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Insects, Mites, and Nematodes

Armyworms ... Get Out the Camera, You May Never See This Again! – *(John Obermeyer, Rich Edwards, and Larry Bledsoe)* –

- Armyworm problems are progressing up the state
- Armyworm questions and answers below
- Northeastern Indiana counties need to be on "RED ALERT"

For over two weeks, many producers in southwestern Indiana have been battling armyworm and for the past week this beast has been quite active in west central counties. Now they are threatening northeastern areas of the state. Many questions have surfaced during this "blitzkrieg." Below are some of these and our best answers.

When was the last time we had armyworm problems? Every year we receive a few reports of fields in the state that have armyworm damage. However, it has been many years since we've had numbers that reached "biblical proportions" (quoting a SW Indiana producer). Some

of you "old timers" may recall a similar situation with this pest back in the 1950's. Get some photos, this widespread and dramatic destruction may not happen for many years to come.

Why so many armyworms this year? There is no good answer to this other than we had an exceptionally high moth flight. It is not completely understood where these moths originated. Considering that there has been serious armyworm damage reported in the states of Texas, Arkansas, Missouri, Illinois, and Kentucky, one can should be able to visualize moths tracking with the same weather fronts as do black cutworms. If this is so, these moths are unwelcomed guests from Texas and/or Mexico. The first week that our black light traps at the seven Purdue agriculture research farms were up and running (April 17-23), we captured as many as 670 armyworm moths (the Whitley County site). This is a phenomenal number compared to the normal 10 to 20 we see most years. But it didn't stop with the April 17-23 period, the 670 were followed by weekly captures of 332, 351, 85, and 497 (last week's)!!! Interestingly, urban folks in northeast-

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ern counties called around May 18 with reports of high numbers of moths coming to their lights at night. These were confirmed to be armyworms.

How long will armyworm be a problem? The answer depends on how many eggs are still being laid and how mature the larvae are in your area. A look back at the literature reveals that in 1914 Indiana experienced a significant armyworm outbreak. Dr. John J. Davis, known to us as the father of Purdue entomology, was inspired to conduct some simple yet valuable life development information on the armyworm that year. The chart below summarizes the approximate number of days for each of the life stages of the armyworm and body measurements.

| Stage | Approx. Days | Approx. Body Length (mm) | Approx. Head Capsule Width (mm) |
|--------------------|--------------|----------------------------------|---------------------------------|
| Egg | 6 | - | - |
| Larva: | | | |
| First instar | 4 | 2 – 4 | 0.4 |
| Second instar | 3.5 | 3 – 6 | 0.6 |
| Third instar | 3 | 5 – 10 | 1.0 |
| Fourth instar | 3 | 11 - 15 (about .5 inch) | 1.5 |
| Fifth instar | 3.5 | 14 – 21 | 2.4 |
| Sixth instar | 8 | 24 – 35 (about 1 to 1.5 inch) | 3.4 |
| Total larval stage | 25 | | |
| Pupa | 21 | - | - |

Are the large armyworms almost finished feeding? When armyworms reach a length of about 1-1/2 inches they still have about 8 days to feed before pupating. During this time period they can consume a tremendous amount of foliage. If they consume their host, they can be seen “marching” from that field to another. Dr. Davis said, “The remarkable voracity of the armyworm during its last larval instar explains its sudden appearance in such enormous and destructive numbers when it is nearly full grown. The amount of foliage eaten in this (sixth) instar was nearly seven times as much as in the fifth instar, and **more than 80 percent of all of the foliage eaten during the entire larval period.**”

When is it best to control armyworms? Obviously from the above, one needs to prevent the armyworm from getting over an inch in length. It has been stated by many of you who have been on the “front line” that the big worms are harder to kill than the small ones. Whether or not to treat damaged fields, especially the grass pastures, has been a difficult question to answer. For some pasture and wheat fields, control decisions are being made too late. Refer to Keith Johnson’s and Ellsworth Christmas’ articles in this issue concerning pasture re-

covery and importance of the wheat flag leaf to assist in management decisions.

What crops are at greatest risk? Grass pastures, especially fescue, are being hit the hardest. Immediately following is wheat. Corn adjoining any of these crops should be carefully monitored. Lawns and golf courses next to denuded pastures are being damaged as well. Very little damage has been reported in soybean and legume forages.

Will border treatments work? Border or field perimeter treatments should be considered for wheat or cornfields adjoining heavily infested grass pastures. Once armyworms completely defoliate a pasture they will begin their movement into adjoining fields. This movement should be carefully monitored as a timely insecticide application 100 – 200 feet into a field should “head them off at the pass.”

What insecticides are working best? We are getting feedback from many producers and ag. chem. dealers that they are pleased with the results they have received from application of pyrethroid insecticides (Ambush, Asana, Capture, Pounce, and Warrior). On the other hand, malathion, which has been used extensively in grass pastures because of its 0 day harvest/pasture restriction, has been rated from fair to poor. The pyrethroid products appear to be giving sufficient residual activity to keep any advancing “armies” at bay.

What about natural controls? Where are they? It has been noted many times in the past that when armyworm populations, as well as other insect pests, begin to become economic that pathogens and/or parasites often significantly reduce pest numbers to non-economic levels within a matter of days. However, this year this has not been case. Speculation is that the dry conditions early on favored the armyworm more than it did the natural controls. Recent reports from several southern Indiana counties, however, now indicate that diseased worms (darkened and shriveled) are becoming a common site. Perhaps the wetter weather is allowing this to happen. We can only hope that this disease(s) outbreak catches up with the larval population in northern Indiana and causes an epizootic before extensive damage occurs.

What areas of the state are at risk at this time? Southern Indiana seems to be at the tail-end of the battle, especially with much of the wheat beginning to mature. West central counties are still in the midst of the war, but most producers and ag. chem. dealers now seem aware of the problem and have been taking action when necessary. **WATCH OUT IN NORTHEASTERN INDIANA!!!!!!!** Heavy moth flights continue in this area. Ron Blackwell, IPMSurvey Specialist, was in Whitley County on May 23 checking wheat fields for larvae and damage. He was having a difficult time finding damage, but when he got on his hands and knees and sorted through the

residue on the soil surface, he easily found 1/2" larvae. One count was over 60 larvae per linear foot of row, well beyond the 5 larvae/linear foot of row treatment threshold. Most counts were above 20. Yet, there were fields where he couldn't find any larvae. This indicates that there are some fields ready to "explode" and others with not much likelihood of significant damage. To find those fields that are about ready to explode, one will have to get down on hands and knees and carefully look for the worms.

Armyworm Insecticides (Read and follow ALL label rate, application, and use directions)

| Crop | Product (Formulation) | Restrictions (days to harvest) |
|----------------------|-----------------------|------------------------------------|
| Corn | Ambush (EC) | 30 |
| | Asana XL | 21 |
| | Capture | 30 |
| | Lannate (SP) | 21 |
| | Lorsban (4E) | 35 |
| | Malathion (EC) | 5 |
| | Pennacp-M | 12 |
| | Pounce (EC) | 30 |
| Sevin (4F, 80S, XLR) | 48 | |
| Soybean | Larvin (EC) | 28 |
| | Lorsban (4E) | 28 |
| | Sevin (4F, 80S, XLR) | 14 |
| | Warrior T | 45 |
| Wheat | Lannate (SP) | 7 (10 for grazing/feeding) |
| | Malathion (EC) | 7 |
| | Pennacp-M | 15 (harvest or grazing) |
| | Sevin (4F, 80S, XLR) | 21 grain harvest, 7 grazing forage |
| | Warrior T | 30 |
| Grass Pasture | Malathion (EC) | 0 |
| | Sevin (4F, 80S, XLR) | 14 (harvest or grazing) |
| Alfalfa | Lannate (SP) | 7 for grazing/feeding |
| | Lorsban (4E) | 14 |
| | Malathion (EC) | 0 |
| | Sevin (4F, 80S, XLR) | 7 (harvest or grazing) |
| | Warrior T | 1 forage, 7 hay |

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Armyworm moth on flowers in greenhouse
(Todd Hutson, Fountain County ANR Educator)



Armyworm larvae on wheat heads
(Todd Hutson, Fountain County ANR Educator)



Armyworm destroying homelawn next to pasture
(Doug Akers, Boone County ANR Educator)



Armyworm larvae on destroyed lawn
(Doug Akers, Boone County ANR Educator)

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European Corn Borer Moths Flying – (John Obermeyer, Rich Edwards, and Larry Bledsoe) –

Our first ECB moth was captured in the Dubois County black light trap during the last week of April. Since then we've captured several moths throughout the state, refer to "Black Light Trap Catch Report." The Whitley County trap, which has been busy with armyworm captures, also took this week's prize for the most corn borer moths caught. Congratulations!

It is too early to draw any conclusions from this very early corn borer flight data. However, it would be wise to inspect the tallest corn in the area for corn borer eggs and moth activity in grassy areas surrounding these fields. More on this pest in future issues of the *Pest & Crop*.

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Variegated Cutworm in Soybean – (John Obermeyer, Rich Edwards, and Larry Bledsoe) –

Armyworms are not the only moths flying this spring. Several calls from central Indiana counties have indicated that strange looking cutworms have been feeding on soybean leaves and in some cases, severely reducing stands. All damaged fields reported at this time had heavy patches of chickweed.

An inspection of one of these fields in Montgomery County revealed very large variegated cutworm larvae curled up under chickweed residue. Normally, we associate this "occasional" pest with clover pastures where early spring variegated cutworm moths like to deposit their eggs. It now appears that they have an alternative egg laying site...chickweed.

The management strategy suggested for this particular weedy soybean field was to tear it up and replant. Since the worms were close to pupation, no insecticide was necessary.

| Black Light Trap Catch Report (Ron Blackwell) | | | | | | | | | | | | | | |
|--|------------------|-----|-----|----|-----|-----|----|-------------------|-----|-----|----|-----|-----|-----|
| County/Cooperator | 5/8/01 - 5/14/01 | | | | | | | 5/15/01 - 5/21/01 | | | | | | |
| | VC | BCW | ECB | GC | CEW | FAW | AW | VC | BCW | ECB | GC | CEW | FAW | AW |
| Clinton/Blackwell | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 12 | 37 | 0 | 0 | 0 | 97 |
| Dubois/SIPAC | 1 | 0 | 3 | 1 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 3 |
| Jennings/SEPAC | 1 | 0 | 7 | 0 | 0 | 0 | 1 | 0 | 0 | 25 | 2 | 0 | 0 | 10 |
| LaPorte/Pinney Ag Center | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 3 | 0 | 0 | 0 | 0 | 36 |
| Lawrence/Feldun Ag Center | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 6 | 1 | 13 | 0 | 0 | 0 | 166 |
| Randolph/Davis Ag Center | 0 | 3 | 5 | 0 | 0 | 0 | 12 | | | | | | | |
| Tippecanoe/TPAC | 1 | 0 | 0 | 0 | 0 | 0 | 10 | 5 | 7 | 19 | 3 | 0 | 0 | 120 |
| Whitley/NEPAC | 3 | 1 | 23 | 0 | 0 | 0 | 83 | 13 | 1 | 153 | 4 | 0 | 0 | 497 |

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

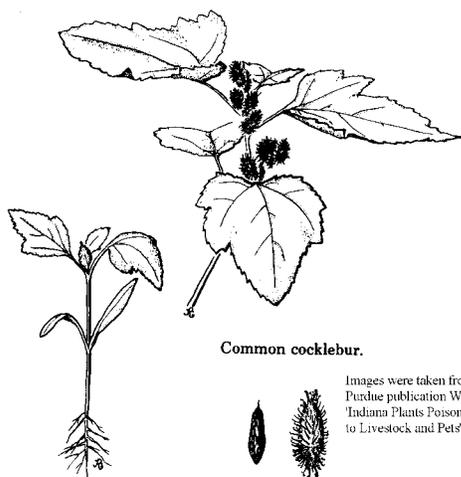
Weeds

Poisonous Plants of Indiana – (Glenn Nice) -

Several plants found in Indiana have natural toxins in them. The toxins, susceptible animals, and symptomology are as diverse as the plants involved. The table below lists a few of the toxic plants. Most of the information presented below was obtained from the extension publication "Indiana Plants Poisonous to Livestock and Pets" (publication WS-9) that can be obtained from the Purdue Media Distribution Center at 1-888-398-4636 toll free (ask for the Media Distribution Center) or (765) 494-6795 for \$5.50.

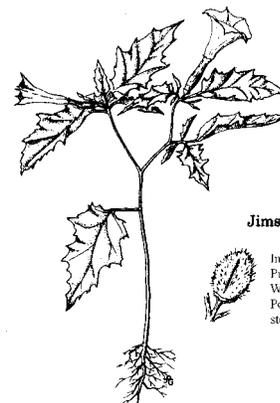
Control of these weeds is also variable depending on the species, where they are located, size of weed, and environmental conditions at the time. However, several herbicides are available to keep these weeds under control. For control recommendations in specific crops see the "2001 Weed Control Guidelines for Indiana" at <<http://www.btny.purdue.edu/Pubs/WS/WS-16.pdf>>.

| Indiana Plants Poisonous to Livestock and Pets | | | |
|--|---|---|--|
| Toxic Plant | Toxic condition | Symptomology | Treatment |
| Common cocklebur (<i>Xanthium strumarium</i>) | Cattle, swine, sheep, poultry. Ingested burs, seeds, and seedlings. | Stomach and intestinal upset, weakness, breathing and heart problems, possibly death. | Consult veterinarian for dosages of mineral oil, cream, or whole milk. Keep animal warm and quiet. |
| Jimsonweed (<i>Datura stramonium</i>) | Cattle, swine, sheep, dogs, cats, poultry. All parts are toxic especially seeds. | Weak and rapid heart rate, dilated eyes, dryness of mouth, and appearance of blindness. pregnant animals may have deformed progeny. | If caught early enough administer mineral oil. Cool the animal by washing if needed. Consult veterinarian for dosages. |
| Redroot pigweed (<i>Amaranthus retroflexus</i>) | Cattle, goats, sheep, and swine. Ingested leaves, stems, and roots. | 5-10 days weakness, trembling, and incoordination. Swine may go into coma and die. | Remove from pigweed. Veterinarian may treat with 2 percent methylene blue. |
| Spurges (<i>Euphorbia</i> spp.) | Horses, cattle, sheep, young dogs, cats, and caged birds. All parts of plant are toxic. | Skin problems, stomach, and intestinal upset, weakness, unthriftiness, and prostration. | Treat areas of contact with ointments or protectants, and administer laxatives. consult veterinarian for dosages. |



Common cocklebur.

Images were taken from Purdue publication WS-9, 'Indiana Plants Poisonous to Livestock and Pets'.

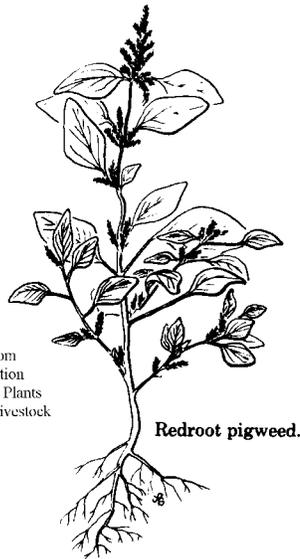


Jimsonweed.

Image taken from Purdue publication WS-9, 'Indiana Plants Poisonous to Livestock and Pets'.

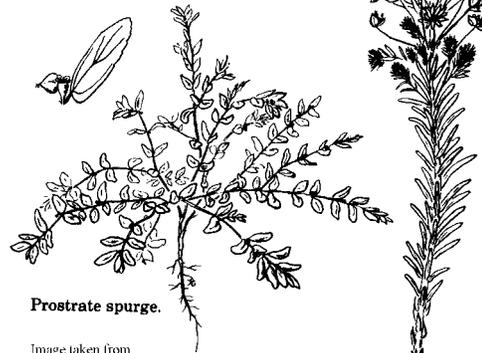
JIMSONWEED, THORNAPPLE
Datura stramonium
(nightshade family)

Image taken from Purdue publication WS-9, 'Indiana Plants Poisonous to Livestock and Pets'.



Redroot pigweed.

REDROOT PIGWEED
Amaranthus retroflexus
(pigweed family)



Prostrate spurge.

Image taken from Purdue publication WS-9, 'Indiana Plants Poisonous to Livestock and Pets'.



Cypress spurge.

Plant Diseases

Update on Wheat Diseases – (Gregory Shaner) –

- The latest spell of rainy weather may give rise to leaf blotch and head scab

Rainfall has been variable around the state during the past 3 weeks, both in terms of frequency and amount. As of late last week, wheat plots in southeastern west central, and northeastern Indiana had little disease. Leaf blotch was evident on lower leaves. I saw only light amounts of powdery mildew on some varieties. There was no leaf rust or symptoms of yellow dwarf. "Windshield" surveys as I drive around the state suggest that the wheat crop is healthy, although wheat seems shorter than normal.

The rather general rainfall of the past few days may promote a burst of leaf blotch. I don't think it will be severe because infection is so light on the lower leaves. Lesions on these leaves are the source of spores that infect upper leaves and heads during wet weather.

I have not seen any head blight (scab) in any of my field plots yet. As part of a head blight epidemiology study, I received two field samples from Posey County today. Two heads out of more than 200 from one field had possible head blight. None of the heads from the second field showed symptoms of head blight. As with leaf blotch, however, the recent rains and high humidity may permit some infection to develop. Wheat is most vulnerable when it is flowering, but can be infected even into the early dough stage of development. Last Friday, wheat in northern Indiana was just starting to flower. The wheat samples from Posey County were in mid to late milk. Thus, wheat throughout the state is probably vulnerable to infection.

George Buechley and I have been monitoring airborne spores of the scab fungus (*Fusarium graminearum*) at the Purdue Agronomy Research Center since mid April. So far, numbers of spores caught in a volumetric sampler have been low. Numbers in recent days may increase, but we won't know for a few days because it takes that long for the spores to germinate and the fungus to grow sufficiently on a selective medium for us to identify it. Until last Thursday, conditions were very dry at this farm. In areas of the state where there has been more rain, the fungus has probably been producing more spores on corn residue.

It is premature to suggest that head blight will be a problem this year. If we have wet, humid weather throughout this week, fields should be scouted for bleached heads. Wheat stem maggot and take-all root rot can also cause premature bleaching of wheat heads. If the maggot is responsible, the head and peduncle can be easily pulled from the flag leaf sheath because this insect chews the peduncle (neck) off just above the node. If take-all is responsible, the entire plant will be dead. Scab causes bleaching on part or all of the head, but the peduncle and foliage will be green. The bleached area may be at the tip, middle, or base of the head, depending on the stage of flowering when infection occurred. Under humid conditions, the bleached areas of the head may show a pink color where the spikelet attaches to the rachis. My best guess at this time is that if we see head blight this year, it will be sporadic, depending on local rainfall conditions and proximity of wheat to corn residue.

Agronomy Tips

Protect Wheat's Flag Leaf – (Ellsworth P. Christmas and Charles Mansfield) -

What is the contribution of the flag leaf to final yield?
When is wheat physiologically mature?

The armyworms are marching northward and a wheat field may be in their sights. Considering this possibility, one question comes to mind that we need to address. That question relates to the amount of leaf area loss that can be tolerated without major yield loss. Other than the top two leaves, the lower leaves contribute very little to the final yield since 70 to 90% of the grain dry weight comes from photosynthates made during the grain-filling period.

Under normal growing conditions, about 50% of the photosynthate moved into the grain originates from the flag leaf, with the balance coming from the leaf immediately below the flag leaf, the leaf sheaths, and the spike. Therefore, the rate and/or duration of kernel development is at least partially limited by the rate and/or duration of photosynthate production, during grain fill, by the flag leaf. The bottom line for top yield is to protect the flag leaf.

The second issue or question relates to the stage of growth at which the wheat plant is physiologically mature. The wheat plant is considered physiologically mature when the grain reaches 40% moisture, which corresponds roughly to that point when the kernels in the center of the head have just begun to turn from a green to a red color. At this stage of growth, the leaves should have a yellowish cast with the nodal areas green.

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Pasture Recovery from Armyworm Damage - (Keith Johnson) -

Good questions have arisen on what to do with grass, hay, and pasture fields that were extremely damaged by the armyworm invasion.

1. Will fescue and orchardgrass fields recover from the damage?

Yes. Consider the damage done by the armyworm to be equivalent to an overgrazing by ruminant livestock or horses.

2. How long will it take fescue and orchard grass fields to recover from the damage?

Time to recover will be dependent upon whether other stresses (e.g., dry weather and low fertility) occur, too. With decent growing conditions, grass regrowth should be sufficient to graze or mow as hay within 6 weeks.

3. Could a farmer no-till sorgham-sudangrass into those fields and have pasture or hay for the rest of the summer and then let the fescue or orchardgrass come back this fall?

I am not in favor of no-tilling any annual crops into pasture or hay fields that were good stands before the armyworm invasion. Grass regrowth will be competitive with young seedlings. I doubt that the farmer recoups the cost of seed and time in no-tilling annuals into the perennial grass pasture or hay fields.

I would also add that I think it would be advantageous to grass regrowth if the fields of stems are clipped. Clipping ought to provide more even and vigorous regrowth. An added benefit could be a reduced possibility of eye irritation to livestock if stems are clipped.

Armyworms March On; Farmers May Apply for Assistance – (Steve Leer, *Agricultural Communications*) –

Armyworms continue to march and destroy Indiana cropland and pastures. Hoosier farmers with damaged acres may be eligible for disaster assistance through the U.S. Department of Agriculture's Farm Service Agency (FSA), but they must apply soon. The 2001 Non-insured Crop Disaster Assistance Program may cover armyworm damage, said Doug Hovermale, FSA program specialist. Details are still being worked out, he said. "Producers who have possible damage to non-insured crops are encouraged to file a notice of loss — form CCC-576 — to protect any possible future benefits," Hovermale said. "This must be done within 15 days of the disaster event or the date loss becomes apparent." Farmers may obtain the form at their county FSA office. Coverage takes effect 30 days after the application is submitted. Benefits are based on 50 percent of a county's established yield or the producer's actual production history — if established with the county FSA office — and 55 percent of the county's established price for the affected crop.

Armyworm larvae are feeding in southwest and west-central Indiana counties. The pests also have been spotted in portions of northern and northeast Indiana, said John Obermeyer, a Purdue University entomologist.

The worms, which range from a quarter-inch to 1.25 inches long, consume emerging corn, wheat, rye and other tall growing grasses. Obermeyer said he's seen fields and pastures "denuded" by the hungry pests.

"This is definitely a serious infestation," Obermeyer said. "Some farmers are comparing it with an infestation going back to the early 1970s. I've heard others say they haven't seen it like this since the 1950s."

Keith Johnson, Purdue Cooperative Extension Service forage specialist, said he was amazed at armyworm damage he'd encountered in southern Indiana in the past few days. "I was actually able to hear the larvae chew their supper," Johnson said. "I hope that I never see or hear such a sight again." Farmers should inspect their fields for armyworm activity and take decisive action, Obermeyer said. Before applying pesticides, check product labels for harvest and livestock grazing restrictions, Obermeyer said.

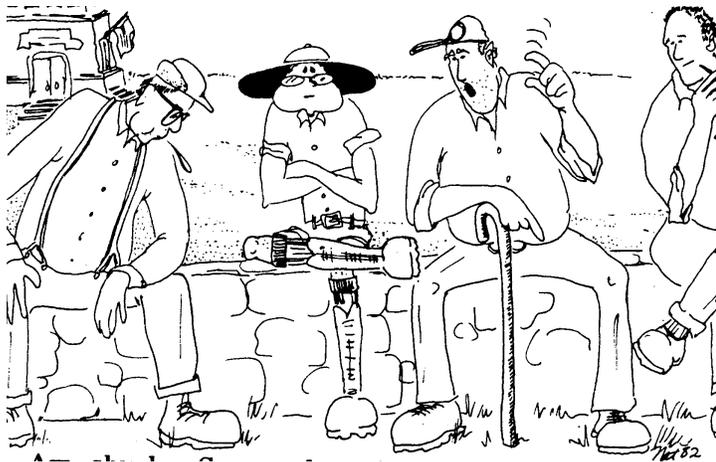
Fescue and orchardgrass fields will recover from armyworm feeding, Johnson said. Under normal growing conditions, grasses should be ready for livestock grazing or hay mowing within six weeks, he said.

Sowing sorgham-sudangrass into damaged fields should not be done, Johnson said. "I am not in favor of no-tilling any annual crops into pasture or hay fields that were good stands before the armyworm invasion," Johnson said. "Grass regrowth will be competitive with the young seedlings. I doubt that the farmer recoups the cost of seed and time in no-tilling annuals into the perennial grass pasture or hay fields."

Clipping stems can provide even and vigorous grass regrowth and reduce eye irritation to livestock, Johnson said.

For more information on armyworms and control options, read Purdue Extension publication E-57, "Armyworm and Fall Armyworm," by Obermeyer and Purdue entomologists Rich Edwards and Larry Bledsoe. The publication is available through county Extension offices or may be downloaded online at <<http://www.agcom.purdue.edu/AgCom/Pubs/pdflinks/E-57/html>>.

Bug Scout



Aw, shucks, Sonny, these armyworms are nothing compared to the time we had'em back in the 50's!

Weather Update

Temperature Accumulations from Jan. 1 to May 23, 2001

| MAP KEY | | | |
|----------|--------|---------|---------|
| Location | | | |
| HU 41 | GDD(3) | GDD(11) | GDD(40) |

4" Bare Soil Temperatures 5/23/01

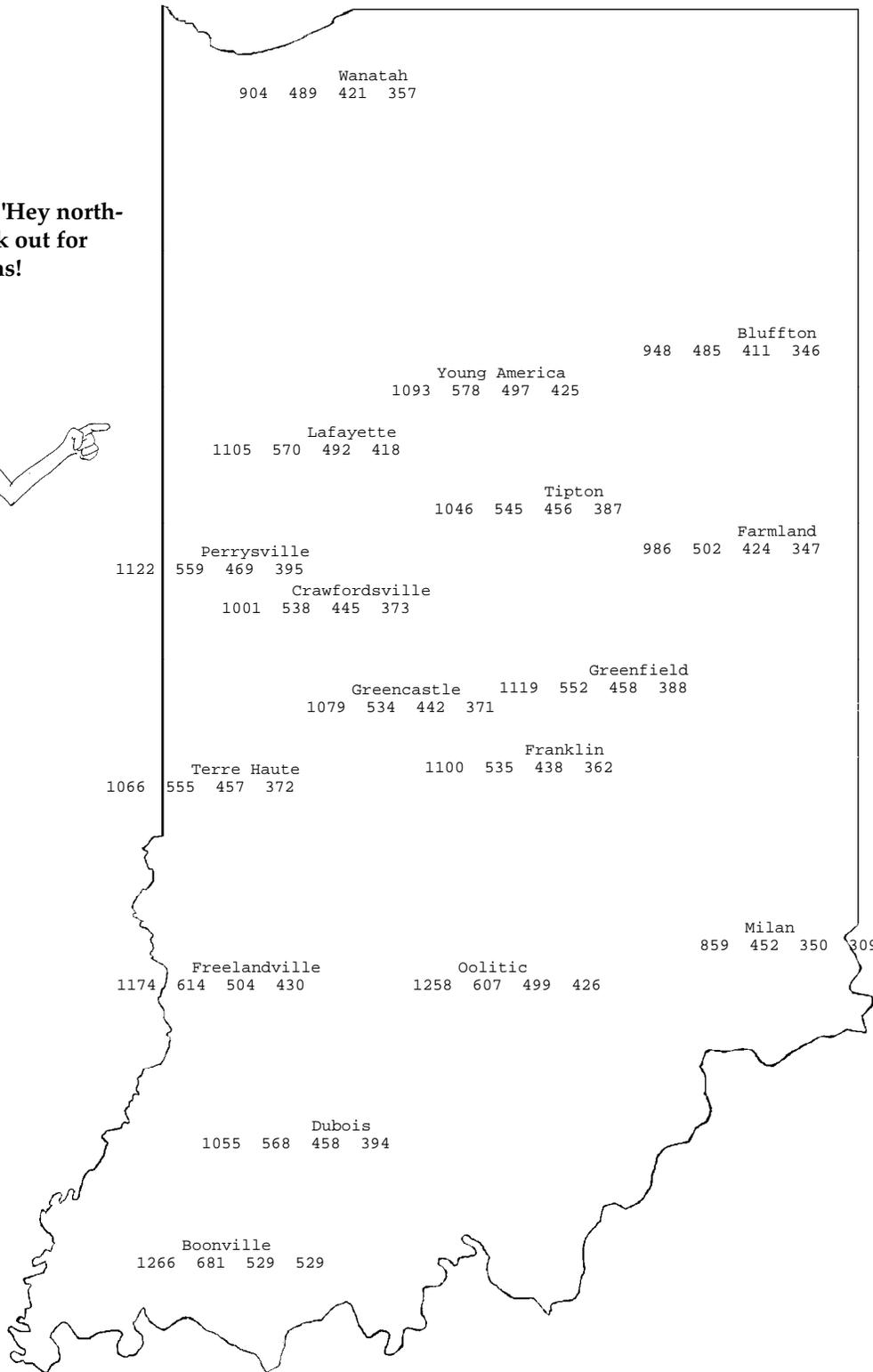
HU41 = heat units at a 41°F base from Jan. 1, stalk borer larval movement begins at approx. 1,400

GDD(3) = Growing Degree Days from April 14 (3% of Indiana's corn planted), for corn growth and development

GDD(11) = Growing Degree Days from April 22 (11% of Indiana's corn planted), for corn growth and development

GDD(40) = Growing Degree Days from April 28 (40% of Indiana's corn planted), for corn growth and development

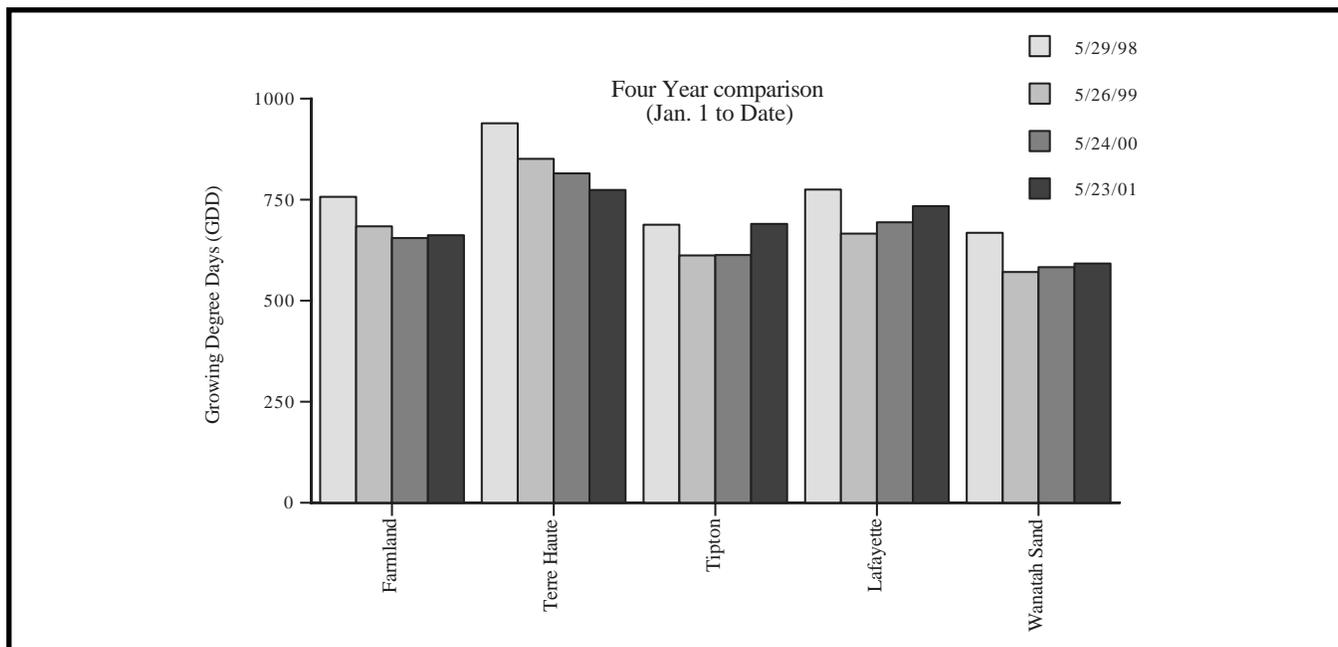
Bug Scout says, "Hey northern Indiana, look out for those armyworms!"



| Location | Max. | Min. |
|----------------|------|------|
| Wanatah | 65 | 56 |
| W Laf Agro | 64 | 54 |
| Tipton | 66 | 62 |
| Farmland | 63 | 52 |
| Crawfordsville | 68 | 61 |
| Trafalgar | 70 | 58 |
| Terre Haute | 71 | 61 |
| Vincennes | 64 | 55 |
| Oolitic | 67 | 62 |
| Dubois | 76 | 56 |

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