Pest&Crop

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In This Issue

Insects, Mites, and Nematodes

What About Controlling WCR Beetles in Soybean Fields Where First-Year Corn Rootworm Problems Exist? - (*John Obermeyer, Rich Edwards, and Larry Bledsoe*) -

- "Dead beetles don't lay eggs"
- WCR beetle suppression in soybean to prevent egg laying is possible, timely and diligent scouting is necessary
- Costs are probably more than using soil insecticide next spring
- Check soybean fields for WCR beetles!

Where problems with western corn rootworm (WCR) in first-year corn (corn/soybean rotation) have shown up, some have asked about controlling the rootworm adults in this year's soybean fields. The idea behind this strategy is to control the adults in soybean before they have laid sufficient eggs to create a rootworm larval problem in next year's corn. Although this strategy sounds good, and in theory is possible, it requires a knowledge of beetle biology and a *very* high level of management. You don't just spray fields and forget them when it comes to adult control! Fields need to be scouted before to determine beetle presence and after treatment to determine if it is necessary to retreat. Even 100% attention to detail will not guarantee that failures will not occur. Of course, one can argue that this is also the case with soil insecticides. However, soil insecticides are more consistent in their control based on timing and the level of management that is required.

The idea of controlling adults to prevent egg laying and subsequent larval damage is not new, the management of rootworm adults in continuous corn using this strategy has been around since the 1970's. Many midwestern states researched this strategy with varying degrees of success. The primary problem was the timing of the application and the amount of field monitoring that was required to ensure that the rootworm beetles were adequately controlled, and, if an economic reinfestation occurred, that these new beetles were quickly controlled. Also, follow-up was needed the next year to make sure that rootworm larvae were not present in high enough numbers to result in economic root damage. If a critical larval population was detected the next year, a cultivation application to rescue the field was required.

At this time, it is *not* possible to utilize this strategy at the same level in soybean since we do not have beetle threshold information. We have research underway that will hopefully provide these numbers. However, since these numbers are not presently available, we are reluctant to recommend this as a control strategy. It could be that without these thresholds many fields will be sprayed and no economic return will be realized. Another possible concern is that preliminary results from a new study indicates that more WCR eggs are laid in soybeans earlier than first believed. Should this be the case, adult control to prevent egg laying may be next to impossible.

How about the economics of adult suppression in soybean versus larval control in corn? As previously mentioned, it will likely take two foliar insecticide applications to prevent enough egg laying in soybean to cause economic damage to next year's corn. Therefore, when comparing foliar insecticide and application inputs, it is about the same cost if not more, as granular insecticides at planting. Knowing that precise scouting and insecticide timing are critical over the rootworm beetle's egg laying period (mid-July through August), it seems that money is best put toward larval control in the spring.

Refer to last week' *Pest&Crop* article "Monitoring Soybeans For Rootworm Beetles With Yellow Sticky Traps," for trapping adults to determine the need for a rootworm insecticide in next year's corn.

Western Corn Rootworm beetle feeding on a soybean leaf.

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Corn Rootworm and Japanese Beetle Survey in Pollinating Corn Fields, July 11 and 12, 2000 (Ron Blackwell)

County (Fields) Sampled	# Adult CRW/plant*	# Adult JB/plant*
Clinton	2.6	0.5
Clinton	2.5	0.0
Clinton	0.1	0.0
Delaware	0.2	0.2
Delaware	0.0	0.0
Fountain	16.4	0.3
Fountain	6.6	0.0
Randolph	1.4	0.0
Randolph	0.2	0.0
Randolph	0.0	0.0
Tippecanoe	1.4	0.7
Tippecanoe	3.2	0.0
Vermillion	0.2	0.9
Vermillion	3.5	2.2
Warren	2.2	0.0
Warren	3.3	2.2
Wayne	0.6	0.0
Wayne	0.0	0.0
Wayne	0.4	0.6

*Average for ten plants examined/field.

Black Light Trap Catch Report (Ron Blackwell)														
County/Cooperator	6/27/00 - 7/3/00							7/4/00 - 7/10/00						
	VC	BCW	ECB	GC	CEW	FAW	AW	VC	BCW	ECB	GC	CEW	FAW	AW
Clinton/Blackwell	3	5	0	0	0	0	0	1	4	0	0	0	1	1
Dubois/SIPAC	4	0	0	0	0	0	7	0	1	0	0	0	0	1
Jennings/SEPAC	3	1	0	2	0	0	1	1	0	0	1	0	0	1
LaPorte/Pinney Ag Center	1	0	5	0	0	0	4	0	1	0	0	0	0	3
Lawrence/Feldun Ag Center	1	2	0	1	0	0	15	2	0	2	0	1	0	8
Randolph/Davis Ag Center	0	2	0	0	0	0	5	1	1	0	1	0	0	1
Whitley/NEPAC	0	2	1	0	0	0	11	3	1	0	0	0	0	2

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

Plant Diseases

Corn Rust – (*Gregory Shaner*) –

- An epidemic of common rust of corn?

In *Pest & Crop* #13 and 14, I reported that common rust of corn was developing rapidly on some corn inbreds. It now appears that rust will be unusually severe on corn this year. The problem is not confined to seed corn and certain specialty corn hybrids. I have had several reports of heavy infection on hybrid field corn.

Common rust is what plant pathologists refer to as a polycyclic disease. The pustules that develop initially on lower leaves, as a result of infections produced by spores that blew into Indiana cornfields from southern states, produce more spores that cause more infections within a field. These infections give rise to more pustules, more spores, more infections, and so on. The number of pustules in a field tends to increase exponentially. At first, the rate of increase does not appear to be too rapid (the lag phase). Then, the disease "explodes" as the rate of pustule development enters the exponential phase. The number of pustules increases in a manner similar to the accumulation of money at compound interest. However, rather than increasing at rates of 5 to 8% per year, rust pustules can increase at rates of 15 to 30% per day.

All that is needed for a rust spore to infect the leaf is a few hours of dew. Temperatures in the range of 60 to 77°F are most favorable for infection, but at higher temperatures some infection will occur. Recent daytime temperatures have been in the 80s, but at night, when infections usually occur, temperatures have been dropping into the lower 70s.

Intensity of rust is generally expressed as the percentage leaf area affected. This is referred to as percent severity. When severity of various leaf blights, such as northern corn leaf blight or gray leaf spot, is assessed, 50% severity means 50% of the leaf area is blighted. With rust, severity is measured a bit differently. A visible rust pustule is a mass of spores produced by the fungus in an infection site. Thread-like strands of the fungus grow within the leaf tissue and after a few days, the fungus begins to produce spores at the center of the infection site. This mass of spores erupts through the leaf epidermis and gives rise to the visible pustule (the brick red spot). The actual pustule occupies only about 1/3 of the leaf area invaded by the fungal colony. Hence, when the maximum possible density of pustules occupies a leaf, only about 33% of the leaf area will actually be covered with pustules. This density of pustules is considered to be 100% severity and lesser densities are rated accordingly.

Rust damages the plant in two general ways. The fungus is a parasite and it derives all of its nutrients from the host plant. Carbohydrates and other nutrients that would normally sustain vegetative growth and fill the grain are diverted into the fungus. Also, at the site of each pustule, the leaf epidermis is torn open. This means that the ability of the plant to regulate its water economy through stomatal action is compromised. A heavily rusted plant can show symptoms of moisture stress under hot, windy weather even though soil moisture would be regarded as adequate. A severely rusted plant suffers both from lack of nutrients moving into the grain and from lack of water.

All corn has a general resistance to rust in that mature leaves are less susceptible to infection than juvenile leaves. This year, rust began developing very early, and a lot of infection evidently occurred while leaves at each layer were in the juvenile stage. Many hybrids also have resistance that reduces the number and size of pustules or extends the time from infection until when a pustule forms. These types of resistance reduce the rate of epidemic development. To return to the money analogy, these types of resistance are somewhat equivalent to a lower rate of compound interest. A few pustules will be seen on leaves of plants with these types of resistance, but severity will remain low throughout the season.

From several phone calls I have had, it appears that some hybrids are very susceptible to rust. Some growers are wondering if a fungicide should be used. Although fungicides are commonly used on seed corn and sweet corn, they are not generally used on hybrid field corn. On both sweet corn and seed corn, effective control requires that the first fungicide application be made when rust first appears. Applications are repeated on a 7- to 14-day schedule, depending on weather and the susceptibility of the corn. Because of the phenomenal number of rust spores that can be produced in a field of corn once the disease is established, it is very difficult to halt an epidemic with fungicides. This is why applications must begin when disease first appears. It is easier to prevent an epidemic than to halt one that is already on a roll. Therefore, if hybrid corn producers are just now noticing that rust is severe, it is probably too late for a fungicide to be effective. On the other hand, if rust was noticed earlier, before it became severe, and a fungicide was applied, a second fungicide application may be justified. It is important to do some careful calculations about costs and returns. Unfortunately, it is not possible to precisely relate disease severity to yield loss. For each 10% severity of rust, yield losses may range from 3 to 8% of potential yield. The earlier rust develops, the greater the loss. Severe rust tends to shrivel grain rather than reduce grain number.

Several fungicides are labeled for use against corn rust. Various mancozeb products can be applied after silking. The label for Tilt specifies that applications not be made after silking. However, Indiana has a supplemental label, 24(c), which allows post-silking applications on corn grown for seed. If Tilt is applied to seed corn after silking, the applicator is required to have a copy of the special label in his or her possession at the time of application. If using any fungicide, the label should be consulted regarding rates, timing of application, total amount that can be applied during the season, and other important considerations.

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

- Conditions are looking more favorable for sudden death syndrome in soybeans

In *Pest & Crop* #14, I speculated about the chances for sudden death syndrome in soybeans this year. An important predisposing factor for SDS is heavy rainfall during early pod filling. During the past few days, many areas in Indiana have received heavy rain. Scott Abney, a USDA-ARS soybean pathologist at Purdue, has already seen SDS in a few fields. Affected plants have been in low areas where soils have been wet. The recent heavy rains may bring on symptoms over a wider area. In scouting for SDS, fields that are most advanced in development should be looked at first. These are the ones most likely to show symptoms. Even though no remedial action is possible, it is useful to know which fields, and where in these fields, the problem exists. This information can be useful for future planting decisions.

Agronomy Tips

Opportunities for Mapping Crop Problem Areas - (*Bob Nielsen*) -

- Water damage to fields not uncommon
- Take opportunity to document problem areas

Near torrential rains continue to create problems for some Indiana corn and soybean fields. Old tile line patterns are appearing. Evidence of broken tile lines is showing. Stunting or death of crops is visually dramatic in the 'wet holes' of fields. River bottom fields have suffered extensive flood damage. Strange patterns of healthy and stunted crops caused by natural soil drainage variability are creating 'modern artwork' for the amusement of airline travelers flying overhead.

Positive thinkers always look for opportunities amidst problems. What opportunities exist for such soggy soil problems?

One opportunity is to take the time and effort to map or otherwise document the boundaries of the problem areas for future reference and, hopefully, reparation. Today's GPS-based technologies offer the type of accurate assistance that makes this mapping exercise possible in a meaningful way.

Aerial Photography

Nothing beats aerial photography to help you visualize problem areas in a field. If you have opportunities locally to contract with a service provider to fly your fields yet this summer, consider doing so to create visual records of crop damage to wet soils for future reference. You can also simply take to the skies yourself with a plain old camera or a digital camera if you have access to a small plane or an ultra-lite and have the nerve to hang your neck out the window/door as the plane flies on its wingtips.

"Go fly a kite!" takes on a new meaning in southeast Nebraska where Rich Douglass of Southeastern Community College is developing agricultural uses for kite aerial photography (KAP). Visit his Web page at <http://www.emporia.edu/kite/agricul/ag_kap.htm> to see what he is 'up to' in adapting this technology to crop scouting.

One of our Purdue Extension publications (AY-252, "Aerial Photography as a Crop Management Aid") will help you evaluate the merits and feasibility of non-georeferenced aerial photography as a crop monitoring and management aid. This publication is available from your local Cooperative Extension Service office or on the Web at <http://www.agcom.purdue.edu/AgCom/Pubs/AY/AY-252.html>.

Georeferenced aerial photography goes a step further and gives you an additional layer to incorporate with your yield maps or soil fertility maps in your farm's Geographical Information System (GIS) database. A problem today is that few service providers offer this aerial version of remote sensing for agriculture and, furthermore, the service is pricey. One such provider is Earthscan (URL: <http://www.dtnearthscan.com/EarthScan/home.asp>).

Last year we were able to document the areas of severe phytophthera seedling rot with georeferenced infrared imagery in one of our 30 acre fields at the Davis-Purdue Ag. Center in Randolph County. In addition to the image being a disease map of the field, it also serves as an indicator of wet areas in the field.

Field M1 - 8 Jul 1999

Differential GPS (DGPS)

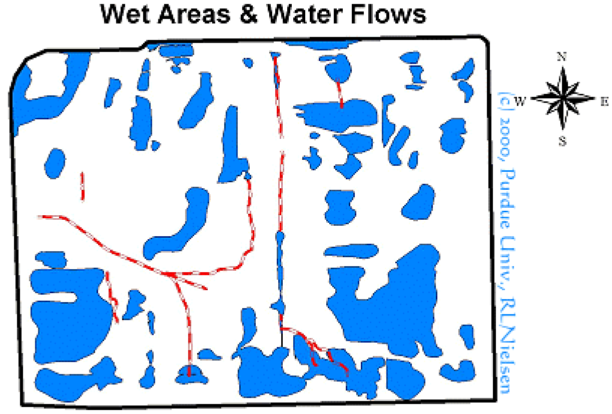
So you've been wondering what else to do with that high-priced DGPS receiver on the top of your combine other than to use it during grain harvest? Spend a little more money for a WindowsCE™ palm computer plus GIS mapping software plus hard-framed backpack and you can use that receiver to map problem areas on foot or by ATV. There are many WindowsCE™ palm computers available on the market today at prices ranging from $400 to $600. See some reviews of these handhelds on the Web at <http://www.zdnet.com/products/filter/guide/0,7267,1500114,00.html>.

There are a few user-friendly GIS mapping software programs available for the WindowsCE™ platform. One that I have experience with is StarPal™ HGIS™ (URL: <http://www.starpal.com>). The learning curve for using the software is reasonably low and the program is reasonably flexible for use in crop scouting. The cost is $400 to $600. Another program that is being evaluated by some of my colleagues is ESRI's ArcPad™ (URL: <http://www.esri.com/software/arcpad/index.html>). The cost is $495. Such programs allow you to mark individual points (e.g., tile blowouts), lines (e.g., gullies) and polygons (e.g., perimeters of ponded areas), as well as record actual values for individual data points in the field (e.g., plant population).

Earlier this summer, we used our backpack GPS unit with a WindowsCE™ palm computer and StarPal™ HGIS™ software to map the wet areas of several of our research fields at the Davis-Purdue Ag. Center in Randolph County. The resulting map was reasonably correlated with our phytophthera map of 1999.

The blue areas (or grey in black and white) outlined in the image below are a mixture of spots with standing water, visible soil surface moisture, ruts from the planter, or barren of plants because the area was not planted in the first place due to muddy conditions. The red/white (grey in black and white) dashed lines represent areas of water flow (some gullies and some simply minor erosion). The depressing part of the exercise was that it required eight hours of walking and/or ATVing by two people to map the 30-acre field.

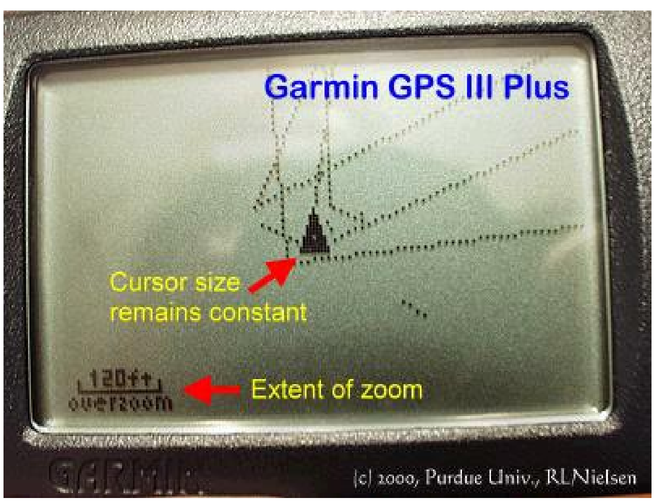
Wet Areas & Water Flows



Recreational GPS

The recent decision by the U.S. federal government to eliminate the GPS Selective Availability (aka satellite signal scrambler) means that the accuracy of non-DGPS receivers has improved from hundreds of feet to tens of feet. Now there is some potential for using recreational GPS navigation receivers (Garmin™, Magellan™, etc.) for certain kinds of field scouting. These devices range in price from about $200 to $500.

Several challenges still exist for their use in field scouting. First of all, their current ability to zoom in on a target is limited relative to your detailed geographic needs in a field. Related to the zooming limitation, the constant size of the navigation cursor itself on the screen limits your ability to 'zero in' on a target because the cursor's footprint is too large.



Thirdly, most of these devices limit you to marking 'waypoints' (individual points of interest) or trip routes ('breadcrumb' trails), but not closed boundaries or polygons (e.g., the perimeter of a soggy soil area). Finally, software programs to facilitate data transfer between these devices and a GIS mapping program on your PC are few and far between.

Nonetheless, you can probably use these devices to mark points of interest (e.g, tile blowouts) or draw 'travel routes' around fairly large problem areas, and use the same device to return to the problem area at a later time.

Bottom Line: The real message of this article on 'high-tech' crop scouting gadgets is that growers should take the opportunity afforded them by the recent spate of 'toad-stranglers' and 'goose-drownders' to document the extent and position of problem areas in their fields caused by the lengthy periods of soggy soils and warm temperatures. Given that we are in mid-summer, documenting these areas may be easier to do in soybean fields than corn due to soybean plants being shorter and easier to walk to spot problem areas. This information could be useful in the future for making decisions about tile drainage installation or repair, improvements in surface drainage, ameliorating significant soil compaction layers or whether to continue farming that 'wet hole'.

[In deference to Purdue's lawyers, none of the commercial products or services mentioned in this article are endorsed by me or Purdue University.]

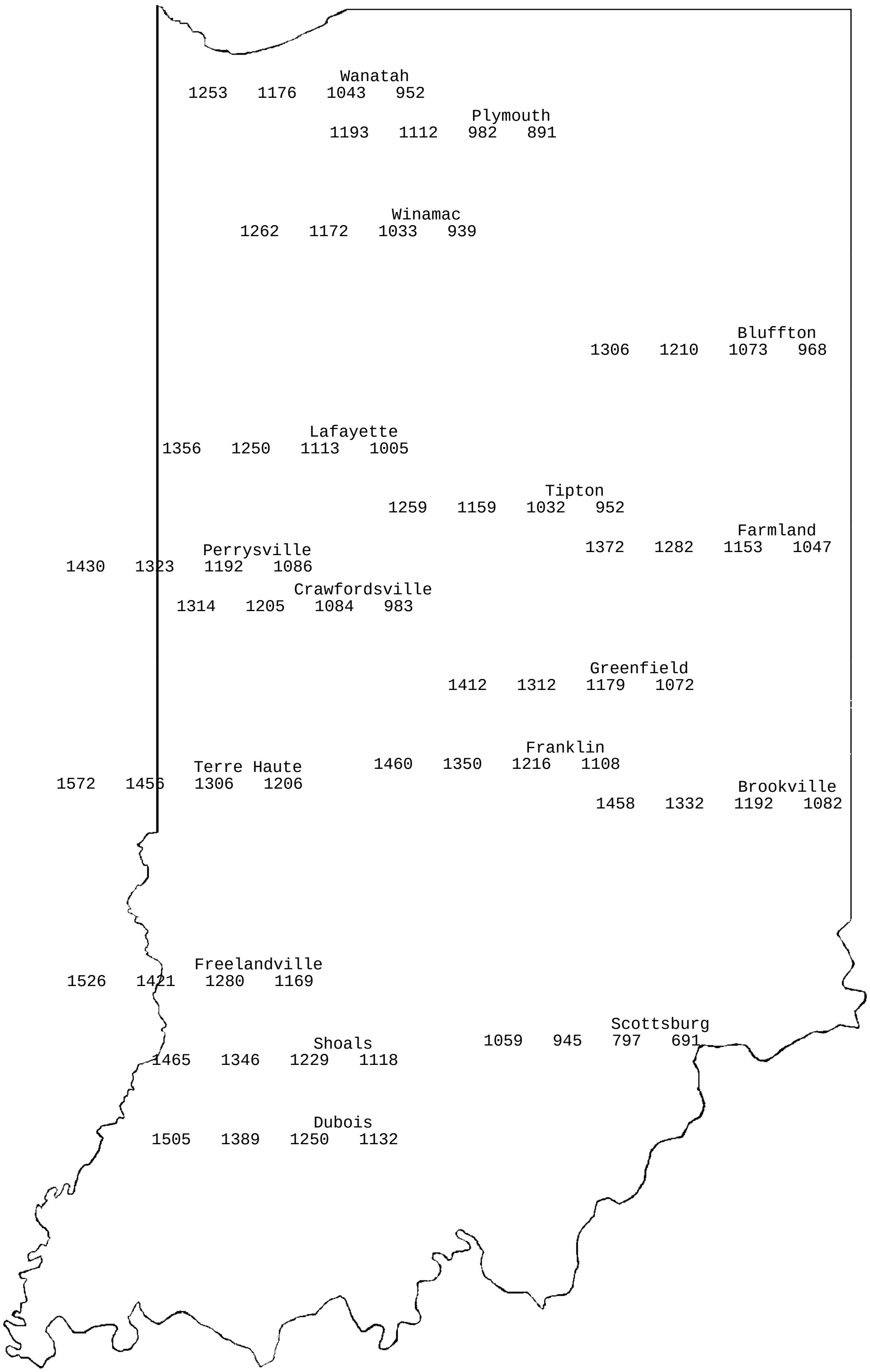
Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the World Wide Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the World Wide Web at <http://www.kingcorn.org/>.

Weather Update

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

Temperature Accumulations from Jan. 1 to July 12, 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 7/12/00

Location	Max.	Min.
Whitford Mills	77	73
Wanatah	86	70
Columbia City	80	69
Winamac	82	69
Kentland	80	71
W Laf Agro	79	68
Tipton	74	66
Perrysville	78	76
Crawfordsville	77	70
Liberty	75	69
Terre Haute	80	76

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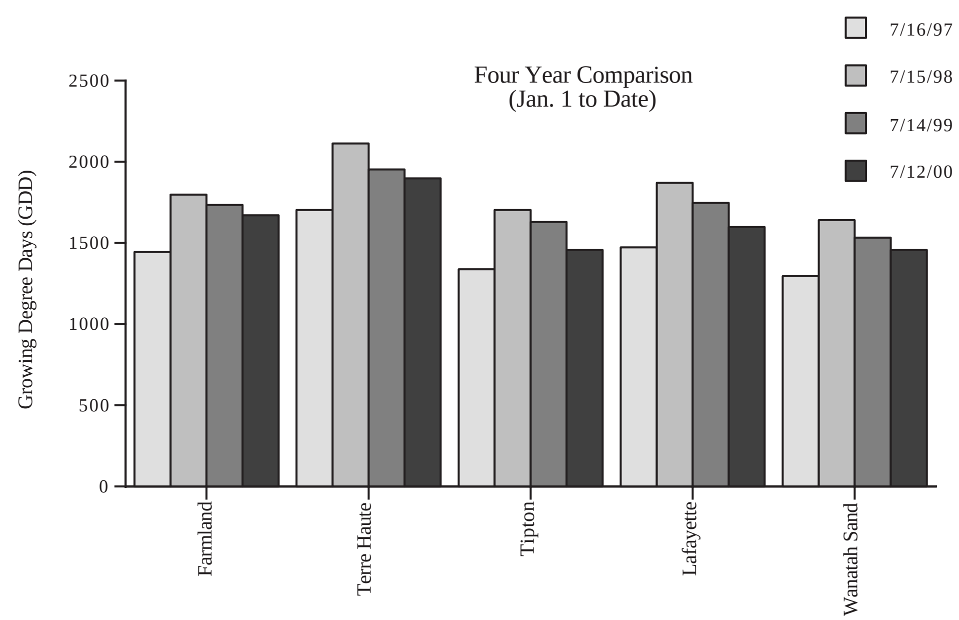
http://www.entm.purdue.edu/Entomology/ext/targets/newslett.htm



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