of row - any row spacing 5 G: 3 oz/1,000 ft of row - any row spacing	Apply as a T-band or in-furrow at planting. Do not apply as a surface band behind the press wheel. Granules exposed on the soil surface must be incorporated. Crop rotational intervals: corn - anytime; other crops - 30 days.
chlorpyrifos Lorsban 4E	*RUP*	2	4 pts	Broadcast PPI application in sufficient water to the soil surface and incorporate into the soil. Not more than 1 application per season. Incorporate into top 0.5 to 1 inch of soil using chains or tines behind press wheel. REI = 24 hours.
chlorpyrifos Warhawk	*RUP*	2	4 pts	
chlorpyrifos Yuma 4E	*RUP*	2	4 pts	
chlorpyrifos Lorsban 15 G	*RUP*	1.2 - 2.4	8 - 16 oz/1,000 ft of row	T-Band or in-furrow at planting. If high wireworm numbers are anticipated, add insecticide seed treatment to planter box to augment control.
Chlorpyrifos + gamma-cyhalothrin Cobalt	*RUP*	0.06 + 0.0001	2.87 fl oz per 1,000 ft of row	PHI = 21 days for forage and ears, 14 days for forage and silage (meat and dairy animals). Do not make more than 3 applications or apply more than 126 fl oz per season. See label for other restrictions.
cyfluthrin Tombstone	*RUP*	0.12 - 0.16	2.0 - 2.8 fl oz	PHI = 21 days for grain or fodder. Green forage may be fed 0 days after last application. Maximum allowed per 7 day interval: 2.8 fl oz per acre. Maximum allowed per crop season: 11.2 fl oz per acre. Total mix volume should be applied in the open furrow ahead of the closing wheels for optimum coverage.
cyfluthrin + tebupirimiphos Aztec 2.1 G	*RUP*	0.12 - 0.15	6.7 oz/1,000 ft of row - any row spacing	May be applied at planting as band, T-band, or in-furrow treatment. Cover or incorporate spills (including end-row spillage). Do not use on other crops grown for food or forage.

INSECTICIDE	DOSAGE IN LB AI/ACRE	PRODUCT PER ACRE	RESTRICTIONS ON USE
ethoprop Mocap 10 G *RUP*	1	12 oz/1,000 ft of row - any row spacing	Apply in a 7-inch band at planting. Do not apply in contact with seed!
fipronil Regent 4SC *RUP*		See label for correct rate. 3 fl oz per acre or 0.17 fl oz per 1,000 row feet for 30 inch row spacing	PHI = 90 days. Do not plant small grains or other rotational crops within 12 months following application. Make one in-furrow application at planting time only. Do not apply this product through any kind of irrigation system.
gamma-cyhalothrin Proaxis *RUP*		0.66 fl oz per 1,000 ft of row	May be applied as a 5- to 7-inch T-band or in the seed furrow. **For Suppression Only.**
lambda-cyhalothrin Lambda-Cy *RUP*	0.005 (at plant) (suppression)	0.66 fl oz (at plant) (suppression)	PHI = 21 days. Do not harvest or graze livestock or cut treated crop for feed within 21 days of at plant application. Do not apply more than 0.09 lb ai (0.72 pt) per acre per crop at plant. Do not apply more than 0.12 lb ai per acre per crop from at plant and foliar application. For banded application - Make application at planting as a 5-7 inch T-band sprayed across the open seed furrow between the furrow openers and the press wheel. For In-furrow application - Make application into the seed furrow through spray nozzle or microtubes, behind the planter furrow openers and in front of the press wheel. Apply a minimum of 3 GPA.
lambda-cyhalothrin Taiga-Z *RUP*	0.005 lbs ai/1000 ft of row	0.66 fl oz/1000 ft of row	Apply at planting as an in-furrow treatment or 5-7 inch T-band for the control of wireworms. Apply into the seed furrow. May be applied in either water or liquid starter fertilizer. Do not harvest or graze livestock or cut treated crops for feed within 21 days of at plant application. Do not apply more than 0.09 lb ai (11.52 fl oz) per acre per season at planting. Do not apply more than 0.12 lb ai (15.36 fl oz) per acre per season from at plant and foliar applications.
lambda-cyhalothrin Warrior *RUP*	0.0008 lbs ai/1000 ft of row	0.1 fl oz/1000 ft of row	Reduced Warrior application rates given in FIFRA Section 2(ee) recommendation for North Dakota, 22 April 2004.
permethrin Perm-Up *RUP*		0.3 oz per 1, 000 linear ft of row	Apply as an in-furrow, band or T-band treatment using a minimum 4 inch band.
phorate Thimet 20 G *RUP*	1	6 oz/1,000 ft of row - any row spacing	Place granules in a 7-inch band over the row directly behind the planter shoe in front of the press wheel. Do not place Thimet in direct contact with seed!
tefluthrin Force 1.5 G and 3 G *RUP*	0.1 - 0.125	1.5 G: 8-10 oz /1,000 ft of row 3 G: 4 - 5 oz/1,000 ft of row - any row spacing	Apply in a 7-inch band or in-furrow behind the planter shoe in front of the press wheel. Do not rotate to another crop within 30 days after application.
terbufos Counter 15 G *RUP*	1	8 oz/1,000 ft or row - any row spacing	Apply in a 7-inch band or in-furrow at planting. Do not apply Accent or Beacon herbicide to corn treated with Counter 15 G.

RUP - Restricted use pesticide