

Crop Profile for Corn (Sweet) in Illinois

Prepared October, 2000

General Production Information

Production Facts⁽¹⁹⁹²⁾	
Processed Sweet Corn	
Acres Used:	38,900
Value of Production:	\$15,7000,000
Fresh Market Sweet Corn	
Acres Used:	8,000
Value of Production:	\$8,800,000
Number of Operations:	288

Cultural Practices

Sweet corn is grown throughout Illinois. Reported acres are mainly those where the crop is sold for commercial use. An undetermined number of sweet corn acres is used for fresh market sweet corn as roadside stands are popular within the state. Sweet corn is planted on similar schedule as field corn. Fields are generally tilled as weed competition decreases with tillage and the need for herbicide treatments also decrease. Sweet corn fields may also be fertilized similar to field corn.

Commercial acres are treated with pesticides similarly to field corn with the exception that weed treatments occur mainly at preemergence. Insect control is very important due to consumer intolerance at the time of purchase.

Sweet corn is harvested before any kernal denting occurs. Small acreages employ manual labor for hand picking ears from the plant. Larger commercial acreages use mechanical means to harvest the ears before maturity so that the kernals remain tender. For processed sweet corn, much of the harvest is iced

to retain high sugar content within the kernels before reaching the processing facilities.

Over mature crops may be harvested as cattle fodder or used for corn silage.

In a typical year, the major insect pests can cause severe economic damage in 15% or more of the total acreage. The type of injury that each pest inflicts is different, and the occurrence of the insect and damage caused by each insect vary significantly from year to year and region to region.

Crop Loss and % of Area Infested by Insects

Common Name	Scientific Name	% Acres Loss*	Acres Infested*
Black Cutworm	<i>Agrotis ipsilon</i>	5%	14,204
Corn Earworm	<i>Helicoverpa zea</i>	4%	39,306
Corn Leaf Aphids	<i>Rhopalosiphum maidis</i>	12.5%	8,522
Corn Rootworm, Northern	<i>Diabrotica barberi</i>		
Corn Rootworm, Western	<i>Diabrotica virgifera</i>	0.4%	53,522
European Corn Borer	<i>Ostrinia nubilalis</i>	2.2%	54,997
Fall Armyworm	<i>Spodoptera frugiperda</i>	2.1%	32,098
Flea Beetles	<i>Disonycha triangularis</i>		
Japanese Beetle	<i>Popillia japonica</i>		
Sap Beetle	<i>Carpophilus lugubris (Murray)</i>		

*Based on U.S. Averages

Black Cutworm

Black cutworm adult moths migrate to southern Illinois from March-May and lay eggs in vegetation in or around cornfields. The eggs hatch and larvae feed on available vegetation, Earlier instars feed on corn

leaves; later instars cut the plants off near the ground. Fields subject to cutworm infestation often have preplant infestations of weeds, heavy surface debris, poor drainage, or a history of cutworm damage. An annual average of 3% of all fields are treated with post harvest insecticides, and up to 7% of acreage is treated with preplant or preplant-incorporated insecticide applications. Postemergence rescue treatments are justified when 3% or more of plants are cut and larvae are still present; preventative treatments are best utilized in no-till systems or where cutworm damage forces replanting of field.

The most harmful cutworms, including the black cutworm, are those that cut off and feed on young seedlings. Young cutworm larvae (first through third instars) are very small, and the larvae feed primarily on corn leaves. This injury is not economic. Older cutworm larvae (fourth and later instars) cut the plants off at, just below, or just above the soil surface. If the growing point is destroyed or the plant is cut below the growing point, the plant will not survive. Large numbers of black cutworms can drastically reduce the plant populations.

Although some growers apply soil insecticides to prevent an infestation of cutworms, this practice is usually not justified economically throughout most of the Corn Belt. Densities of cutworms are sporadic and difficult to predict. Consequently, most growers now scout their cornfields, looking for the presence of cutworms and their injury, and apply a "rescue" or therapeutic insecticide if the numbers of cutworms found exceed established economic thresholds.

Corn Earworm

The adult earworms are about 1/4 inch long and have a wing span of 1-1.5 inches. Their color ranges from green, to tan, to dark brown. Females deposit eggs on the foliage, where they hatch within 5-7 days. The egg laying occurs throughout the sweet corn growing season. Larvae cause damage to the corn by feeding deep inside the whorls, causing holes that measure 1-2 inches across. Proper timing for applying chemical controls is critical. Begin to treat sweet corn during the silkening stage, at the start of egg hatch.

Corn Leaf Aphids

Winged corn leaf aphids are blown into Illinois by the prevailing winds. Hot, dry weather is unfavorable for natural enemies and can lead to severe infestations of aphids. Heavy infestations will wilt, curl, and cause necrosis of the upper leaves. Aphids excrete honeydew, which coats leaves and reproductive structures and may interfere with pollination. Certain varieties of corn favor aphid survival and may have up to 9 generations a year.

Corn Rootworm, Northern and Corn Rootworm, Western

The larvae of corn rootworm beetles cause the most economic damage every year in Illinois. The larvae overwinter in the soil and undergo three instars while feeding on corn roots, causing lodging and reducing nutrient and water uptake. It is estimated that of the 11,200,000 acres in Illinois corn about

200,000 acres are treated annually for corn rootworm.

The corn rootworm complex consists of four species: Mexican corn rootworm (*Diabrotica virgifera zeae* Krysan & Smith), northern corn rootworm (*D. barberi* Smith & Lawrence), southern corn rootworm (*D. undecimpunctata howardi* Barber), and western corn rootworm (*D. virgifera virgifera*). Corn rootworm larvae chew on and tunnel inside or along the roots during the summer months. As they feed, the larvae prune roots back to the stalk. Extensive feeding weakens the root systems. Injured plants cannot take up water and nutrients efficiently and are susceptible to lodging. Yield losses are a result of both root pruning and lodging.

Management of corn rootworms is usually accomplished by crop rotation or the use of soil insecticides to prevent severe injury to the roots. A corn-soybean rotation usually provides excellent control of rootworm larvae because the larvae survive only on corn roots, rootworm adults do not lay many eggs in soybeans, and rootworms complete only one generation each year. A corn-soybean rotation may fail to control rootworms when volunteer corn plants in a soybean field attract egg-laying beetles or when rootworms exhibit prolonged diapause, a biological phenomenon that allows some eggs, primarily those of northern corn rootworms, to remain dormant in the soil for more than one winter. This trait has become more common in Illinois within the last few years.

Corn planted after corn is susceptible to injury by corn rootworm larvae, depending upon the size of the rootworm population. Most producers who grow corn after corn in the Corn Belt usually apply a soil insecticide at planting time to protect the corn roots from larval feeding injury. Most growers apply granular insecticides in either a seven-inch

European corn borer

First generation corn borer larvae feed on foliage and bore into the stems of whorl-stage plants. Second-generation larvae tunnel into ears, ear stalks, and stalk which causes breakage, lodging, stress, and can significantly reduce yield. It has been estimated that at least 10% of cornfields are infested every year by 3 or more larvae per plant, and that this level of damage causes an estimated 9 to 16% yield loss annually. Annually, from 2-5% of acres are treated in Illinois for corn borer. During outbreak years, as many as 1 millions acres have been treated.

Fall Armyworm

Fall Armyworms overwinter in southern states because they cannot overwinter in locations where the ground freezes. Larvae range in color from light tan to black. They have a distinct inverted Y on the front of their head capsule. Fall Armyworms reach lengths of 1-1^{1/2} inches.

Flea Beetle

The different species of flea beetles include the potato flea beetle, the threespotted flea beetle, and the

palestriped flea beetle. The potato beetle is a small shiny black beetle. The threespotted beetle has an orange colored thorax which has three dark spots on it. The palestriped beetle is dark brown and has two ivory colored stripes running vertically down its wings. All flea beetles have enlarged hind legs which allow them to jump when disturbed. Flea beetles cause damage to sweet corn as they feed on the leaves. They leave numerous amounts of small holes behind, which can cause the sweet corn to die. In order to control the beetles, fields should be kept weed-free, particularly of field bindweed and mustard, as they are preferred hosts of flea beetles.

Japanese beetle

The Japanese beetles are very strong fliers. They are about 5/8 inch long and overwinter as a larva or grub in soil. In most cases, it's around July when the adults emerge from the soil in great numbers and feed heavily upon foliage. Soaking rains can also cause damage, as it urges successive invasions by the beetles. If effective insecticides are not used, or used in time, beetles from afar will tend to make their way to the fresh vegetables.

Sap Beetle

As an adult, the sap beetle overwinters in soil or debris. The adult sap beetle is usually 1/8 inch long, and black. The adults feed on ripening pollen and chew tassels. The larvae can cause damage by eating into the kernels of roasting ears. Remove damaged ears as soon as possible. Control with a recommended pesticide.

Insecticide Rates, MOA, REI, PHI and Target Insects

Trade Name	Common Name	Rate/Acre		Unit	MOA*	REI	PHI	Primary Target
		Low	High					
Ambush, Pounce	permethrin	0.1	0.2	lb		12	1	cutworms, flea beetles, European corn borer, corn earworm,
Asana	esfenvalerate	0.03	0.05	lb		12	1	cutworms, flea beetles, corn earworm
Aztec	cyfluthrin +tebupirimphos	see label				0	P	corn rootworm

Baythroid	cyfluthrin	0.0125	0.044	lb		12	0	cutworms, european corn borer, corn earworm, fall armyworm
Capture	bifenthrin	0.033	0.10	lb		18 fresh market 24 processing only	1	flea beetles, european corn borer, corn earworm, fall armyworm
Counter G	terbufos	0	1	lb			P	corn rootworm
Dyfonate G	fonofos	0	1	lb			P	corn rootworm
Force 1.5G and 3G	tefluthrin	3	5	oz/1,000 ft row		0	P	corn rootworm
Furadan	carbofuran	0	2.5	fl/oz		48	P	flea beetles
Lannate	methomyl	0.23	0.45	lb		48	0	corn earworm, fall armyworm
Lorsban	chlorpyrifos	1	1.5	lb		24	35	cutworms, flea beetle,
Lorsban G	chlorpyrifos	0	1	lb		12	P	corn rootworms
Sevin	carbaryl	1	2	lb	Carb	12	2	sap and picnic beetles, corn earworm, european corn borer, japanese beetle, flea beetles

SpinTor	spinosad	0.023	0.094	lb		4	1	fall armyworm, corn earworm, european corn borer,
Thimet G	phorate	0	1	lb		48-72	P	corn rootworm
Warrior	lambda-cyhalothrin	0.02	0.03	lb		24	1	cutworms, flea beetles, european corn borer, corn earworm, fall armyworm
None	diazinon	0	1	lb			7	sap and picnic beetles
None	malathion	0	1	lb			5	sap and picnic beetles, corn leaf aphid

P=apply at or before planting or as early in season side-dress according to label

Diseases

For sweetcorn, the most frequently cited diseases and pathogens are:

- leaf blights (Stewart's wilt and blight)
- viruses (Maize dwarf mosaic)

In Illinois, farmers are utilizing conventional tillage systems that assist in disease and weed control. Fusarium species of fungi, in particular, increase when residues are present. These fungi are common root rotters and also invade corn stalks, causing stalk rots. Many leaf blights and rusts are spread through plant residue.

Corn seeds are treated to avoid infection by disease spores in the air and on the seed coat. Essentially all

hybrid corn seed is treated with a broad-spectrum protectant fungicide that adds very little additional cost to production. Some foliar spraying may be necessary.

Avg. % Crop Loss and Avg. Acres Infested by Diseases

Common Name	Scientific Name	Avg. % Crop Loss*	Avg. Acres Infested*
Common Rust	<i>Puccinia sorghi</i>		
Common Smut	<i>Ustilago Maydis</i>		
Maize Dwarf Mosaic Virus	<i>MDMV</i>		
Northern Corn Leaf Blight	<i>Exserohilum turcicum</i>		
Stewart's Wilt and Blight	<i>Erwinia stewartii</i>		

*Based on US Averages

Common name: Common rust

Aggravating factors:

- Cool temps. (65-75°)
- Light rains, heavy dews, and high humidity.

How disease is spread:

- Urediniospores are windblown from previously infected leaves.

Loss range: 0-50% (depending on environment and resistance)

Control:

1. Plant moderately resistant varieties.
2. Foliar fungicides may be applied (apply a recommended fungicide).

(RPD : no. 965)

Common name(s): Common Smut⁷

Aggravating factors:

- Injury from hail, cultivators, etc.

Control:

1. Avoid mechanical injury.
2. Provide well-balanced soil fertility.

Common name(s): Maize Dwarf Mosaic Virus⁸

Scientific name: *MDMV*

How disease is spread:

-Vectors

Comments:

- Early infections may expose sweetcorn to root and stalk rots cause premature death.
- Symptoms can appear in the field within 30 days after seedling emerge.

Control:

1. Use resistant hybrids.
2. Control rhizome Johnsongrass or other overwintering weed hosts.

Common name(s): Northern Corn Leaf Blight⁸

Aggravating factors:

- Wet, cool, humid weather.

How disease is spread:

- Airborne spores.
- Infected crop residue.

Comments:

- Can cause premature death and a gray frosted appearance.
- Usually infects during or after pollination.

Control:

1. Use resistant hybrids.
2. Use a foliar fungicide.
3. Cleanly plow under infected residue.

Common name(s): Stewart's wilt and blight

Distribution: East to mid-west

Aggravating factors:

- Dry weather
- Above 30° average for Dec., Jan., and Feb.(this is when beetles migrate)

How disease is spread:

- Overwinters in corn flea beetles

Comments:

- The beetles carry and transmit the disease as long as they like.

Loss range: up to 90% (following mild winters)

Control:

1. Grow well-adapted, wilt-resistant varieties.
2. Where beetles are a problem, an approved insecticide may help reduce disease.
3. Delayed or later plantings may have less flea beetle activity than if planted early in the season.
4. Plant disease-free seed.

(RPD : no. 907)

Fungicides and Target Diseases

Trade Name	Common Name	Rate		Unit	REI	PHI	Target
		low	high		hrs	days	
Captan 30-DD, Captan 400	captan				112		seed rot, seedling blights, seedborne diseases
Counter 15G	terbufos	0	6	oz/1,000 ft row	48		nematodes
Maxim 4FS	fludioxonil	0	0.8	fl oz/100 lb seed			seedling blights
Mocap	ethoprop	1.4	2.9	fl oz/1,000 ft row	48		nematodes
Tilt	propiconazole	0	4	fl oz	24		leaf blights
various	thiram						seed rot, seedling blights, seedborne diseases

Weeds

Weeds will be present in every field every year. The severity of populations is determined by local field management conditions such as tillage, crop rotations, and herbicide use. The prevalence of specific weeds throughout the state is dependent upon soil type, rainfall and moisture, temperatures, and day-length for the region. Losses attributed to weeds in field corn average from 3 to 7 percent annually, but in sweet corn total losses can be 35 percent or more.

Avg. Crop Loss and % Crop Area Infested by Weeds

Weed Name	Scientific Name	% Ill. Acres Infested	% Acres Loss*	Avg. Acres Infested*
Barnyardgrass	<i>Echinochloa crusgalli</i>	30	4.5%	18,181
Black nightshade	<i>Solanum ptycanthum</i>	30	0.7%	3,409
Common cocklebur	<i>Xanthium strumarium</i>	90	0.5%	4,950
Common lambsquarters	<i>Chenopodium album</i>	90	1.8%	3,257
Common milkweed	<i>Asclepias syrica L.</i>	32	11.9%	400
Common ragweed	<i>Ambrosia artemisifolia</i>	90	0.5%	2,500
Crabgrass	<i>Digiteria spp.</i>	60	0.5%	4,950

Fall panicum	<i>Panicum dichotomiflorum</i>	60	3.2%	28,693
Giant foxtail	<i>Setaria spp.</i>	95	0.6%	1,704
Giant ragweed	<i>Ambrosia trifida</i>	90	5.2%	500
Jimsonweed	<i>Datura stramonium</i>	80	0.5%	4,950
Morningglory	<i>Ipomoea spp.</i>	70	0.5%	4,950
Pigweed spp.	<i>Amaranthus spp.</i>	90	0.5%	15,937
Shattercane	<i>Sorghum bicolor L. Moench</i>	40	1.1%	2,272
Velvetleaf	<i>Abutilon theophrasti</i>	90	5.6%	2,272
Wild Proso Millet	<i>Panicum miliaceum</i>	30	2.5%	14,070

*Based on U.S. Averages

Barnyardgrass

This summer annual germinates from 0 to 5 inches deep in the soil. The seeds remain viable for several years, and plants may emerge throughout the summer. Barnyardgrass is most troublesome in low, moist, warm areas.

Black Nightshade

This summer annual can produce thousands of berries; each berry contains up to 50 seeds. While nightshade is generally not considered a serious pest in Illinois, severe infestations in individual fields do occur. Tillage and row cultivation are effective for early, newly emerged seedlings.

Common Cocklebur

Common cocklebur is a summer annual weed. Its seeds are spread by attaching to animal fur or by tillage or harvesting equipment. Cocklebur is a serious competitor for moisture. Cultivation, tillage, and mowing will all help control cocklebur establishment.

Common Lambsquarters

Common lambsquarters produce numerous small seeds which germinate after an overwintering process. Optimal temperature for germination is 70F, but can germinate between 40 to 94, which suggests early germination capabilities. Survival is favored by rains which dilute or leach herbicides from the soil surface.

Common Milkweed

This perennial weed reproduces by seeds and adventitious buds that sprout from underground roots. Seedlings produce vegetative buds 18-21 days after germination, and seeds may remain viable for up to three years. Seeds may germinate from as deep as 2 inches in the soil, and undisturbed fields or fields with reduced tillage and moist soils are favored. Problems with common milkweed have been increasing due to the decrease in tillage and row cultivation.

Common Ragweed

Common ragweed is a summer annual that is favored by moist soils and can be a serious problem in individual fields. Control of common ragweed with tillage or row cultivation is effective in controlling small seedlings.

Crabgrass

A warm season grass most often troublesome in the southern and southeastern part of the state. The plants generates stolons and may result in a severe infestation from a single plant. May be most severe during the late part of the growing season after herbicides have degraded or and holes remain in the canopy. Tillage and row cultivation also help control.

Fall Panicum

Fall panicum is a summer annual that grows best in warm, wet, fertile soils. The plant tillers profusely and in late August and September the tillers open and scatter hard-coated seeds. These seeds may remain viable for years, and fall panicum is most often a problem in reduced or no-till fields whose undisturbed soils are favorable for germination. Fall panicum has shown some resistance to atrazine, and is one of the most serious grass weeds in the state.

Giant Foxtail

The three species of foxtails in Illinois are giant foxtail (*Setaria faberi*), green foxtail (*S. viridis*) and yellow foxtail (*S. glauca*). Giant foxtail is the most competitive of the three species. Foxtails are considered the most important weeds species in Illinois. One plant may produce several heads with 500-1000 seeds per head that can germinate in one to several years after production. These plants are adapted to most Illinois conditions, tend to grow in clumps that compete with crops and make cultivation and plowing difficult. All foxtails are more serious in reduced and no-till fields.

Giant Ragweed

Wet weather favors giant ragweed, and this summer annual may be a severe problem in isolated fields.

The seeds of giant ragweed may remain viable in the soil for several years. Small seedlings can be controlled with row cultivation and tillage.

Jimsonweed

Jimsonweed produces several hundred hard-coated seeds per plant which may remain viable in the soil for years. This summer annual grows best under warm temperatures and moist soils. Jimsonweed infestations harm soybean crops via competition for water, especially in dry years. The shade of its leaves in shorter crops increases yield loss due to decreased nutrient uptake. Jimsonweed also contains the alkaloids, atropine, hyoscyamine, and hyoscine, which are toxic. Even small amounts of jimsonweed can cause harvest problems.

Morningglories

Tall morningglory and ivyleaf morningglory are the two major annual morningglory species found on Illinois soils. The seeds of these summer annuals may survive for several years in soil. Infestations are most common in moist soils along river bottomland, but these plants can be found most anywhere in the state. Annual morningglories adapt to crops by vining about the crop, so shading by the canopy is not particularly successful in reducing growth. Newly emerged seedlings can be controlled by tillage and cultivation, but this may result in conditions that favor emergence by weeds deeper in the soil profile. After vines begin to twine about the stems of the crop, cultivation may not be as effective.

Pigweeds

Pigweeds are prolific seed producers, and one female can produce over 100,000 seeds in one growing season. The seeds of this plant may remain viable for years. Pigweeds are a problem in no-till systems because undisturbed soils favor germination of the minuscule seeds, and the debris keeps the field moist and allows for extended germination. Other favorable germination locations are where excess nitrogen is available, and where no soil applied herbicides have been used. Localized populations of some biotypes of pigweed have shown triazine or acetolactate synthase (ALS)-inhibitor resistance.

Shattercane

Shattercane is an annual which reproduces by seed. Mature plants range in height from 3 to 12 feet. The plant grows best on fertile, productive cropland. Fields may become infested by shattercane from maize, livestock, birds, machinery, runoff water, and irrigation water. Heavy infestations may nearly eliminate the yield. For the most effective control of shattercane, the seedbed must be well prepared prior to the use of a soil-applied herbicide. Other control measures include using crop rotation, cost-effective herbicides, cultivation, and ridge-planting.

Velvetleaf

Velvetleaf is the most significant annual broadleaf weed in Illinois corn, most damaging in the Northern and Central parts of the state. Velvetleaf is a serious competitor for moisture in drought conditions. Cultivation can somewhat control velvetleaf when used in the early season.

Wild Proso Millet

The wild proso millet is a rapidly growing annual, reproducing by seed. The seed can be distributed by irrigation water, harvesting equipment, waterfowl, and livestock. Seed germination occurs in the spring and throughout the summer when the soil temperatures reach 68°. Wild proso millet plants can produce 400 to 12,000 seeds per square foot. The plants can grow from 2 to 6 feet tall. Wild proso millet is difficult to control once established. For best control, combine early season cultivation with either preplant or postemergence herbicides.

Herbicide Rates, MOA, REI, PHI and Primary Target

Trade Name	Common Name	Product rates		Unit	MOA	REI	PHI	Primary
		low	hi					
Preemergence								
AAtrex 4L	atrazine	3.2	4	pt		12		
AAtrex Nine-O	atrazine	1.8	2.2	lb		12		
Bladex 80WP	cyanazine	1.5	6.0	lb				Grass/BL
Bladex 90DF	cyanazine	1.3	5.3	lb		12		Grass/BL
Bladex 4L	cyanazine	1.25	4.75	qt		12		Grass/BL
Dual 8EC	metolachlor	1.5	3	pt				Grass/BL
Eradicane Extra 6.7EC	EPTC+safener+extender	4	8	pt		12		Grass/BL
Frontier 6EC	dimethenamid	13	25	fl oz		12		Grass/BL
Lasso 4EC	alachlor	2	4	qt		12		Grass/BL
Prowl 3.3EC	pendimethalin	1.2	3.6	pt		24		Grass/BL
Sutan 6.7EC	butylate+safener	2.5	3.5	qt				Grass
Postemergence								
2,4-D amine	2,4-D	0.5	1	pt		48		BL
AAtrex 4L	atrazine	1	1.5	pt		12		
AAtrex 80WP	atrazine	0	1.8	lb		N/A		

AAtrex Nine-O	atrazine	0	1.6	lb		12		
Accent 75SP	nicosulfuron	0	0.6	oz				Grass/BL
Basagran 4S	bentazon	1.5	2	pt		12		BL
Stale seedbed								
Roundup Ultra	glyphosate	1.5	2	pt		4		Grass/BL

Contacts

David Pike

S-310 Turner Hall
University of Illinois
1102 S. Goodwin
Urbana, IL. 61801
(217) 333-4424

John Masiunas

260 PABL
University of Illinois
Urbana, IL. 61801
(217) 244-4231

Rick Weinzierl

S-522 Turner Hall
University of Illinois
1102 S. Goodwin
Urbana, IL. 61801
(217) 333-6651

References

1. Anonymous. 1997. Illinois Agricultural Pest Management Handbook, 1997. University of Illinois at Urbana-Champaign, College of Agricultural, Consumer, and Environmental Sciences Cooperative Extension Service, 400 pages.
2. Pike, D.R., W.H. Kuhlman, W.H. Luckmann, M.C. Shurtleff, K.L. Steffey. 1992. Illinois Pest Profiles. Illinois Natural History Survey, Urbana, IL. 95 pages.
3. Spencer, J., 1998. Behavioral Change And High Populations Suggest Rootworm Problem. In 1998 College of Agricultural, Consumer and Environmental Sciences University of Illinois at Urbana-Champaign Information Services News and Public Affairs. <http://www.ag.uiuc.edu/news/articles/884787024.html>
4. Pike, D. R., H. W. Kirby, and S. T. Kamble. 1993. Distribution and Severity of Pests in the Midwest. University of Illinois, College of Agricultural, Consumer, and Environmental Sciences,

5. Pike, D. R. 1998. The occurrence and densities of weeds in Illinois and Iowa as noted from crops scouting records. North Central Region Pesticide Impact Assessment Program, Project #95EPIX 1-0207
6. Pike, D.R., W.H. Kuhlman, W.H. Luckmann, M.C. Shurtleff, K.L Steffey. 1992. Illinois Pest Profiles. Illinois Natural History Survey, Urbana, IL. 95 pages.
7. North Carolina State University http://ipmwww.ncsu.edu/corn/diseases/corn_diseases.html#N_Blight
8. Purdue Botany <http://www.btny.purdue.edu/Extension/Pathology/CropDiseases/Corn/corn1.html#northerncornleafblight>
9. Pike, D. R. Estimation based on experience.