Pest & Crop

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Insects, Mites, and Nematodes

Rootworms, Ponding, and Soil Insecticides - (*John Obermeyer and Larry Bledsoe*) -

- Eggs don't drown
- Newly hatched larvae might
- By the time all larvae drown, so will the corn
- Soil insecticides are broken down by sunlight and moisture
- Insecticide efficacy in flooded areas may be compromised

Flooding has little detrimental effect on rootworm eggs (overwintering stage). This is evident in the fact that rootworm injury can occur on corn planted in bottom ground after extended spring flooding. In other words, eggs are very durable.

However, larvae are vulnerable to flooding. Flooded soils cause larval death in one of two ways. Larvae in saturated soils would either drown from lack of oxygen (anaerobic conditions) or starve from lack of food, because the corn plants have succumbed to flooding. We saw this in the spring of 1998, which was a slow planting season because of continual rains. Rootworms were subjected to saturated soils during egg hatch, and larval numbers and subsequent damage were reduced. Keep in mind that hatch takes place over an extended period of time and it is quite possible to have both eggs and mature larvae in the root zone. In summary, saturated soils

Tough conditions for soil insecticides. Photo credit: Bob Nielsen, Agronomy Dept.

increase larval mortality, but by the time all rootworm larvae drown, so will the corn.

Two things that accelerate the breakdown of soil insecticides are sunlight and rainfall. The sun's UV rays will degrade insecticide exposed on the surface of the soil. T-band applications may leave a considerable percent of product exposed if there wasn't any incorporation (e.g., drag chains). Insecticide chemistries vary in their solubility and their tendency to stay put after application. Insecticides in fields that received "toad floaters" may have been either physically moved off-target by erosion or leached deeper into the soil.

Think of your insecticide application methods and the environmental factors that your rootworm protection has contended with since planting. Soil insecticide performance will certainly be challenged this year in early planted, high-risk rootworm fields. Consider these fields to be good candidates for larval sampling once egg hatch is underway. More later!

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Slugs and Seed Slots - (*John Obermeyer and Larry Bledsoe*) -

- Slugs are favored by a wet spring with heavy crop residue on the soil surface
- Crop damage and stand losses are most severe when slugs enter open seed slots
- Control options are limited

With planting going at a "snail's" pace recently, there will be a great temptation to plant fields before soils are in their optimal condition. Over the last decade or so, slug populations have increased in various areas of the state, especially where heavy residue is left on the soil surface. Fields that have a history of slug problems with small grain or grass-type residues are especially vulnerable.

Most damage and stand losses by slugs occur when fields are planted too wet and seed slots are not properly closed. In this situation, slugs can be found feeding on the seedlings within the slot, day or night. Control of slugs is difficult, if not impossible at this point. Granular and liquid insecticides applied during or post-planting are ineffective against slugs, as they slime over them. Obviously, once the growing point of corn or soybean is injured, plant recovery is unlikely.

Where slugs have been a problem in years past, tillage is a possible management strategy. Disrupting the soil environment exposes slug eggs and juveniles, destroying many and/or discouraging population growth. This is not an option on highly erodible land (HEL). A couple metaldehyde-pelleted baits are labeled and available for use. Spreading the mini-pellets evenly over damaged areas is a challenge; a commercial mechanical dispenser is one possibility. With the significant cost and difficulty of application, consider these baits only as a last resort to protect crop stands in high slug populated areas.

Soybean damage from seed slot feeding.

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Wheat Stem Maggot – (*John Obermeyer and Larry Bledsoe*) –

Betsy Smith, Grower's Co-op Agronomist in southwest Indiana, has reported finding some wheat stem maggot damage in the Daviess County area. Bleached wheat heads alerted the producer and Betsy to the problem.

Wheat stem maggot is an occasional and non-economic pest of small grains in Indiana. Typically only 1-

White heads from wheat stem maggot damage. Photo credit: Betsy Smith, Growers Co-op.

2% of plants are damaged in a field. White wheat heads are the result of the larva (maggot) feeding within the stem and cutting off plant fluids to the upper portion of the plant.

The biology of this pest is very similar to the potentially destructive Hessian fly. Producers planting wheat after the Fly Free Date in the fall should rarely see damage from this insect. This should serve as a reminder to practice this simple, yet effective pest management technique.

Assortment of Insect Reports – (*John Obermeyer*) – There's been a smattering of "bug" reports (bean leaf beetle, corn flea beetle, cutworm leaf feeding, slugs) received from pest managers in Indiana and neighboring states. Most have the same conclusion, damage below economic thresholds. Greg Bossaer, White County Extension Educator, reported one producer with patches of wireworm damage that may necessitate replanting. Crop Tech scouting services in Elkhart County reported a high residue cornfield seriously damaged by variegated cutworm. For the most part, all's quiet on the Indiana front.

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Black Light Trap Catch Report
(Ron Blackwell)

County/Cooperator	4/29/03 - 5/5/03							5/6/03 - 5/12/03						
	VC	BCW	ECB	SWCB	CEW	FAW	AW	VC	BCW	ECB	SWCB	CEW	FAW	AW
Clinton/Blackwell	9	3	0	0	0	0	4	4	1	0	0	0	0	1
Dubois/SIPAC	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Jennings/SEPAC	3	0	0	0	0	0	2	1	1	0	0	0	0	5
Knox/SWPAC	1	1	3	0	0	1	0	1	0	1	0	0	1	2
LaPorte/Pinney Ag Center	1	0	0	0	0	0	0	0	0	0	0	0	0	9
Lawrence/Feldun Ag Center	1	1	0	0	0	0	10	0	0	1	0	0	0	4
Randolph/Davis Ag Center	0	0	0	0	0	0	0	1	0	0	0	0	0	3
Tippecanoe/Throckmorton Ag Center	1	0	0	0	0	0	2	0	0	0	0	0	0	11
Vermillion/Hutson	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Whitley/NEPAC	1	0	0	0	0	0	10	1	0	0	0	0	0	131

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

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Black Cutworm Adult Pheromone Trap Report
Week 1 = 5/1/03 - 5/7/03 Week 2 = 5/8/03 - 5/14/03
(Ron Blackwell)

County	Cooperator	BCW Trapped		County	Cooperator	BCW Trapped	
		Wk 1	Wk 2			Wk 1	Wk 2
Adams	Roe/Price Ag Services	8	14*	Lake	Kliene (1)	8	0
Allen	Gynn/South Wind Farms	11*	3	Lake	Kliene (2)	5	0
Bartholomew	Ludwig/Growers Service	0	4	Marshall	Barry/Marshall Co. Co-op	4	3
Clay	Smith/Growers Co-op (Bzl)	0	2	Parke	Rule/Midland Co-op	6	14*
Clay	Smith/Growers Co-op (CC)	3	0	Porter	Mueller/Agriliance	5	2
Clinton	Blackwell/Purdue	11	16	Putnam	Nicholson Consulting	2	1
Elkhart	Kauffman/Crop Tech (1)	1	4	Randolph	Jackson/Davis-Purdue Ag Center (S)	4	3
Elkhart	Kauffman/Crop Tech (2)	6	5	Randolph	Jackson/Davis-Purdue Ag Center (N)	6	4
Fayette	Schelle/Falmouth Farm Supply	3	1	Rush	Tacheny/Pioneer	13	2
Fountain	Mroczkiewicz/Syngenta	0	3	Shelby	Gabbard/Shelby Co. Extension	6	6
Fountain	Hutson/Purdue	0	2	Sullivan	Smith/Growers Co-op (Farmersburg)	0	0
Green	Maruszewski/Pioneer	15	3	Sullivan	Smith/Growers Co-op (E)	3	6
Hamilton	Dobbins/FMC (1)	10	0	Sullivan	Smith/Growers Co-op (W)	2	7
Hamilton	Dobbins/FMC (2)	14*	0	Sullivan	Smith/Growers Co-op (NwLb)	7	6
Hendricks	Whicker/Midland Co-op	3	2	Tippecanoe	Obermeyer/Purdue	11	5
Henry	Schelle/Falmouth Farm Supply	0	2	Tipton	Johnson/Pioneer	12	19*
Jasper	Manning/Jasper Co. Extension (S)	4	0	Vermillion	Hutson/Vermillion Co. Extension	0	0
Jasper	Manning/Jasper Co. Extension (W)	2	0	Vigo	Smith/Growers Co-op	1	0
Knox	Smith/Growers Co-op (Oaktown)	1	1	White	Reynolds/ConAgra Popcorn 1K	2	3
Knox	Smith/Growers Co-op (Whtlnd E)	0	0	White	Reynolds/ConAgra Popcorn 2P	1	1
Knox	Smith/Growers Co-op (Whtlnd W)	5	4	Whitley	Walker/NEPAC	1	0

* = Intensive Capture.... An intensive capture occurs when 9 or more moths are caught over a 2-night period.

Weeds

Weed Management Considerations in Corn in a Wet Spring - (*Bill Johnson, Tom Bauman, and Glenn Nice*)

The recent wet weather has created some challenging weed management situations for corn. Most of the corn acres in Indiana utilize soil-applied, preemergence herbicides and some utilize both soil-applied and postemergence herbicide combinations. In certain parts of Indiana and other areas in the Midwest, corn was planted at a rate which exceeded the ability of custom and private applicators to spray preemergence herbicides. Then the rains came. The result is a lot of acres with emerged corn and no preemergence herbicides applied and fields that were sprayed but have received 5 or more inches of rain within the last three weeks. Below, I have listed various scenarios and some things to consider for each scenario.

Scenario # 1

Corn and weeds have emerged, but the field has ***not*** been sprayed with soil applied, preemergence herbicides.

a. Do not spray Axiom, Balance Pro, Princep to emerged corn. Axiom and Balance Pro will cause injury to emerged corn. Princep is not labeled to be applied to emerged corn.

b. You can apply many of the soil-applied atrazine premixes (Bicep II Magnum, Degree Xtra/Harness Xtra/Keystone/Fultime, Guardsman Max, Lumax, others) to emerged corn. If weeds have emerged, but grass weeds are 1 inch or less and broadleaf weeds less than 4 inches in height, simply add crop oil concentrate to the atrazine premix to burn down the emerged weeds. Consider using lower rates of the atrazine premixes, such as two thirds to three fourths of the label rate since the length of residual control needed is less now than if the product was applied in mid to late April.

c. If grass weeds are larger than 1 inch tall, Option, Steadfast and Accent can be added to most of the soil applied grass:atrazine premix products. Option, Steadfast, and Accent will control grass weeds up to 4 inches tall. Be sure to consult the label for appropriate adjuvants with these mixtures.

d. If broadleaf weeds are in excess of 4 inches, there are several herbicides that can be added to an atrazine premix. Be cautious about adding 2,4-D + crop oil + nitrogen solutions to an atrazine premix and applying it to spike stage corn. I have observed rather severe injury in these situations. If 2,4-D is added, wait to apply this mixture until the corn is in the V1 to V2 growth stage.

e. Consider switching to a total post program with Accent Gold, Basis Gold, Celebrity Plus, Exceed, Northstar, Spirit, or Steadfast/Steadfast ATZ herbicides. These products are designed for this use and allow one to tankmix additional herbicides for added activity on specific weeds. Be cautious of the corn growth stage when using these products. Products containing Beacon (Exceed, Spirit, Northstar) and Distinct (Celebrity Plus) cannot be applied until corn is 4 inches tall, and cannot be applied broadcast after corn is 20 inches tall (Northstar) or 24 inches tall (Celebrity Plus). Products containing atrazine (Basis Gold, Steadfast ATZ) cannot be applied to corn more than 12 inches tall. If the product you chose doesn't contain atrazine and corn is less than 12 inches tall, we recommend that you add atrazine at 0.75 lb ai/A to provide residual control.

f. If you switch to a total post program and have used a soil insecticide, consult the herbicide label to determine if use of a specific product is allowed after the soil insecticide. Certain insecticides will increase the possibility of crop injury with specific ALS inhibiting herbicides (Accent, Basis, Beacon, Option, and Steadfast containing herbicides).

Scenario # 2

Corn and weeds have emerged, the field has been sprayed with soil applied, preemergence herbicides. If an atrazine, Balance, or Callisto containing herbicide was used premergence, weeds may emerge, turn white or yellow, then brown and die a few days later. If weeds emerge and don't die within a few days:

a. Use a rotary hoe to dislodge small weeds and reactivate herbicides. Weeds should be Ω inch or less in height. Operate the tool at a minimum of 6 mph. If the operation is dislodging more than 10% of the corn stand, slow down.

b. Apply appropriate postemergence herbicides based on scouting and weed species present. As mentioned above, be careful with specific products because of the potential to injure corn if not applied at the proper corn growth stage.

c. Do not exceed the application limits for atrazine. These limits include the following: on highly erodible soils, do not apply more than 1.6 lb ai/A in one application or more than 2 lb ai/A total. On soils that are not highly erodible, do not apply more than 2 lb ai/A in one application or more than 2.5 lb ai/A total.

Other general items to consider with both scenarios:

a. Corn growing in wet soils will be stressed and not able to metabolize herbicides as rapidly as it would if it were growing in drier soils. After applying postemergence herbicides, don't be surprised to see herbicide related injury symptoms. Most seed companies have databases on herbicide injury potential with commonly used herbicides. Be cautious about applying specific herbicides to hybrids which have been shown to be sensitive to growth regulators (2,4-D, Clarity/Distinct), ALS inhibitors (Accent, Exceed, Option, Spirit, Steadfast), or HPPD inhibitors (Callisto). Contact your seed representative if this information is not readily available.

b. Adjuvant selection is critical with postemergence herbicides. Certain tankmixes require specific adjuvants to maximize the activity of both products. Consult the label carefully to determine the appropriate adjuvant. Since corn is more sensitive to weed competition and the window to control weeds is much narrorwer than in soybean. You don't have time to correct mistakes.

c. Some soil applied and postemergence insecticides slow down the corn plant's ability to metabolize herbicides and crop injury will occur. If you are making dramatic changes to your weed control program, it pays to re-read the herbicide and insecticide labels and look for warning statements. As mentioned above, corn will be stressed more likely to show injury anyway, and the addition of an insecticide to a herbicide mixture could cause additional injury.

Specific details related to most of the comments above can be found in the 2003 Weed Control Guidelines for Indiana (WS-16) which is on the web at <http://www.btny.purdue.edu/Pubs/WS/WS-16/>.

Plant Diseases

Crazy Top of Corn – (*Gregory Shaner*) -

- Flooded corn may be infected by *Sclerophthora macrospora*

Crazy top is a disease of corn that gets its name from a conspicuous symptom on the tassels. Instead of producing tassels, infected plants produce a proliferation of small leaves. The disease is normally more of a curiosity than a real problem in Indiana. Sometimes a few plants in low-lying areas show symptoms, but it is unusual to see large numbers of diseased plants. This year we may see more of the disease. This is because many fields planted in late April had large ponded areas for several days in early May, after the corn had emerged.

A fungal-like organism named *Sclerophthora macrospora* causes crazy top. Overwintering spores (oospores) of this organism germinate in saturated soil and produce a second type of spore (zoospore) that swims for short distances. Zoospores that land on a corn plant attach themselves and then infect. Saturation of soil for 24-48 hours is sufficient for spore production and infection. One common avenue of infection may be through the whorl of young leaves when corn is under water for a day or two.

Once inside the plant, *Sclerophthora macrospora* invades the growing point and produces several bizarre symptoms. Infected plants may tiller excessively. Upper leaves may be rolled, twisted, and leathery. The most conspicuous symptom is the replacement of the tassel with a mass of small leaves, a symptom termed phyllody. Ears may also show phyllody.

If many plants are infected, yield may be significantly reduced. There is no remedy that can be applied to plants once they are infected, so the only recourse would be replanting. However, this decision should be based on knowledge that a substantial number of plants in a flooded area were infected. Unfortunately, by the time symptoms appear it may be too late for replanting.

Sclerophthora macrospora has a wide host range. It infects wheat, oat, green foxtail, and barnyard grass, as well as many other grasses. Thus, the organism is probably widespread and common throughout Indiana.

Crazy top of corn

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Leaf and Glume Blotch of Wheat – (*Gregory Shaner and Andreas Westphal*) -

• Recent wet weather will give these diseases a boost

The wet weather during the first third of May was ideal for leaf and glume blotch of wheat. Two different fungi – *Septoria tritici* and *Stagonospora nodorum* – cause these diseases. They thrive when there are prolonged periods of leaf wetness.

Septoria and *Stagonospora* survive between wheat crops in wheat residue. Primary infection probably occurs in the fall, but these infections don't produce visible lesions until the spring. In the spring, dead spots appear on the lowest leaves. Fruiting bodies of the fungi develop in these dead spots. The fruiting bodies (pycnidia) are tiny, flask-shaped structures embedded in the leaf with an opening just beneath the leaf stomata. They contain spores that are dispersed when water drops strike them.

Both *Septoria* leaf blotch and *Stagonospora* leaf blotch are polycyclic diseases. Severity (the amount of leaf area showing blotch symptoms) increases during the growing season as the result of repeated cycles of infection. Lesions on lower leaves are the source of spores that cause infection on upper leaves. When there are only a few infections on a leaf, each spot may be somewhat isolated, but as the number of infections increases, large, irregular dead areas (leaf blotch) develop.

Rains in early May splashed spores from lower leaves to upper leaves. These spores require long periods of leaf wetness to infect. Although it did not rain continuously during early May, wheat foliage was wet for long periods. This, coupled with temperatures favorable for the fungi, created ideal conditions for leaf blotch.

Wheat in many Indiana fields had reached the stage of flag leaf emergence by early May, when the wet weather system moved into the state, so leaves all the way to the top of the canopy may have been infected during recent periods of warm wet weather. Heads of wheat in southern Indiana may have already been infected.

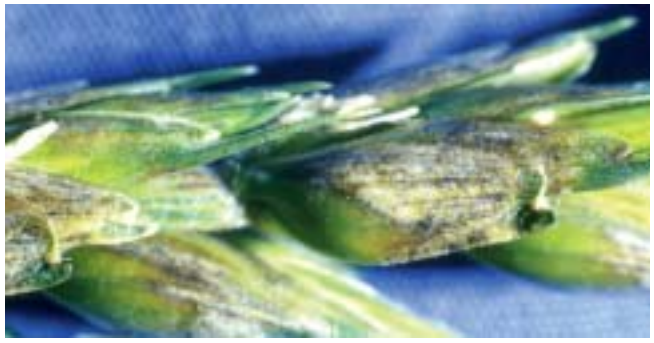
When long periods of moisture on leaves occur during warm weather, *Stagonospora nodorum* is much more likely to cause leaf blotch than *Septoria tritici*, which is a cooler-season pathogen. *Stagonospora nodorum* can also infect heads, giving rise to glume blotch. *Septoria tritici* is confined to leaves.

There are differences in the symptoms produced by *Stagonospora nodorum* and *Septoria tritici*, but sometimes the differences are subtle and reliable diagnosis is only possible by examination of infected tissue under the microscope. The classical symptom of *Septoria* blotch is a brown lesion containing numerous, tiny dark spots (these are the pycnidia). Except on the lowest leaves, lesions caused by *Septoria* tend to be straight-sided. The classical *Stagonospora* lesion is lens-shaped, tan at the edges with a dark center. Although *Stagonospora* also produces pycnidia, they are not as dark as those produced by *Septoria*, so they usually cannot be seen as black specks in the lesion unless the tissue is viewed under a microscope. Even an experienced diagnostician can be fooled by lesion appearance. A lesion that looks like *Septoria* will sometimes prove to be *Stagonospora* (or vice versa) when spores are examined under the microscope. Because of the similarity of symptoms, because both diseases are favored by similar weather conditions, and because both diseases may be found on the same plant or even the same leaf, the disease complex is often referred to as leaf blotch, as though it were a single disease.

At this time, lesions caused by *Septoria* or *Stagonospora* may still be no higher than the third leaf below the flag leaf (F-3). However, this may change rapidly if *Stagonospora* is present in a field. The incubation period (the time from infection to the development of a visible lesion) for this pathogen is quite short under warm conditions. There could have been a lot of infection during the past week that has not yet incubated. This week we are experiencing cooler temperatures, so lesions may not appear on upper leaves until mid May or later.

There are several fungicides registered for use against *Stagonospora* and *Septoria* leaf blotches. Some of these can be applied after full flag leaf emergence, under provisions of the standard label or of a section 24(c) label. These may provide some protection against the disease, but only if application can be made very soon.

Wheat varieties differ in susceptibility to both pathogens. No variety has a high degree of resistance to *Stagonospora*, but the upper two leaves of the most resistant varieties will remain green for 7 to 10 days longer than those of susceptible varieties. This prolongation of photosynthetic capacity of the flag and flag-1 leaves will help protect yield and test weight.



Glume blotch of wheat

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Seedling Blight on Corn and Soybean - (*Andreas Westphal and Gregory Shaner*) –

- Heavy spring rains can result in poor stands

The stressful conditions created by wet soils, compaction, or crusting can lead to seedling blight problems. Seedling blight is caused in corn and soybean by any of several common fungi in soil. Under good conditions for seed germination and seedling growth these fungi are not a problem, but they can infect young plants when they are under stress, and retard seedling growth once conditions improve. Seedling blight can thin stands below acceptable limits in corn and soybean.

The dry, warm days of mid April encouraged many farmers to plant corn and even some soybean well in advance of the optimal planting date. Although seedlings in many of these fields have emerged, the wet weather of early May impeded their growth. Leaves of plants that emerged before the heavy rains may now be pale-green to yellow. Several species of fungi that cause seedling blight thrive in wet soil. The combination of stress on seedlings created by saturated soils and the greater activity of seedling blight fungi in these wet soils means that seedling blight will likely show up on many fields. Also of concern are fields that were planted just before the heavy rains. While soil remains wet, young seedlings can emerge, but rapid surface drying can lead to soil surface crusting that will delay or prevent seed emergence. The stress of emerging through crusted soil also increases the risk of seedling blight.

Virtually all corn seed is treated with fungicides, but effectiveness of these fungicides diminishes with time. It's a good idea to check planted fields, once it is possible to walk in them, to see if stand thinning is occurring. In extreme cases, replanting might be necessary. Guidance in making a replant decision can be found in AY-264-W (Estimating Yield and Dollar Returns from Corn Replanting), available through the Purdue Cooperative Extension Service or accessible online at <http://www.agry.purdue.edu/ext/corn/cgg2/search.shtml>.

Soybean seed and seedlings are also vulnerable to seedling blights. Poor-quality seed is always at greater risk of seedling blight, but even high-quality seed is at risk under severe stress. Fungicide seed treatment can provide protection against seedling blight. Because fungicide seed treatment is not a standard practice for soybeans, many seed dealers are reluctant to treat seed except on demand. There are several fungicides registered for use on soybean seed, including some designed for on-farm application either as a hopper box treatment or for application to seed as it is augured into the planter. If a soybean stand is reduced by seedling blight, consider carefully the economics of replanting. Guidelines for making a replant decision can be found in the *Corn & Soybean Field Guide* (ID 179) beginning on page 67 of the 2003 edition.

Seedling blight on corn

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Agronomy Tips

Delayed Planting Considerations for Corn - (*Bob Nielsen, John Obermeyer, and Tony Vyn*) –

Quite a bit of Indiana's corn crop remains to be planted, especially in southern Indiana, due to the current rainy spell that put the brakes on what had been a very rapid planting pace. As of 11 May, 42% of Indiana's intended corn acreage was yet to be planted (USDA-NASS, <http://www.nass.usda.gov/in/cropweat/2003/we1903.txt>). While the calendar should not yet be a concern for corn and soybean planting, growers may want to consider the following issues as they impatiently wait for fields to dry out.

- **Corn Hybrid Maturity.** Some growers may be thinking about switching from their fuller maturity hybrids to earlier maturing ones out of concern for the shortening growing season. This concern should be placed on the back burner for a while because most adapted hybrid maturities can be planted in Indiana

until at least the end of May with little to no risk of fall frost injury to immature grain. If the rains continue or growers believe they will continue for another couple of weeks, information about hybrid maturity decisions is available in the Purdue Extension publication **AY-312-W**, "*Delayed Planting & Hybrid Maturity Decisions*". Ask for this publication at your local Purdue Extension office or download it from the Web at <http://www.agry.purdue.edu/ext/pubs/AY-312-W.pdf>.

· **Bt Corn Hybrids.** For most Indiana corn production systems, economic benefits from the use of transgenic Bt corn hybrids resistant to corn borers are more likely to occur with delayed plantings. Consequently, growers may want to consider switching some of their late-planted intended non-Bt corn acreage to Bt hybrids as insurance against the higher risk of infestation by late brood corn borers. This is especially true for growers in extreme southern Indiana where southwestern corn borer can be an issue.

· **Corn Seeding Rates.** There is no need to consider changing seeding rates for corn simply because planting is delayed. Optimum seeding rates for most growers' fields range from 28,000 to 33,000 seeds per acre. Lower rates (low to mid-20's) are suitable for fields with yield levels historically near or below 100 bushels per acre.

· **Corn Seeding Depth.** The key factor that should be used for determining seeding depth for corn is the importance of adequate and uniform soil moisture in the seed furrow. Some might say this is a moot point given the current soggy soil conditions. Remember, though, how quickly Mother Nature can change and how quickly shallow-placed seed can find themselves in bone-dry soil. A seeding depth of 1.5 to 2 inches is acceptable over a range of soil conditions. Shallower depths are risky if rains stop altogether and surface soils begin to dry rapidly.

· **Corn Insecticides.** For those areas of Indiana where western corn rootworm is a major pest to contend with, continue to use a full rate of soil-applied insecticide for corn plantings through the first week of June to insure against damage from corn rootworm larvae. For more information on managing corn rootworms, see Purdue Extension E-49-W, "*Managing Corn Rootworms – 2003*". This publication can be obtained at your local Purdue Extension office or download it from the Web at <http://www.entm.purdue.edu/entomology/ext/targets/e-series/EseriesPDF/E-49.pdf>.

· **Corn Replanting Decisions.** Extensive corn death is likely to occur over the next week or so in low-lying fields affected by floodwaters or poorly drained areas within fields that are ponded. If growers are uncertain whether replanting is warranted, the Purdue Extension publication **AY-264-W**, "*Estimating Yield and Dollar Returns From Corn Replanting*" will help growers make this important decision. This publication can be obtained at your local Purdue Extension office or download it from the Web at <http://www.agry.purdue.edu/ext/pubs/AY-264-W.pdf>. Recognize that the decision to replant ponded areas of fields needs to be made in the context of how much of a grower's original corn and soybean acres remain to be planted. Non-planted acres should usually take priority in the remaining planting schedule over the ones to be replanted.

· **Field Tillage Operations.** Remaining pre-plant field operations should be scrutinized carefully to determine whether they are truly necessary. With today's modern corn planters, there is little reason to overly-prepare a field to create a picture-perfect seedbed. In delayed planting situations, every day wasted overworking a field is a day lost to planting and represents lost yield potential. Furthermore, unnecessary tillage operations on soils that may be marginally wet increase the risk of creating tire and tillage compaction layers that can haunt root development and corn health later if excessively dry conditions suddenly become the norm. Remember your neighbors' fields last year?

· **Planter Sidewall Compaction.** Another lesson learned from last year's wet planting conditions was the dramatic potential for significant root restriction by severe sidewall compaction when a rapid shift from wet to dry conditions occurred after planting. If at all possible, avoid planting fields when soil moisture conditions favor the smearing of furrow sidewalls by the coulters or double-disc openers of the planter.

· **Nitrogen Fertilizer Applications.** Growers that have yet to apply pre-plant nitrogen fertilizer should consider switching to a sidedress application strategy instead to make the best use of available field working days for planting in the coming weeks. If planting is seriously delayed to the end of May or early June, growers may want to consider backing off on their intended nitrogen fertilizer application rates due to the expected lower yield of the late-planted corn. The rule of thumb most commonly applied to lost yield potential for delayed planting is one bushel per acre per day after May 10 up to 2 bushels per acre per day after June 1. Consider using a **pre-sidedress soil nitrate test** to further fine-tune your nitrogen application rates. Information about this soil test can be found in the Purdue Extension publication **AY-314-W**, "*The Pre-Sidedress Soil Nitrate Test for Improving N Management in Corn*". Ask

for this publication at your local Purdue Extension office or download it from the Web at <http://www.agry.purdue.edu/ext/pubs/AY-314-W.pdf>.

- **Starter Fertilizer.** Where soil phosphorus and potassium soil test levels are adequate or better and tillage is other than pure no-till, consider eliminating starter fertilizer use for the remainder of this season's corn planting. Soil temperatures at planting from here on will be more than adequate for rapid corn germination and early seedling growth, thus greatly diminishing the value of starter fertilizer. Eliminating starter fertilizer will not only reduce your costs, but will save some time during the planting operation. No-till corn, however, will likely continue to benefit from starter fertilizer applications, especially the nitrogen component, for planting throughout the remainder of the month.

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Soggy Soils Lead to Questions About Supplemental Nitrogen Fertilizer -(*Bob Nielsen*) -

- **Bottom Line:** Reasonably little nitrogen loss has likely occurred from denitrification and leaching to date this spring because fertilizer application timing and soil temperatures have not been conducive for significant conversion of ammonium nitrogen to nitrate nitrogen.
- Where nitrogen loss has occurred, the remaining soil nitrogen levels are likely sufficient to support the expected lower yield potential of the plants surviving lengthy periods of saturated soil conditions or that of a yet-to-be replanted crop.
- Read on only if you want the gory details that back up this opinion.

Pre-plant nitrogen fertilizer applications followed by frequent periods of intensive rainfall in April and May often cause corn growers to question whether supplemental nitrogen fertilizer may be required because of a concern that some of the pre-plant nitrogen may have been "lost" by leaching or denitrification. The question is a valid one because soil nitrogen in the nitrate form can disappear at rates as high as 5% per day of ponding or saturated soil conditions.

Unfortunately, the answer to the question is often clouded by many complicating factors. Among them are nitrogen fertilizer source, time of fertilizer application, soil temperatures since the time of application, use or not of a nitrification inhibitor, use or not of an urease inhibitor, calendar time since time of application, amount of rainfall, timing of rainfall, duration of saturated soil conditions, soil temperatures during the period of saturated soil conditions, and soil texture.

Since the nitrate form of soil nitrogen is the one vulnerable to loss by leaching or denitrification, estimating how much of the applied nitrogen fertilizer was in the nitrate form when the rainy period began is important to estimating how much nitrogen may have been lost. Nitrogen fertilizer exists in several forms; including ammonium, urea, and nitrate.

The ammonium and urea forms eventually convert to the nitrate form via soil microbial processes. The rates of conversion are dependent on soil temperature and aeration. About one-fourth of urea-ammonium-nitrate solutions (UAN) is already in the nitrate form and is susceptible to leaching or denitrification loss as soon as the material is applied to the field.

In warm soils (60°F or warmer) with ample soil oxygen, conversion of non-anhydrous ammonium forms of nitrogen will occur in only one to two weeks (Brouder & Joern, 1998). The process will take much longer when soil temperatures are in the 50's and eventually slows down to zero as soils cool from 50°F to freezing. Conversion of anhydrous ammonia to nitrate occurs more slowly because the anhydrous band itself is toxic to the soil microbes responsible for the conversion. The soil microbial population must rebuild over a several week period before the conversion to nitrate can begin and so nitrification is delayed from two to six weeks (Brouder & Joern, 1998). Finally, recognize that conversion of ammonium to nitrate is interrupted when soils become saturated.

Having said all that, let's return to the question of how much nitrogen loss has likely occurred so far this spring. The good news is that essentially none of the anhydrous or UAN applied this spring was likely converted to the nitrate form before the "monsoon" season began in late April. Soil temperatures through mid-April were simply too cool in most areas of the state to encourage much soil microbial activity. The exception may be UAN applications in the far southwestern part of Indiana where warmer soils may have enabled nearly complete conversion of UAN applied in late March or early April to nitrate before the end of April.

Fall-applied anhydrous programs occur most commonly in northern Indiana. The conversion of fall-applied anhydrous to nitrate depends on fall and spring soil temperatures and whether a nitrification inhibitor was used. From 50 to 100% of fall-applied ammonia generally converts to nitrate by May 1 of the following year (Hoeft, 2001, 2002a; Sawyer, 1999). Given the rapid cooling of soils by mid-October 2002 and the slow soil warm-up this spring, the conversion rate is likely closer to the 50% value than the 100% value.

So, the three candidate scenarios for possible nitrogen losses this spring are:

- Southwestern Indiana, UAN applications in late March or early April: Likely 100% of nitrogen in nitrate form by end of April.

- Northern Indiana, fall-applied anhydrous: Approximately 50% of nitrogen in nitrate form by end of April.

- All of Indiana, UAN applications this spring: At least 25% of the nitrogen in UAN is already in the nitrate form.

The next step in this tortuous estimation process is to predict the likely rate of denitrification loss this spring. According to Univ. of Illinois data (Hoeft, 2002b), denitrification rates range from 1 – 2 % per day at soil temperatures less than 55°F, 2 – 3 % per day at soil temperatures between 55 and 65°F, and 4 – 5 % per day at soil temperatures greater than 65°F. The higher rates are applicable to southwestern Indiana this spring since the rains began in late April. The intermediate rates are applicable to the remainder of Indiana since late April.

Remember that the estimate of nitrogen loss is equal to the multiplication of the likely denitrification rate by the likely pounds of available soil nitrate by the estimated number of days of saturated soil conditions. Example calculations of N loss for the three scenarios, each assuming an initial nitrogen fertilizer application rate of 180 lbs. N per acre and seven days of saturated soils, are listed here.

- Southwestern Indiana, UAN applications in late March or early April
  - o Amount of nitrate nitrogen ~ 180 lbs total N x 100 % = 180 lbs
  - o Daily denitrification ~ 180 lbs nitrate x 4 % = 7.2 lbs per day
  - o Total nitrogen loss ~ 7.2 lbs per day x 7 days = 50.4 lbs N

- Northern Indiana, fall-applied anhydrous
  - o Amount of nitrate nitrogen ~ 180 lbs total N x 50 % = 90 lbs
  - o Daily denitrification ~ 90 lbs nitrate x 2 % = 1.8 lbs per day
  - o Total nitrogen loss ~ 1.8 lbs per day x 7 days = 12.6 lbs N

- All of Indiana, UAN applied this spring
  - o Amount of nitrate nitrogen ~ 180 lbs total N x 25 % = 45 lbs
  - o Daily denitrification ~ 45 lbs nitrate x 2 % = 0.9 lbs per day
  - o Total nitrogen loss ~ 0.9 lbs per day x 7 days = 6.3 lbs N

These estimates of nitrogen loss can then be used to determine the rates of supplemental nitrogen that could be applied to the corn crop. As you might expect by now in this discussion, this decision is not straightforward either because of uncertainties involved with the health of corn that has been subjected to ponding or saturated soils.

Frankly, the prospects for corn that has been ponded or subjected to saturated soils for more than three or four consecutive days are not positive at all. Similarly, corn that has suffered repeated ponding or flooding events would not be in good shape. Root death due to oxygen deprivation and/or disease will stunt or kill the water-logged plants.

The worst of the wet holes or river bottoms will require replanting or will remain barren the remainder of this season. In many cases, the yield potential of the corn crop will be dramatically lower than hoped for and the remaining soil nitrogen levels are probably adequate to support that now lower yield level. Supplemental nitrogen fertilizer application would probably not be beneficial.

If you decide to apply supplemental nitrogen, remember that the very nature of flooding or ponding is spatial in its variability. If supplemental nitrogen fertilizer application was deemed to be economically valuable for the affected crop, the application itself will also need to be spatial and not performed over the entire field. The tire traffic involved with applying supplemental nitrogen to the affected spots in the field may damage otherwise healthy plants in the remainder of the field and create undesirable soil compaction.

You could elect to pull soil samples for a Presidedress Soil Nitrate Test (PSNT) that may help predict the need for supplemental nitrogen. Information about this soil sample test can be found in the Purdue Extension publication AY-314-W (Brouder, 2003). Be aware, however, that the PSNT is best suited for estimating soil nitrogen availability in high organic matter soils or fields that have received manure applications. Use of the test for other situations has its limitations, including the fact that the standard 1-foot soil sample depth will not identify soil nitrate that may have leached to greater depths but is still available to plant roots. Additionally, the challenge of pulling representative soil samples in fields where pre-plant nitrogen fertilizer has already been applied is daunting because of the need to sample sequentially across the nitrogen applicator row widths. For suggestions on soil sampling such fields, read the 2002 Illinois Pest & Crop Bulletin article "*Predicting/Measuring Nitrogen Loss*" (Hoeft, 2002b).

Finally, you could forget all about the discussion up to this point and instead monitor the surviving or replanted plants near the time of sidedressing opportunities. Knee-high plants that exhibit distinct symptoms of nitrogen deficiency (yellowing, especially lower leaves) may benefit from roughly 50 lbs of sidedressed nitrogen.

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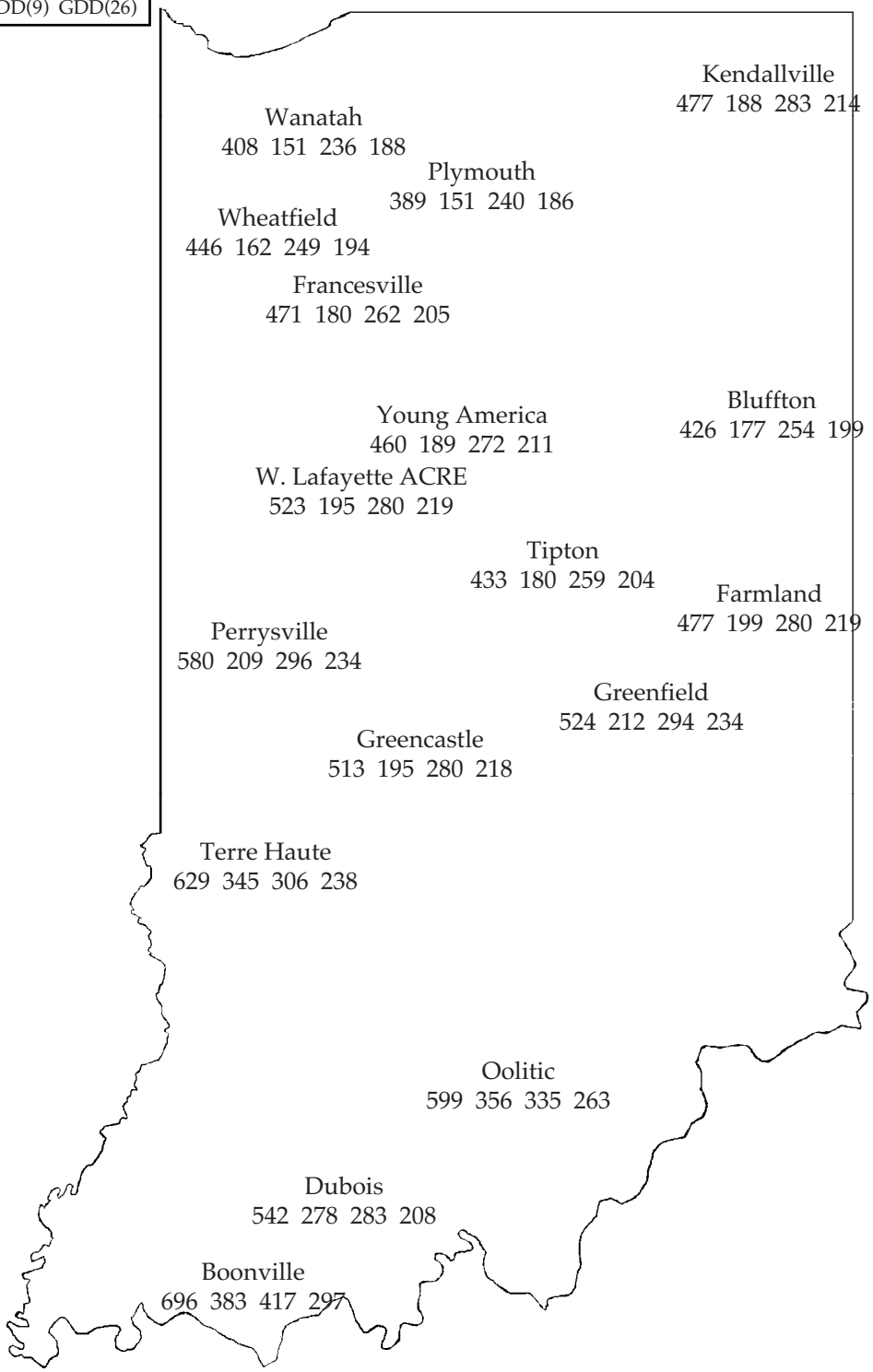
Don't forget, this and other timely information about corn can be viewed at the Chat 'n Chew Café on the Web at <http://www.kingcorn.org/cafe>. For other information about corn, take a look at the Corn Growers' Guidebook on the Web at <http://www.kingcorn.org>.

Weather Update

Temperatures as of May 14, 2003

HU48 = heat units at a 48°F base from Jan. 1, for alfalfa weevil development (begin scouting at 200)
HU50 = heat units at a 50°F basefrom date of intensive moth capture, for black cutworm development (larval cutting begins about 300)
GDD(9) = Growing Degree Days from April 16 (9% of Indiana's corn planted), for corn growth and development
GDD(26) = Growing Degree Days from April 25 (26% of Indiana's corn planted), for corn growth and development

MAP KEY			
Location			
HU48	HU50	GDD(9)	GDD(26)



4" Bare Soil Temperatures 5/14/03

Location	Max.	Min.
Wanatah	68	51
Winamac	68	52
Bluffton	50	48
W Laf Agro	74	54
Tipton	68	58
Farmland	59	50
Perrysville	65	58
Crawfordsville	68	57
Liberty	69	47

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