Pest&Crop

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In This Issue

Insects, Mites, and Nematodes

Corn Borer Activity High in Some Areas of Indiana - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- Reports of splattered windshields
- Scout now for egg masses and small borers
- Scouting requires diligence
- Income potential must justify treatment costs, two applications may be needed

Black light trap catches, and splattered windshields have confirmed that certain areas of Indiana are experiencing a significant European corn borer moth flight. One must now evaluate high-risk fields for egg masses and borers to determine if economic levels exist. Typically, egg laying of second generation corn borer is highest in late-planted fields, especially those actively pollinating. Fields that were wet and delayed in development this spring or drowned out and replanted may be acting as a "trap crop" for egg laying. Consider that infestations after the blister stage do not have as much of a physiological effect on yields as they do at earlier stages.

It is very time consuming and frustrating to scout for second generation egg masses and larvae. The adult moths usually lay their eggs on the underside of corn leaves in the ear zone area (90% of the time). The tiny borers (1/16-1/8" long) hatch and crawl to leaf axils, behind leaf sheaths, in ears, or ear shanks to seek protection from the environment and feed. When one inspects these areas, it is not easy to see the larvae. Also, areas with pollen, anthers (pollen sacs), mold, etc., make it even more difficult. Once the larvae are large enough to easily be seen, they probably have already entered the stalk, ear shank, and/or the ear itself.

Young corn borer in leaf axil

Fields in areas where the moth flight has been extremely high and where income will be high enough to warrant corrective measures if an economic population of borers develop, should be scouted for egg masses and borers. If you find that 1/3 of the borers have already bored into the stalks, etc., a control should not be applied. Remember, to be effective, 2 applications of an insecticide will normally be needed to control the second generation. This can get expensive!

Something to consider and observe while inspecting is the presence of beneficial organisms. Some fields have high numbers of lady beetle adults and larvae, they will devour corn borer egg masses and small borers. There are many other predators and parasites present in fields that can have a significant impact of corn borer populations.

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Yellowing of Soybeans in Dry Areas May or May Not be Due to Twospotted Spider Mite Feeding - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) –

- Many factors can cause yellow soybeans
- Spider mite damage will first show on field edges and/or stressed areas
- Several factors should be considered before treating
- Spot treatments may work if caught early
- High nozzle pressure and plentiful water improves pesticide efficacy

As the rains continue to hit n' miss in Indiana, the areas with little to no rain are observing some soybean fields with yellowing, and in some cases stunting. Although the damage caused by twospotted spider mites comes to mind, a number of factors can cause leaf yellowing. These include soybean cyst nematode, nutrient deficiencies, thrips, early senescence of leaves due to lack of moisture, diseases, compaction, etc. This is certainly not to say that spider mites are not causing some of the problems. However, it points out the fact that one should not jump to conclusions concerning the cause of a particular plant problem without making a thorough field evaluation. If the problem is due to spider mites, a good understanding of the pest's biology, level of infestation, potential for damage, and management alternatives is needed to properly deal with the infestation.

Spider mite damage is often first noted on field borders and seemingly spreads to areas of the field (clay/sand nobs, compacted areas, poor fertility, etc.) where moisture stress has the greatest impact. Where yellowing is observed, twospotted spider mites could be the culprit. However, before considering control, it is very important that spider mites are identified as the source of the problem. Shake some discolored soybean leaves over a white piece of paper. Watch for small dark specks moving about on the paper. Also look for minute webbing on the undersides of the discolored leaves. Once spider mites have been positively identified in the damaged areas of the field, it is essential that the whole field be scouted to determine the range of infestation. Sample in at least five different areas of the field and determine whether the spider mites are present or not by using the "shake" method.

Reduction of crop yield is directly related to duration and intensity of the mite attack. The most severe damage occurs when the infestation starts in the early stages of plant growth and builds throughout the season. However, a heavy infestation at seed set can still cause economic damage. With the above in mind, it is extremely important that producers closely monitor their fields to determine if they have a mite problem. However, before applying controls there are certain factors that should be taken into consideration. These include:

1) Infestation and/or damage level.
2) Short and long range weather forecasts.
3) Presence of diseased spider mites.
4) Cost of treatment versus the value of the crop.

When the discoloration from twospotted spider mite feeding is first noticed along field borders, or in spots within fields, and scouting information from the remainder of the field reveals no movement, then spot treating may suffice. Success of spot treating depends on spraying beyond the infested area, not just the damaged area. Spray a buffer zone 100 to 200 feet beyond spider mite colonized plants. If scouting results indicate that movement has occurred within several areas of a field or throughout a field, then treating the whole field should be considered. Although spot treating was of limited value in 1988 due to the earliness of the infestation, spot treating is a viable option at this time since we are in the advanced stages of plant development.

If a control is warranted, two pesticides are recommended for use. These include dimethoate (Dimethoate 400 and 4 EC) and chlorpyrifos (Lorsban 4E). Proper placement of these pesticides is the key to successful control results. Nozzle pressures of 40 psi and 30-40 gallons of water per acre for ground application helps distribute the pesticide throughout the foliage. If using aerial application, the control material should be applied in 3-5 gallons of finished spray per acre. Normally, aerial applications are not as efficacious as ground applications due to limited surface-area coverage. So where possible, use ground application. Also, research has shown that mite controls work best in the early morning or evening hours. This is primarily due to more stable weather conditions, less convection currents and evaporation, resulting in better targeting of the pesticide.

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Corn Earworm Surge - (*John Obermeyer*) - Overnight (Aug. 9) corn earworm pheromone trap catches boomed in numbers! This and the black light trap catches indicate that this pest is on the move. Late market sweet corn and late pollinating seed corn should be closely monitored with pheromone/black light traps or for eggs on silks.

Black Light Trap Catch Report (Ron Blackwell)														
County/Cooperator	7/25/00 - 7/31/00							8/1/00 - 8/700						
	VC	BCW	ECB	GC	CEW	FAW	AW	VC	BCW	ECB	GC	CEW	FAW	AW
Clinton/Blackwell	0	0	650	4	2	0	0	0	20	1020	8	14	0	4
Dubois/SIPAC	0	0	4	16	3	0	0	0	2	0	6	9	1	0
Jennings/SEPAC	0	0	66	12	0	0	0	0	2	34	6	7	0	0
LaPorte/Pinney Ag Center	0	0	86	12	0	0	0	0	0	217	7	1	0	2
Lawrence/Feldun Ag Center	0	0	18	5	0	2	0	0	1	19	6	7	0	4
Randolph/Davis Ag Center	0	0	52	28	0	0	0	0	0	49	9	0	1	0
Whitley/NEPAC	0	0	117	26	2	0	1	0	2	730	40	0	6	14

BCW = Black Cutworm ECB = European Corn Borer GC = Green Cloverworm CEW = Corn Earworm
AW = Armyworm FAW = Fall Armyworm VC = Variegated Cutworm

Plant Diseases

Diplodia Ear Rot of Corn – (*Gregory Shaner*) –

• Diplodia ear rot is confirmed in Indiana

Diplodia ear rot is confirmed to be present in at least some west central Indiana cornfields. It is likely present in fields in other areas of the state as well. At its most extreme, husks and shanks of infected ears are completely brown. When the husks are peeled back, white mycelial growth of the fungus can be seen on the surface of the kernels. The ear leaf sheath and blade may also be dead. Less severe infections may appear as small (1/4 inch) to fairly large (2 inches) dead areas on the surface of the husk. On these ears, mycelium of the fungus may not yet be evident on kernels, but if the dead husk tissue extends into the ear, the kernels are probably already infected. These infections may be more recent than those in which the shank and husks are completely dead. With time, these milder infections may become more severe.

The fungus that causes Diplodia ear rot, *Stenocarpella maydis* (see last week's Pest & Crop for an explanation of the nomenclature), survives in previous years' corn residue. During wet weather, the fungus produces fruiting bodies on old corn stalks. These fruiting bodies contain spores of the fungus. Splashing rain is thought to be the main means of dispersing these spores. Spores that land on silks or husks can infect. Infection may also occur from fungus in the stalk that grows up through the shank. Heavy rains that fell in many areas during early silking probably carried spores from residue to silks and husks.

Because splash dispersal is presumed to be over only relatively short distances, Diplodia ear rot is most likely to be found in fields where there is residue from a previous corn crop. Another likely place for the disease to occur is in the areas of a field adjacent to corn residue from last year, i.e. fields that may be in reduced tillage or no-till soybeans this year. However, I have seen severe ear rot in a field that followed a crop of soybeans. There was only a limited amount of corn residue in this field, from 2 years ago, yet the disease could be found throughout the field.

Now is the time for growers to scout their fields. For corn that is following soybeans or some other crop, the first place to look would be in areas nearest adjacent fields that were in corn last year. If any Diplodia ear rot is found there, other areas of the field should also be examined to estimate the extent of damage. Hybrids differ greatly in susceptibility to Diplodia ear rot. Some hybrids are very susceptible.

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Corn Anthracnose – (*Gregory Shaner*) –

• Mid-season anthracnose is showing up on corn

Anthracnose leaf blight is appearing on upper leaves of corn. Lesions are quite variable in size, ranging from small oval areas to large, irregular areas of dead tissue. Under humid conditions, it is possible to see dark structures on the surface of the lesion. These are somewhat smaller than a pinhead, and if they are examined with a hand lens at an oblique angle, it may be possible to see tiny, black spines projecting from the surface of the leaf.

Anthracnose is common on seedlings early in the season, but then "fades away" during the time of vigorous vegetative growth. When the corn plant enters the reproductive phases of growth, it becomes more susceptible, and leaf blight may develop on upper leaves. Warm, wet, cloudy weather favors infection and disease development.

Premature death of upper leaves during grain filling will reduce yield and test weight. The extent of damage depends on how early the leaf blight develops, and the amount of leaf tissue destroyed. The anthracnose fungus can also cause stalk rot. It is thought that spores of the fungus produced on leaf lesions may wash down between the leaf sheath and the stalk, from there the fungus penetrates the stalk.

Hybrids differ in resistance to anthracnose leaf blight and stalk rot. Leaf blight resistance and stalk rot resistance are not highly correlated.

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Soybean Sudden Death Syndrome – (*Gregory Shaner*) –

• Sudden death syndrome is showing in soybeans

Definite symptoms of sudden death syndrome have been seen in west central Indiana soybean fields. Dan Egel, plant pathologist at the Purdue Southwest Agricultural Center near Vincennes, reports seeing the disease in southern Indiana. Upper leaves show interveinal chlorosis and necrosis and, when stems are split, the cortex is brown and the pith is white. The disease will probably appear first as patches within a field, particularly in areas where soils hold water longer.

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Yellow Areas on Soybean Fields – (*Gregory Shaner*)

• Yellow areas on soybean fields may be caused by any of several problems

In a number of soybean fields, areas of pale green or yellow plants are appearing. This could be from a number of causes in addition to sudden death syndrome – soybean cyst nematode, brown stem rot, Phytophthora rot, ponding, and other causes. It is important to investigate these areas to determine the cause of the problem. Knowing the reason for poor growth or premature plant death will permit appropriate management decisions for future crops.

Agronomy Tips

Grain Fill Stages in Corn - (*Bob Nielsen*) -

The grain fill period begins with sucessful pollination and initiation of kernel development, and ends approximately 60 days later when the kernels are physiologically mature. During grain fill, the developing kernels will be the primary sink for concurrent photosynthate produced by the corn plant.

What this means is that the photosynthate demands of the developing kernels will take precedence over that of much of the rest of the plant. In essence, the plant will do all it can to 'pump' dry matter into the kernels, sometimes at the expense of the health and maintenance of other plant parts.

A stress-free grain fill period can maximize the yield potential of a crop, while severe stress during grain fill can cause kernel abortion and lightweight grain. Thus far in 2000, weather and moisture conditions have been very favorable for grain filling.

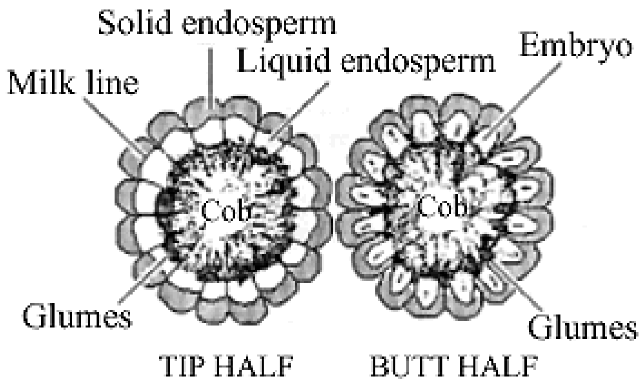
Kernel development proceeds through several relatively distinct stages.

Kernel Blister Stage (Growth Stage R2). About 10 to 14 days after silking, the developing kernels are whitish 'blisters' on the cob and contain abundant clear fluid. The ear silks are mostly brown and drying rapidly. Some starch is beginning to accumulate in the endosperm. The radicle root, coleoptile, and first embryonic leaf have formed in the embryo by the blister stage. Severe stress can easily abort kernels at pre-blister and blister stages. Kernel moisture content is approximately 85 percent.

Kernel Milk Stage (R3). About 18 to 22 days after silking, the kernels are mostly yellow and contain 'milky' white fluid. The milk stage of development is the infamous 'roasting ear' stage, that stage where you will find die-hard corn specialists out standing in their field nibbling on these delectable morsels. Starch continues to accumulate in the endosperm. Endosperm cell division is nearly complete and continued growth is mostly due to cell expansion and starch accumulation. Severe stress can still abort kernels, although not as easily as at the blister stage. Kernel moisture content is approximately 80 percent.

Kernel Dough Stage (R4). About 24 to 28 days after silking, the kernel's milky inner fluid is changing to a 'doughy' consistency as starch accumulation continues in the endosperm. The shelled cob is now light red or pink. By dough stage, four embryonic leaves have formed and about 1/2 of the mature kernel dry weight is now in place. Kernel abortion is much less likely once kernels have reached early dough stage, but severe stress can continue to affect eventual yield by reducing kernel weight. Kernel moisture content is approximately 70 percent.

Kernel Dent Stage (R5). About 35 to 42 days after silking, all or nearly all of the kernels are denting near their crowns. The fifth (and last) embryonic leaf and lateral seminal roots form just prior to the dent stage. A distinct horizontal line appears near the dent end of the kernel and slowly progresses to the tip end of the kernel over the next 3 weeks or so. This line is called the 'milk line' and marks the boundary between the liquid (milky) and solid (starchy) areas of the maturing kernels. Severe stress can continue to limit kernel dry weight accumulation. Kernel moisture content at the beginning of the dent stage is approximately 55 percent.



Physiological Maturity (R6). About 55 to 65 days after silking, kernel dry weight usually reaches its maximum and kernels are said to be physiologically mature and safe from frost. Physiological maturity occurs shortly after the kernel milk line disappears and just before the kernel black layer forms at the tip of the kernels. Severe stress after physiological maturity has little effect on grain yield, unless the integrity of the stalk or ear is compromised (e.g., ECB damage or stalk rots). Kernel moisture content at physiological maturity averages 30 percent, but can vary from 25 to 40 percent grain moisture.

Harvest Maturity. While not strictly a stage of grain development, harvest maturity is often defined as that grain moisture content where harvest can occur with minimal kernel damage and mechanical harvest loss. Harvest maturity is usually considered to be near 25 percent grain moisture.

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Yield Loss During Grain Fill - (*Bob Nielsen*) -

Yield potential in corn is influenced at several stages of growth and development. Ear size potential (number of potential kernels) is determined quite early, from about knee-high to about shoulder-high, or from about leaf stage V6 to V15. Generally, conditions in 2000 during that time period were quite favorable for ear size determination.

The next influential period for the corn crop is pollination. Again, generally conditions in 2000 were excellent for this critical yield-determining interval. Essentially no stress occurred from either excessive heat or moisture deficits.

The period following successful pollination and finishing at kernel black layer is defined as the grain filling period in corn and represents the final important yield determining time frame. Grain fill stages in corn are described in an accompanying article. Perfect conditions for ear size determination and pollinations can still be negated if severe stress occurs during the grain fill period.

Yield loss during grain fill can occur from 1) stand loss, 2) incomplete kernel set, 3) lightweight kernels, and 4) premature plant death.

Stand Loss During Grain Fill

Yield loss due to stand loss during grain fill is usually greater than that due to stand loss that occurs during the vegetative phase. When stand loss occurs prior to pollination, ear size (number of kernels) on surviving plants may compensate in response to the lesser competition of a thinner stand. Additional compensation may occur during grain fill in terms of greater kernel weight. When stand loss occurs during grain fill, ear size has already been set. Only kernel weight can compensate in response to the lesser competition of a thinner stand.

Incomplete Kernel Set in Corn

Kernel set refers to the degree to which kernels have developed up and down the cob. Incomplete kernel set is not always apparent from 'windshield' surveys of a corn field. Husks and cob will continue to lengthen even if kernel set is incomplete. A wonderfully long, robust-looking, healthy green ear shoot can completely mask even a 100 percent failure of pollination or severe kernel abortion.

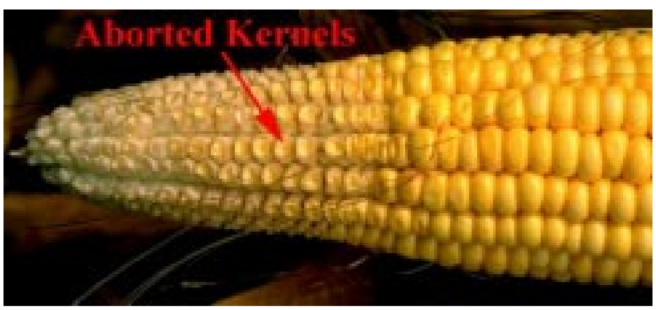
One of the causes of incomplete kernel set is **unsuccessful pollination**. Unsuccessful pollination results in ovules that are never fertilized and, subsequently, ears with varying degrees and patterns of incomplete kernel set. Many factors can cause incomplete pollination and distinguishing between them can be very difficult.

Certain insects like corn rootworm beetles and Japanese beetles can interfere with pollination and fertilization by their silk clipping action. These insects feed on pollen and subsequently clip silks as they feed on the pollen that has been captured by the silks. Unusually early or late pollinating fields are often particularly attractive to these insects.

Drought stress may delay silk emergence until pollen shed is nearly or completely finished. During periods of high temperatures, low relative humidities, and inadequate soil moisture levels, exposed silks may also dessicate and become non-receptive to pollen germination.

Unusually favorable conditions prior to pollination that favor ear size determination can result in ears with an unusually high number of potential kernels per row. Remember that silk elongation begins near the butt of the ear and progresses up toward the tip. The tip silks are typically the last to emerge from the husk leaves. If ears are unusually long (many kernels per row), the final silks from the tip of the ear may emerge after all the pollen has been shed.

Another cause of incomplete kernel set is **abortion of fertilized ovules**. Aborted kernels are distinguished from unfertilized ovules in that aborted kernels had actually begun development. Aborted kernels will be shrunken, mostly white, often with the yellow embryo visible; compared to normal plump yellow kernels.



Kernels are most susceptible to abortion during the first 2 weeks following pollination, particularly kernels near the tip of the ear. Tip kernels are generally last to be fertilized, less vigorous than the rest, and are most susceptible to abortion. Once kernels have reached the dough stage of development, further yield losses will occur mainly from reductions in kernel dry weight accumulation.

Severe drought stress that continues into the early stages of kernel development (blister and milk stages) can easily abort developing kernels. Severe nutrient deficiencies (especially nitrogen) can also abort kernels if enough of the photosynthetic 'factory' is damaged. Extensive loss of green leaf tissue by certain leaf diseases, such as common rust or gray leaf spot, by the time pollination occurs may limit photosynthate production enough to cause kernel abortion. Consecutive days of heavily overcast, cloudy conditions may also reduce photosynthesis enough to cause abortion in recently fertilized ovules.

Decreased Kernel Weight

Severe stress during dough and dent stages of grain fill decreases grain yield primarily due to decreased kernel weights and is often caused by premature black layer formation in the kernels. Decreased kernel weight can result from severe drought and heat stress during grain fill; extensive European corn borer tunneling (especially in the ear shanks); loss of photosynthetic leaf area by hail, insects, or disease early in grain fill; and killing fall frosts prior to normal black layer development.

Once grain has reached physiological maturity, stress will have no further physiological effect on final yield, because final yield is already achieved. Stalk and ear rots, however, can continue to develop after corn has reached physiological maturity and indirectly reduce grain yield.

Premature Plant Death

A killing fall frost prior to physiological maturity can cause premature leaf death or whole plant death. Premature death of leaves results in yield losses because the photosynthetic 'factory' output is greatly reduced. The plant may remobilize stored carbohydrates from the leaves or stalk tissue to the developing ears, but yield potential will still be lost.

Premature death of whole plants results in greater yield losses than if only leaves are killed. Death of all plant tissue prevents any further remobilization of stored carbohydrates to the developing ear. Whole plant death that occurs before normal black layer formation will cause *premature* black layer development, resulting in incomplete grain fill and lightweight, chaffy grain. Grain moisture will be greater than 35%, requiring substantial field drydown before harvest.

Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the World Wide Web at http://www.kingcorn.org/cafe . For other information about corn, take a look at the Corn Growers' Guidebook on the World Wide Web at http://www.kingcorn.org/

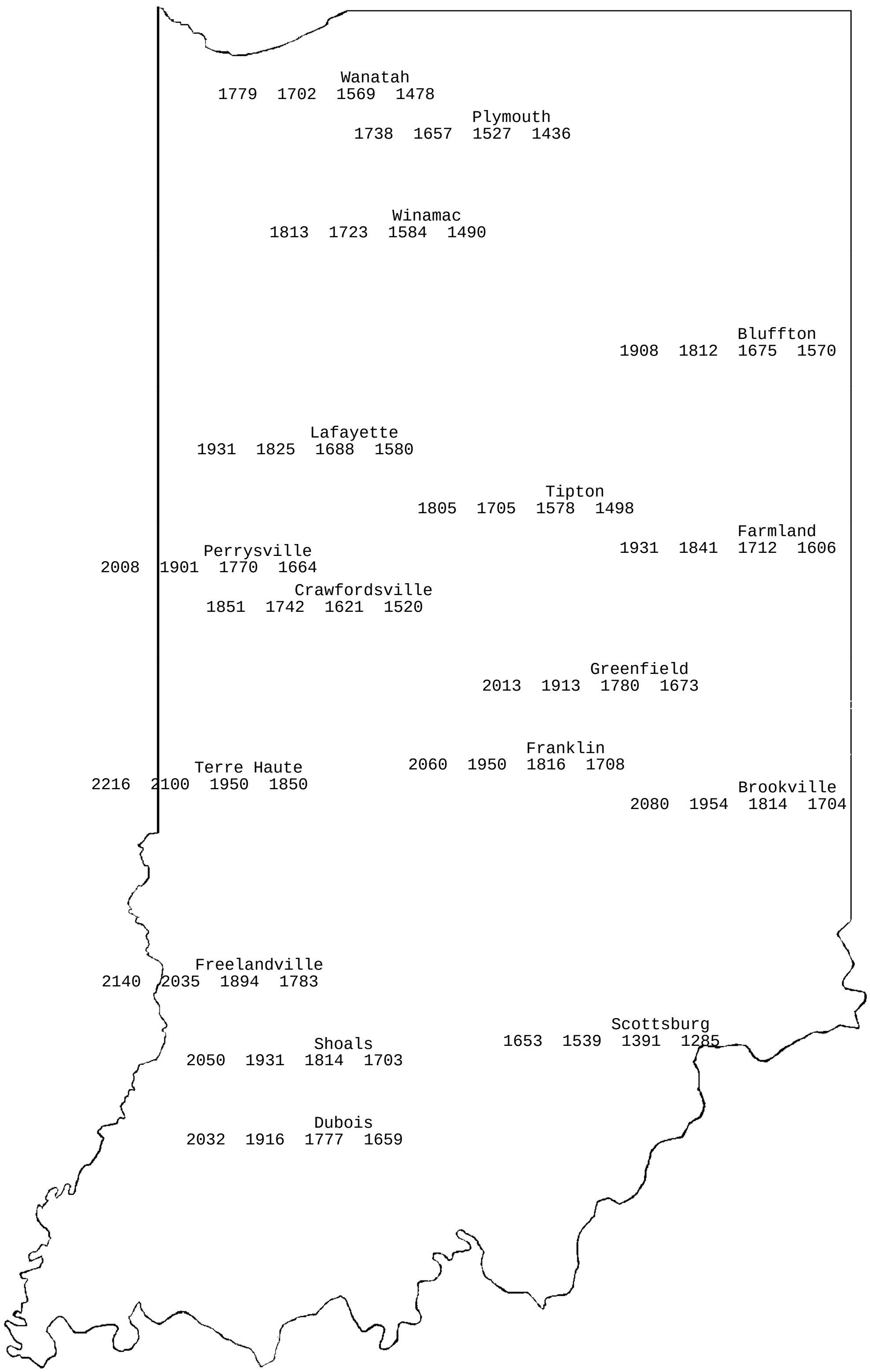
Weather Update

MAP KEY

Location
GDD(4) GDD(10) GDD(60) GDD(90)

Temperature Accumulations from Jan. 1 to August 9, 2000

GDD(4) = Growing Degree Days from April 14 (4% of Indiana's corn planted), for corn growth and development
GDD(10) = Growing Degree Days from May 1 (10% of Indiana's corn planted), for corn growth and development
GDD(60) = Growing Degree Days from May 5 (60% of Indiana's corn planted), for corn growth and development
GDD(90) = Growing Degree Days from May 12 (90% of Indiana's corn planted), for corn growth and development



4" Bare Soil Temperatures 8/9/00

Location	Max.	Min.
Wanatah	83	74
Columbia City	77	71
Winamac	81	73
Bluffton	71	71
W Laf Agro	78	71
Tipton	79	70
Farmland	72	68
Perrysville	79	75
Crawfordsville	76	74
Trafalgar	75	73
Terre Haute	77	76
Oolitic	75	75
Vincennes	77	67
Dubois	78	73

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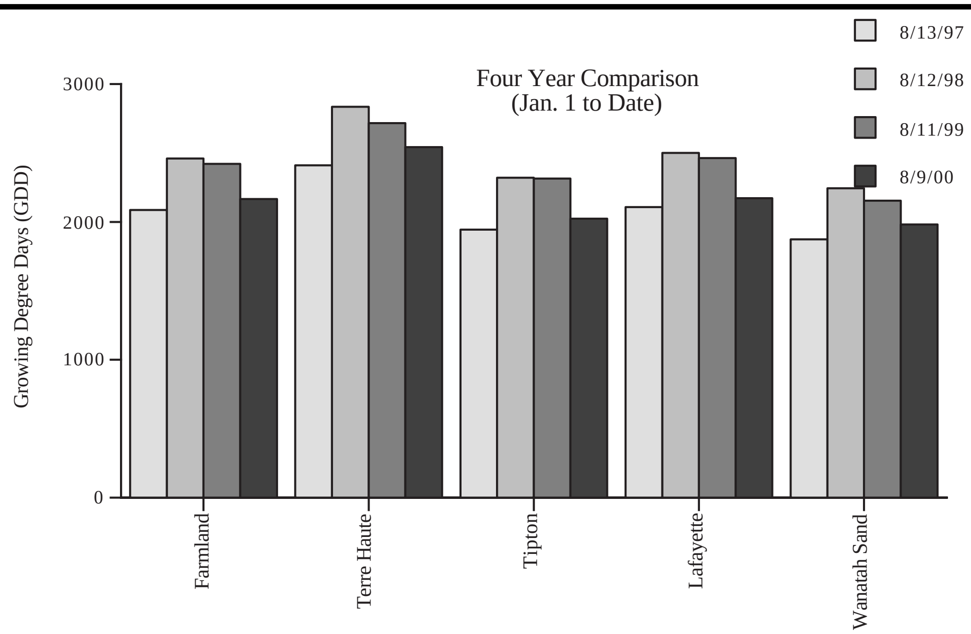

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