Pest & Crop

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In This Issue

Insects, Mites, and Nematodes

Soybean Insects and Defoliation - *(John Obermeyer and Larry Bledsoe)*

- Insect damage varies from field to field.
- Pod fill is the critical time for soybean defoliation.
- Identify insect defoliators, crop growth stage, and determine level of defoliation.
- Japanese beetles now doesn't necessarily equate to grubs next spring.

According to the Indiana Agricultural Statistics Service, as of July 18, twenty-two percent of the state's soybean crop is setting pods (15% is the 5-year average). Pod development and fill are critical stages for the soybean crop, certainly a time when stress is undesirable. Bean leaf beetle, Japanese beetle, grasshoppers, and green cloverworm all feed-on soybean leaves. And even though soybeans have the amazing ability to withstand damage from defoliation, yield losses can occur.

The best management guidelines for soybean defoliators involve identifying the insect pests and then characterizing the level of defoliation and growth stage of the beans. Then, management decisions will depend on anticipated market price of the soybeans, cost of treatment, the level of damage, the growth stage of the soybean, and potential yield. At mid pod fill, consider treatment when defoliation exceeds approximately 15 to 20% and the defoliator(s) is still present and actively feeding. Refer to the following table for treatment thresholds for insect defoliated soybeans.

Japanese beetle develop from grubs that fed on organic matter and/or the roots of plants last fall and this spring. Therefore it seems logical that killing adult beetles this year should prevent grub damage in 2005. However it simply doesn't work that way. Researchers' attempts to draw in beetles to encourage them to lay eggs for subsequent grub damage in research plots have generally failed. Entomologists for years have been trying to understand this fickle creature. Basically, the adults feed, mate, and lay eggs when and where they want to. The grubs are just as unpredictable. Research attempts to correlate grub presence to crop damage have usually shown insignificant differences. Damage does occur, but we are just not usually able to predict when or assess how much. Consider that each beetle mates and lays eggs several times during its oviposition period. To prevent egg-laying in a field, one would need to treat multiple times during July and August.

TREATMENT THRESHOLDS FOR INSECT DEFOLIATED SOYBEANS

PERCENTAGE DEFOLIATION*

Soybean growth stage	Market price - $5/bu Cost of treatment $6/A	$8/A	$10/A	$12/A	$14/A	Market price - $6/bu Cost of treatment $6/A	$8/A	$10/A	$12/A	$14/A
V1-2	40-50	45-55	50-60	45-55	55-65	35-45	40-50	45-55	45-55	50-60
V3-4	40-50	45-55	50-60	55-65	55-65	40-50	45-55	45-55	50-60	50-60
V5-6	45-55	45-55	50-60	55-65	55-65	40-50	45-55	50-60	50-60	50-60
V7+	40-50	40-50	45-55	50-60	55-65	35-45	40-50	40-50	45-55	50-60
R1	25-35	30-40	35-45	40-50	40-50	25-35	25-35	30-40	30-40	35-45
R2	20-30	25-35	30-40	35-45	35-45	20-30	25-35	25-35	25-35	30-40
R3	15-25	20-30	20-30	25-35	25-35	10-20	15-25	20-30	20-30	20-30
R4	10-20	15-25	15-25	20-30	20-30	10-20	10-20	15-25	15-25	20-30
R5	15-25	15-25	20-30	20-30	25-35	10-20	15-25	15-25	15-25	20-30
R6	15-25	20-30	25-35	25-35	30-40	10-20	20-30	25-35	25-35	30-40

PERCENTAGE DEFOLIATION*

Soybean growth stage	Market price - $7/bu Cost of treatment $6/A	$8/A	$10/A	$12/A	$14/A	Market price - $8/bu Cost of treatment $6/A	$8/A	$10/A	$12/A	$14/A
V1-2	35-45	40-50	40-50	40-50	45-55	30-40	35-45	40-50	40-50	45-55
V3-4	35-45	40-50	45-55	45-55	45-55	35-45	40-50	40-50	40-50	45-55
V5-6	40-50	45-55	45-55	45-55	50-60	40-50	40-50	45-55	45-55	45-55
V7+	35-45	35-45	40-50	40-50	45-55	35-45	35-45	40-50	40-50	45-55
R1	20-30	25-35	30-40	30-40	30-40	20-30	25-35	25-35	30-40	30-40
R2	15-25	20-30	25-35	25-35	25-35	15-25	20-30	20-30	25-35	25-35
R3	10-20	15-25	15-25	15-25	20-30	10-20	15-25	15-25	15-25	20-30
R4	10-20	10-20	10-20	15-25	15-25	5-15	10-20	10-20	15-25	15-25
R5	10-20	10-20	15-25	15-25	20-30	10-20	10-20	15-25	15-25	15-25
R6	15-25	15-25	20-30	20-30	25-35	10-20	15-25	20-30	20-30	20-30

* The defoliation level needed before a control is applied will vary somewhat depending on insect numbers and stage of development, growing conditions, variety grown, expected yield, economic factors, and plant population counts. All of these factors must be taken into consideration when making control decisions. The defoliation figures are shown as a range in each category. This range is included so that limiting factors can be considered. When few limiting factors are present, the control decision value will normally be at the higher end of the scale. Under some circumstances or conditions management guidelines given above may need to be adjusted from what is given. Based on 50 bushel per acre yield.

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Corn Blotch Leafminer, Again – (*John Obermeyer and Larry Bledsoe*)

- This insect's damage is generally more of a curiosity than a yield threat.
- Leaf tunneling may be compared to defoliation to determine yield impact.
- Larvae in the leaf cannot be controlled.
- Treating for the adult fly in untested and likely fruitless.

The following article is being reprinted, with slight updates, from last year's *Pest&Crop*. Several calls from northern Indiana on this little-understood insect have necessitated this repeat. Besides, we have nothing else to add.

Corn blotch leafminer, *Agromyza parvicornis*, is a leaf-feeding insect normally considered "occasional or non-economic." The adult is a gray to brown fly 1/4 inch in length. In the early spring, adults insert eggs in either the upper or lower leaf surface of corn. The larva, or maggot, is yellowish and about 1/4 inch long when full grown. The larva pupates in a damaged leaf, or in the soil. Although there are several generations in a season, damage to only certain corn leaves indicates that infestations occur once per season. Larvae eat out the leaf interior leaving a transparent area or "mine." Often many mines appear and sometimes merge on a single leaf. This can be quite an eye catcher, as leaves may appear completely bleached resembling herbicide damage.

There are no sampling methods or economic thresholds for corn blotch leafminer. The damage from this pest is believed to be of little economic importance as only a few leaves per plant are usually damaged. It has been suggested by colleagues at the University of Nebraska that the hail adjuster's charts can be used to estimate potential losses from the leafminer damage. This data is available on pages 34-35 of the *Corn and Soybean Field Guide*, 2004 Edition (ID 179). From this chart, in order to expect a 5% yield loss, it would require 70% leaf defoliation (mining) in 7-leaf corn. In 10, 12, or 15-leaf corn it would require 45, 40, and 30% mining respectfully for a 5% yield loss. Corn in the silking to blister stage could have significant yield losses at 15-20 percent leaf defoliation.

Even if a control were attempted, it would likely fail because the larvae are protected within the corn leaves. Treatments would have to target the adult flies, which would be difficult with one insecticide application. It is possible that foliar insecticides may worsen the damage. An early investigator of this insect, W. J. Phillips wrote in 1914: "With such a host of... constantly on the watch, we need not concern ourselves seriously with remedies so long as conditions continue as they are now. In the event that a combination of circumstances should occur that would restrain the parasites and give free rein to their host, the blotch miner would undoubtedly prove a pest very difficult of control. This species seems to furnish an instance in which only the barrier of parasites stands between the farmer and what may easily become temporarily at least, a very serious pest." Speculation as to why there is an "outbreak" of corn blotch leafminer points to either unique environmental conditions, which includes many variables, or practices that are inhibiting the natural parasites (e.g., multiple broadcast pesticide applications).

Corn blotch leafminer larva and damage

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Black Light Trap Catch Report - (John Obermeyer)

County/Cooperator	7/06/04 - 7/13/04							7/14/04 - 7/20/04						
	VC	BCW	ECB	SWCB	CEW	FAW	AW	VC	BCW	ECB	SWCB	CEW	FAW	AW
Dubois/SIPAC			1				8							8
Jennings/SEPAC							13							8
Knox/SWPAC			2	1	3		6		1			1		6
LaPorte/Pinney Ag Center		6	1				15	1	3	1				6
Lawrence/Feldun Ag Center							3							3
Randolph/Davis Ag Center		1					15		1					45
Tippecanoe/TPAC Ag Center							9							
Vermillion/Hutson							3	4						1
Whitley/NEPAC		8					227		14					29

VC = Variegated Cutworm, BCW = Black Cutworm, ECB = European Corn Borer, SWCB = Southwestern Corn Borer, CEW = Corn Earworm, FAW = Fall Armyworm, AW = Armyworm

Weeds

Resistant Weeds – *(Glenn Nice and Bill Johnson)*

Resistance can be defined as a plant biotype that is able to withstand an application of herbicide that once controlled it, and that this trait can be inherited by future generations. About this time of year suspicion starts to rise concerning resistant weeds in escapes. Is a field that has a large amount of escapes mean that the weed is resistant?

Resistance develops from the natural selection for biotypes that survive the use of a herbicide. Continual use of the same type of herbicide is what can drive this system leading to a dominant resistant population in a location. If the development of resistance is possible in a specific plant, the use of herbicides with different modes of action can inhibit or slow this process down. Table 1 has a list of weeds that have been reported to be resistant in Indiana and the states surrounding Indiana. For a quick reference list of herbicide mode of action please see table provided in the 2004 Weed Control Guide for Ohio and Indiana or by typing the following address into your web browser <http://www.btny.purdue.edu/Pubs/WS/WS-16/HerbSiteOfAction04.pdf>

I have observed that in the past resistant weeds can "sneak" up on us. What may appear as the odd escape can supply the seed bank, for several years. This may give the appearance of not being a problem, especially if the specific weed germinates late in the growing season. A couple of years down the road, we get either a flooding situation that distributes seed from somewhere else or optimum germinating conditions for a specific weed and then we have a field full of the resistant biotypes of that weed.

If you suspect you may have a resistant weed on your hands and would like further conformation in the way of a greenhouse trial, please send mature seed or seed heads from the plants with the completed form given at this address; <http://www.btny.purdue.edu/weedscience/2003/Articles/sform9-2-03.pdf>. Please be aware some seed or immature seed may not germinate well and results may not be obtainable.

For more information on glyphosate resistant marestail/horseweed in Indiana, please go to the Purdue University Weed Science web site <www.btny.purdue.edu/weedscience>.

Table2. Resistant weeds in Indiana and the states surrounding states*.

Weed	Herbicide Group	State
Common cocklebur	ALS inhibitors	Ohio
Common groundsel	photosystem II inhibitors	Kentucky
Common lambsquarters	photosystem II inhibitors	Illinois, Indiana, Kentucky
	ALS inhibitors	Kentucky
Common purslane	photosystem II inhibitors and Ureas and amides	Kentucky
Common ragweed	ALS inhibitors	Illinois, Indiana, Kentucky, Ohio
	photosystem II inhibitors	Kentucky
Common waterhemp	ALS inhibitors and photosystem II inhibitors and PPO inhibiting herbicides	Illinois
	ALS inhibitors	Ohio
Eastern Black Nightshade	ALS inhibitors	Illinois
Giant ragweed	ALS inhibitors	Illinois, Indiana, Ohio
Jimsonweed	photosystem II inhibitors	Indiana
Johnsongrass	ACCase inhibitors	Kentucky
Kochia	ALS inhibitors and photosynthetic inhibitors	llinois, Indiana
Ladysthumb	photosystem II inhibitors	Kentucky, Ohio
Marestail	glyphosate	Indiana, Kentucky, Ohio
	ALS inhibitors	Kentucky, Ohio
	photosystem II inhibitors and Ureas and amides	Kentucky,
Powell amaranth	photosystem II inhibitors and Ureas and amides	Michigan
	ALS inhibitors	Ohio
Redroot pigweed	photosystem II inhibitors	Indiana
	photosystem II inhibitors and Ureas and amides	Kentucky
Smooth pigweed	photosystem II inhibitors	Illinois, Kentucky
	ALS inhibitors	Kentucky, Michigan
Tall waterhemp	ALS inhibitors	Kentucky
Wild carrot	growth regulators	Kentucky

*Information adapted from www.weedscience.org (Dr. Ian Heap). Accessed July 21, 2004

Agronomy Tips

Estimating Corn Grain Yield Prior to Harvest- *(Bob Nielsen)*

Fancy colored yield maps are fine for verifying grain yields at the end of the harvest season, but bragging rights for the highest corn yields are established earlier than that down at the Main Street Cafe, on the corner of 5th and Earl. Some patrons of the cafe begin "eyeballing" their yields as soon as their crops reach "roasting ear" stage. Some of the guys there are pretty good (or just plain lucky) at estimating yields prior to harvest, while the estimates by others are not even close to being within the proverbial ballpark. Interestingly, they all use the same procedure referred to as the Yield Component Method.

Other pre-harvest yield prediction methods exist (Lauer, 2002; Thomison, 2003), but the Yield Component Method is probably the most popular because it can be used well ahead of harvest; as early as the so-called "roasting ear" or milk (R3) stage of kernel development. Under "normal" conditions, the kernel milk stage occurs about 18 to 22 days after pollination is complete (Nielsen, 2004a). Estimates made earlier in the kernel development period risk being overly optimistic if subsequent severe stresses cause unforeseen kernel abortion (Nielsen, 2004b).

The Yield Component Method is based on the premise that one can estimate grain yield from estimates of the yield components that constitute grain yield. These yield components include number of ears per acre, number of kernel rows per ear, number of kernels per row, and weight per kernel. The first three yield components (ear number, kernel rows, kernels/row) are easily measured in the field.

Final weight per kernel obviously cannot be measured until the grain is mature (kernel black layer) and, realistically, at harvest moisture. Consequently, an average value for kernel weight, expressed as 90,000 kernels per 56 lb bushel, is used as a proverbial "fudge factor" in the yield estimation equation.

Crop uniformity greatly influences the accuracy of any yield estimation technique. The less uniform the field, the greater the number of samples that should be taken to estimate yield for the field. There is a fine line between fairly sampling disparate areas of the field and sampling randomly within a field so as not to unfairly bias the yield estimates up or down.

- At each estimation site, measure off a length of row equal to 1/1000th acre. For 30-inch (2.5 feet) rows, this equals 17.4 feet.

  TIP: For other row spacings, divide 43,560 by the row spacing (in feet) and then divide that result by 1000 (e.g., [43,560/2.5]/1000 = 17.4 ft).

- Count and record the number of ears on the plants in the 1/1000th acre of row that you deem to be harvestable.

  TIP: Do not count dropped ears or those on severely lodged plants unless you are confident that the combine header will be able to retrieve them.

- For every fifth ear in the sample row, record the number of complete kernel rows per ear and average number of kernels per row. Then multiply each ear's row number by its number of kernels per row to calculate the total number of kernels for each ear.

  TIPS: Do not sample nubbins or obviously odd ears, unless they fairly represent the sample area. If row number changes from butt to tip (e.g., pinched ears due to stress), estimate an average row number for the ear. Don't count the extreme butt or tip kernels, but rather begin and end where you perceive there are complete "rings" of kernels around the cob. Do not count aborted kernels. If kernel numbers are uneven among the rows of an ear, estimate an average value for kernel number per row.

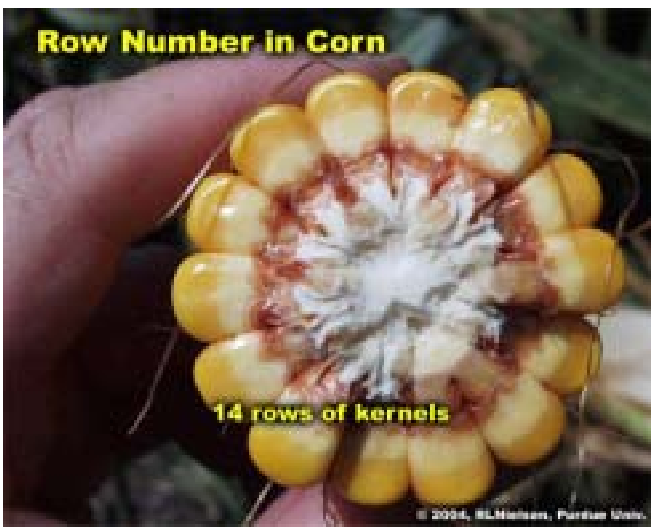
- Calculate the average number of kernels per ear by summing the values for all the sampled ears and dividing by the number of ears.

  EXAMPLE: For five sample ears with 480, 500, 450, 600, and 525 kernels per ear, the average number of kernels per ear would be (480 + 500 + 450 + 600 + 525) divided by 5 = 511.

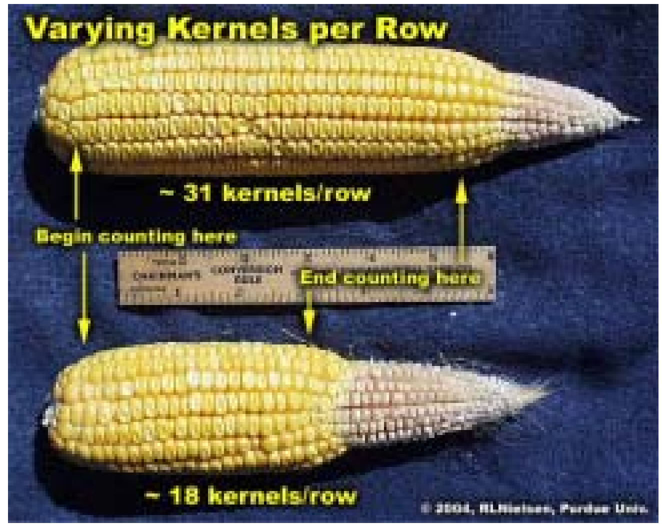
- Estimate the yield for each site by multiplying the ear number by the average number of kernels per ear, then dividing that result by 90. The value of '90' represents the average number of kernels (90,000) in a bushel of corn.

TIP: Use a lower value (e.g., 80) if grain fill conditions have been excellent (larger kernels, fewer per bushel) or a larger value (e.g., 100) if grain fill conditions have been stressful (smaller kernels, more per bushel).

Example of 18-row ear.



Example of 14-row ear.



Ears w/varying kernel numbers per row.

Example

Let's say you counted 30 harvestable ears at the first sampling site. Let's also assume that the average number of kernels per ear, based on sampling every 5th ear in the sampling row, was 511. The estimated yield for that site would (30 x 511) divided by 90, which equals 170 bu./ac.

Repeat the procedure throughout field as many times as you deem to be representative. Calculate the average yield for all the sites to estimate the yield for the field.

Remember that this method for estimating pre-harvest grain yield in corn indeed provides only an estimate. Since kernel size and weight will vary depending on hybrid and environment, this yield estimator should only be used to determine "ballpark" grain yields. Yield will be overestimated in a year with poor grain fill conditions (e.g., low kernel size and weight from a drought year) and underestimated in a year with excellent grain fill conditions (e.g., larger kernel size and weight from non-stress grain fill periods).

You can try to improve the yield estimation for unusual grain fill conditions by adjusting the estimation formula . For example, if you believe that kernel weight will be lower due to stress during grain fill, you may elect to replace the value of "90" in the equation with "100" to reflect the potential for smaller and lighter kernels (i.e., more kernels per 56 lb. bushel). Conversely, in a good crop year, you may elect to replace the value of "90" in the equation with "80" to reflect the potential for larger and heavier kernels (i.e., fewer kernels per 56 lb. bushel).

Recognize that the Yield Component Method for estimating corn grain yield is probably only accurate within plus or minus 30 bushels of the actual yield. Obviously, the more samples you measure within a field, the more accurately you will "capture" the variability of yield throughout the field. Use the yield estimates obtained by this method for general planning purposes only.

** Thanks to Emerson Nafziger, Univ. of Illinois, for suggested revisions to the kernel number calculations.

Illinois Agronomy Handbook. 2004. **Estimating Corn Yields.** (An Online Calculator) Univ. of Illinois. Online at <http://www.ag.uiuc.edu/iah/index.php?ch=ch2/est_corn_yield.html&m=CFAR>. (URL verified 7/11/04, but temporarily off-line as of 7/18/04)

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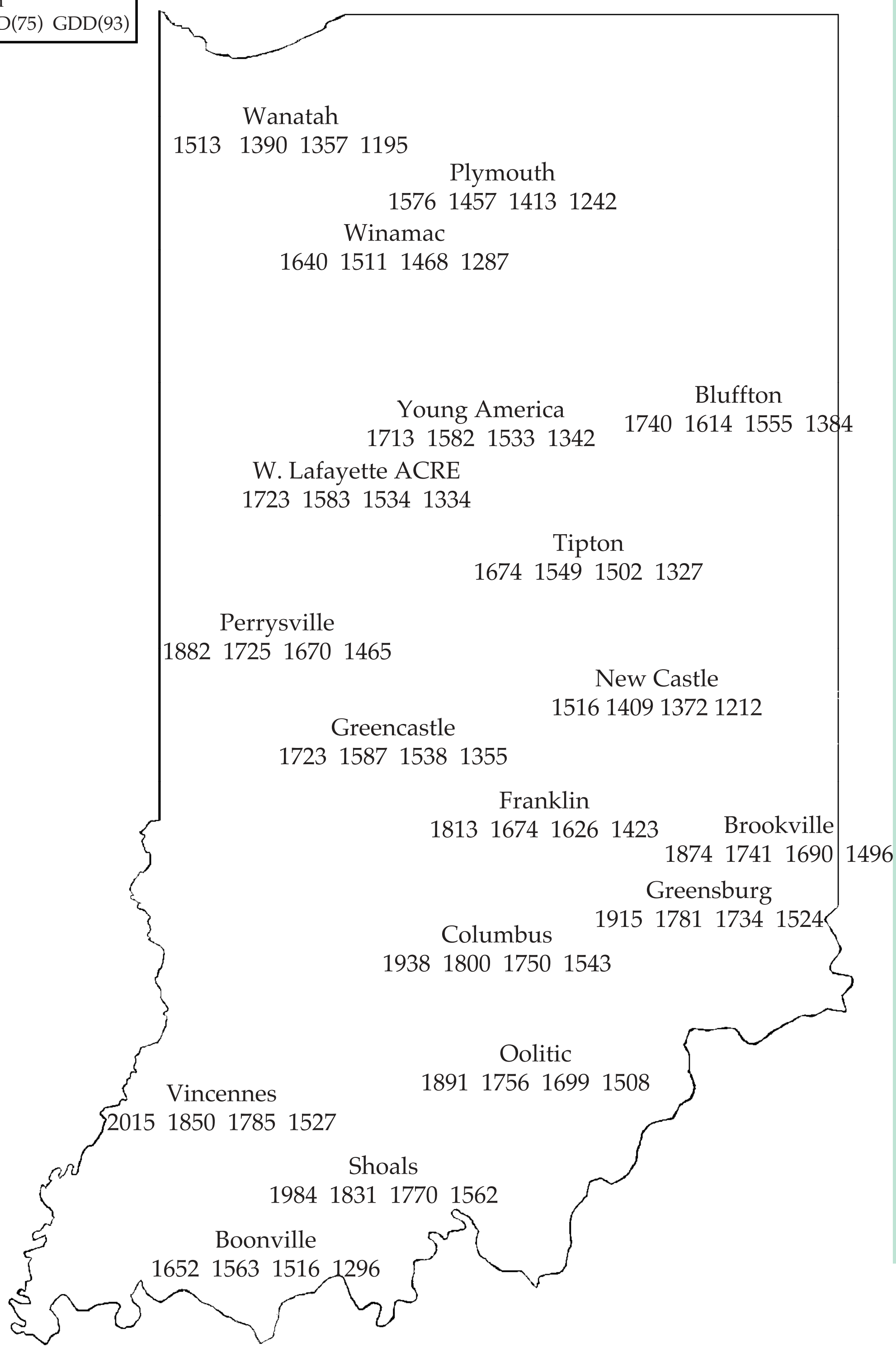
Thomison, Peter. 2003. **Estimating Corn Yields Prior to Harvest.** C.O.R.N. Newsletter, Ohio State Univ. Online at <http://corn.osu.edu/archive/2003/aug/03-28.html#linkc>. (URL verified 7/11/04).

Weather Update

Temperatures as of July 23, 2004

GDD(5) = Growing Degree Days from April 7 (5% of Indiana's corn planted), for corn growth and development
GDD(42) = Growing Degree Days from April 21 (42% of Indiana's corn planted), for corn growth and development
GDD(75) = Growing Degree Days from April 30 (75% of Indiana's corn planted), for corn growth and development
GDD(93) = Growing Degree Days from May 14 (93% of Indiana's corn planted), for corn growth and development

MAP KEY
Location GDD(5) GDD(42) GDD(75) GDD(93)



4" Bare Soil Temperatures 7/23/04

Location	Max.	Min.
Wanatah	89	72
Winamac	88	75
Bluffton	76	74
Chalmers	76	73
W Laf Acre	91	78
Tipton	82	75
Farmland	79	73
Perrysville	82	77
Crawfordsville	80	75
Liberty	85	71

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