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Pest & Crop Newsletter

Purdue Cooperative Extension Service

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INSECTS, MITES, & NEMATODES

Corn Rootworm Hatch is Underway – *(Christian Krupke and Larry Bledsoe)* -

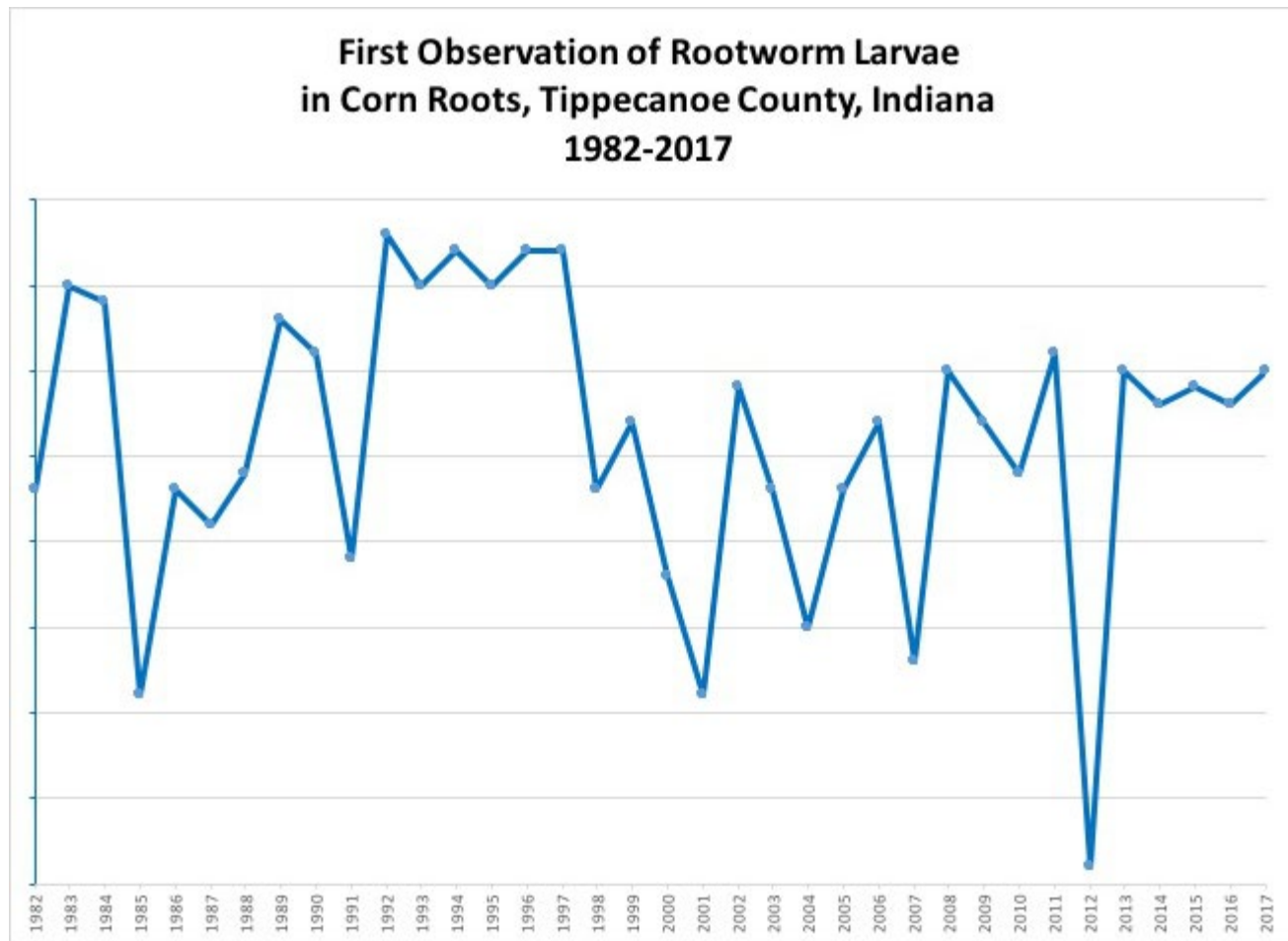
- Hatch of rootworm in west central Indiana occurred on June 4.
- Sampling for larvae in high-risk fields will be possible in mid June.

A newly hatched rootworm larva was found outside of unprotected corn roots on June 5 near Lafayette in Tippecanoe County. Hatch in southern Indiana counties has occurred several days earlier, while hatch in northern counties will soon be occurring. Hatch will continue for several weeks.

Newly hatched larvae are prone to drowning, and reduced orientation, when soil pores are water filled. However, this year it seems as though the “monsoon” season has finally subsided for this year’s hatch. Dry weather is on the schedule for these little hatchlings! So, initially that sounds like rootworm might be a major concern this year until you consider that overwintering (eggs) population should be low (low adult populations last summer) and that hatching larvae will have a hard time finding this year’s tiny and underdeveloped corn roots.

It is much too early to sample corn roots for the presence of larvae, as the minute worms are inside the roots. In about three weeks, it will be possible to dig up and inspect for

larvae and feeding scars on the roots. More on rootworms, root digs etc. in a future issue of *Pest&Crop*.



First Observation of Rootworm Larvae in Corn Roots.

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European Corn Borer First Generation Flight Underway – *(John Obermeyer and Christian Krupke)* -

Another perennial corn pest is on the move, we were alerted to the beginning of moth flight and egg laying in Benton County (West Central Indiana) by Jeff Nagel, Ceres Solutions. The producer had grown non-Bt corn last year and had some ECB damage. The larvae overwintered in corn stalks and are now emerging as moths.

Being aware of beginning flight is important, as it alerts pest managers to the need for scouting at-risk corn about a week later. This first generation is the one to watch for this pest. Survey for the characteristic random “shot hole” damage pattern within whorls or 20 consecutive plants in five areas of the field. Consider that moths of the first-generation are attracted to the tallest, greenest plants. Because of this year’s challenges in stand establishment, this may be patchy and in certain areas of a given field. Consider

that moth emergence occurs over an extended time, so egg laying and larval infestations will continue for a couple weeks.



European corn borer egg mass.



Female ECB moth on corn leaf.



Shot-hole damage to corn whorl from ECB larval feeding.

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Potato Leafhopper Numbers Increasing – (John Obermeyer and Christian Krupke) -

- Sample newly cut alfalfa fields for leafhoppers.
- If yellowing has already occurred, it is too late to prevent damage to this cutting.

Potato leafhopper populations will be increasing with warmer temperatures and drier conditions in the forecast. Alfalfa pest managers should begin sampling their alfalfa shortly after cutting.

Potato leafhoppers are small, wedge-shaped, yellowish-green insects that remove plant sap with their piercing-sucking mouthparts. Leafhopper feeding will often cause the characteristic wedge-shaped yellow area at the leaf tip, which is referred to as “hopper burn.” Widespread feeding damage can cause a field to appear yellow throughout.

Leafhopper damage reduces yield and forage quality due to a loss of protein. If left uncontrolled for several cuttings, potato leafhoppers can also significantly reduce stands.

Timely scouting and applying insecticides when necessary can prevent potato leafhopper damage. Treatment is preventative rather than curative. To effectively prevent

economic losses, treatments must be applied **before yellowing occurs**. Be sure to scout the alfalfa regrowth for leafhoppers shortly after cutting and removal, as this is one of the more critical periods.

The need to treat for leafhoppers can be determined prior to the appearance of damage if fields are surveyed on a regular basis. To assess leafhopper populations and the potential for damage, take at least 5 sets of 20 sweeps with a 15" diameter sweep net in representative areas of a field. Carefully examine the contents of the sweep net, count the number of adults and nymphs, and calculate the number of leafhoppers per sweep. Use the guidelines given below to determine the need for treatment. For recommended insecticides see Extension Publication E-220, Alfalfa Insect Control Recommendations which can be viewed at <http://extension.entm.purdue.edu/publications/E-220.pdf>.



Hopper burn on leaves.

Management Thresholds for Potato Leafhoppers

Stem Height in Inches	Leafhoppers (Adults/Avg. No. Nymphs) Per Sweep
Under 3	0.2
4-7	0.5
7-12	1.0

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Armyworm Pheremone Trap Report

County	Cooperator	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12
Dubois	SIPAC Ag Center	0	0	0	101	193	16	0	3	31	6	8	5
Jennings	SEPAC Ag Center	0	1	1	56	57	9	4	32	4	4	13	4
Knox	SWPAC Ag Center	0	13	26	42	189	57	2	10	20	13	89	15
LaPorte	Pinney Ag Center	0	0	3	352	936	382	154	445	750	100	112	82
Lawrence	Feldun Ag Center	4	108	216	246	650	348	112	31	40	74	61	55
Randolph	Davis Ag Center	0	29	41	528	1232	300	72	10	298	44	21	87
Tippecanoe	Meigs	0	2	15	107	730	243	98	95	86	21	70	9
Whitley	NEPAC Ag Center	0	34	90	537	1689	1349	855	665	1265	334	127	416

Wk 1 = 3/16/17 - 3/22/17; Wk 2 = 3/23/17 - 3/29/17; Wk 3 = 3/30/17 - 4/5/17; Wk 4 = 4/7/17 - 4/12/17; Wk 5 = 4/13/17 - 4/19/17; Wk 6 = 4/20/17 - 4/26/17; Wk 7 = 4/27/17

- 5/3/17; Wk 8 = 5/4/17 - 5/10/17; Wk 9 = 5/11/17 - 5/17/17; Wk 10 = 5/18/17 - 5/24/17; Wk 11 = 5/25/17-5/31/17; Wk 12 = 6/1/17 - 6/7/17

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Agronomy Tips

Soil Sampling to Assess Current Soil N Availability – (Jim Camberato and Bob Nielsen) -

Excessive rainfall and flooding often result in the loss of applied and soil-derived nitrogen (N). Nitrate-N is the form of N most likely to be lost from the crop root zone, either to tile drainage and groundwater via leaching or into the atmosphere via denitrification. Ammonium-N is not vulnerable to the same losses when incorporated into the soil.

Most of the N applied to soil is initially in forms other than nitrate. The exception is liquid N (28-0-0 or 32-0-0), of which 25% of the fertilizer product is nitrate-N, the remainder is ammonium-N (25%) and urea-N (50%). Anhydrous ammonia is 100% ammonium-N when it reacts with water in the soil. Manure contains mostly organic- and ammonium-N forms.

Unfortunately, no matter what forms of N are added to the soil, all of them eventually convert to nitrate-N. Time, temperature, soil type, N source, rate, and application method, and other factors determine how rapidly nitrate-N is formed. It is difficult to estimate the extent of nitrate formation because of the many factors affecting N conversion and their interaction.

It is even more difficult to then estimate how much of the nitrate-N was subsequently lost from the root zone. Soil sampling and measuring the concentration of nitrate- and ammonium-N remaining in the root zone is an alternative to guesstimating how much N was lost.



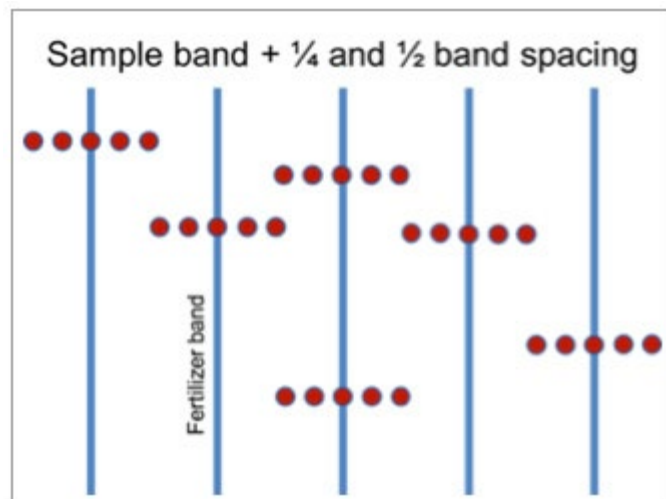
Excessive rain in a field.

Soil Sampling Strategies

Soil nitrate-N and ammonium-N are quite variable and so obtaining a good representative soil sample requires many cores from relatively small field areas. The depth of sampling recommended is 1 foot in most soils. Consider collecting a separate deeper soil sample from between 1- and 2-foot soil depth for a more complete assessment of plant available N, especially in sandy soils where leaching through the soil profile is the predominant form of N loss.

Where fertilizer N was broadcast-applied rather than banded, collect 20 to 30 random soil cores per sample. If fertilizer N was banded rather than broadcast-applied, collect 15

to 20 groups of 5 soil cores each that proportionally represent areas with and without banded fertilizer (see illustration below).



Sample band + 1/4 and 1/2 band spacing.

Handling Soil Samples Prior to Delivery to Soil Test Laboratory

Dry or refrigerate the soil samples as soon as possible to stop the soil microbes from altering the N levels. Spread the soil thinly on plastic to air dry and hasten drying with a fan if possible. If you choose to use an oven to dry the soil, keep the temperature below 250°F. Alternatively refrigerate the samples and keep them cold through shipping to the laboratory.

Most soil testing laboratories offer soil N test analysis services, but contact them first to confirm and ask about any special procedures they recommend.



Soil testing.

Soil Test Laboratory Analyses

Ammonium-N is just as available to plants as nitrate-N, but typically little accumulates in the soil because it is readily converted to nitrate under most conditions. However, if N fertilizer was recently applied, there may well yet be some ammonium N available in the soil for plant use.

Significant levels of soil ammonium are most likely if anhydrous ammonia was the N source, a nitrification inhibitor such as nitrapyrin or dicyandiamide (DCD) was used, and/or soil pH was low (below 5.5). In these situations, low levels of soil nitrate may indicate little conversion of ammonium to nitrate, rather than simply loss of nitrate.

If soil test values for ammonium and nitrate are reported as "ppm" or "mg/L" nitrogen ($\text{NH}_4\text{-N}$ or $\text{NO}_3\text{-N}$), then pounds per acre of available N are calculated by multiplying the test results by 4 when the sample depth was 1 foot. For other sample depths, divide the sample depth (in inches) by 3 and then multiply by the test results.

Example:

Soil $\text{NO}_3\text{-N}$ in a 1-foot sample was reported to be 30 ppm.

Conversion from ppm to pounds per acre is $(12 \text{ inches} / 3) \times 30 \text{ ppm} = 120 \text{ pounds per acre}$.

If soil test values are reported directly as NH_4 or NO_3 , then these values must be converted to an 'N' basis first. The calculations are: $\text{NH}_4\text{-N} = (\text{NH}_4 / 1.2)$ and $\text{NO}_3\text{-N} = (\text{NO}_3 / 4.5)$.

Example:

Soil NO_3 was reported to be 90 ppm.

Conversion from NO_3 to $\text{NO}_3\text{-N}$ is $(90 \text{ ppm } \text{NO}_3 / 4.5) = 20 \text{ ppm } \text{NO}_3\text{-N}$.

Interpreting Soil Nitrate and Ammonium Levels

In our opinion, soil nitrate and ammonium levels can be used to guide additional N applications to fields subjected to saturation and flooding. However, there are admittedly no hard and fast research-based recommendations for this particular situation.

The primary tool for soil N sampling in the Eastern Corn Belt has been the pre-sidedress soil nitrate test (PSNT) which is most applicable as an indicator of N availability in soils where manure had been applied or a legume such as clover or alfalfa had been plowed down (Brouder & Mengel, 2003). For these field situations, the level of soil nitrate found is considered an index of N availability, i.e., an indicator of how much N is currently available AND how much N may become available from the manure or organic matter. When used in this context, soil $\text{NO}_3\text{-N}$ levels greater than 25 ppm are thought to be adequate for optimum corn yield without the addition of more fertilizer N.

During the research that developed this soil test, sampling deeper than 1 foot or analyzing for exchangeable $\text{NH}_4\text{-N}$ did not increase the predictive ability of the PSNT enough to warrant the extra effort. **However, when the intent is to assess the loss of N due to rainfall, we suggest that deeper sampling plus analysis for $\text{NH}_4\text{-N}$ content can**

provide useful information to help growers decide whether additional fertilizer N is merited. It is important to recognize that in this context, measurements of soil nitrate and ammonium following fertilizer N applications indicate current N availability only, because there is no manure- or legume-derived N to be released later in the season. Considering this fact, the commonly accepted 25 ppm NO₃-N critical level for manure- or legume-N fertilized soils may be too low for soils that have only received fertilizer N.

Leaching of soil nitrate is expected with ponding, flooding, or soil saturation, but not all of the nitrate will have been moved below the root zone. **A shortcoming of the 1-foot sampling depth is that it does not always reflect plant available N deeper in the profile, particularly when abnormal leaching occurs. This is why we suggest also sampling from the 1- to 2-foot depth for assessment of soil N availability, particularly in sandy soils.**

In our on-going N rate trials conducted throughout the state, the “normal” background levels of soil N in the upper 1 foot of mineral soils typically range from 5 to 10 ppm NO₃-N and 4 to 8 ppm NH₄-N for corn grown in rotation with soybean or corn without manure- or legume-derived N. Typically the deeper 1- to 2-foot soil samples would have slightly lower N levels.

Making a Decision

We suggest that the 25 ppm NO₃-N critical level for manure- or legume-N fertilized soils may be too low for soils that have only received fertilizer N and where N loss conditions have been severe. Where enough rainfall has occurred to cause substantial N loss, we suggest this level of rain has depleted the lower soil profile as well as the upper foot of soil.

This table includes estimates of expected soil NO₃-N levels with different fertilizer rates assuming “normal” background levels of nitrate and ammonium at the time of fertilization and a “normal” amount of movement below the one foot sampling depth (approximately 1/3 of the fertilizer N is moved below the 1-foot sampling depth but retained within the root zone with normal rainfall).

Table 1. Expected soil analysis levels of nitrate or nitrate plus ammonium in the upper 1 foot of soil for different rates of applied N fertilizer. NOTE: Use the NO₃-N and NH₄-N levels together if both forms of N are measured in the soil sample and use the last column to assess N availability.

lbs/acre of Fertilizer N Applied Prior to Rains	NO ₃ -N*	NO ₃ -N + NH ₄ -N**
130	30	36
140	31	37
150	33	39
160	35	41
170	36	42
180	38	44

190	40	46
200	41	47
210	43	49
220	45	51

*ppm or mg/L N - Assumes background level of ammonium at 6 ppm and "normal" levels of soil N below the 1-foot sampling depth.

**ppm or mg/L N - Assumes "normal" levels of soil N below the 1-foot sampling depth.

If the corn is healthy and the growing season is expected to be typical from here on out, we would suggest applying no more than 10 pounds of N for every 2 ppm reduction in soil sample N below the expected levels listed in the table.

Recognize that as a healthy crop moves through the rapid growth phase prior to pollination, soil N levels will naturally decrease in response to rapid N uptake by the plants.

However, by the time a healthy crop reaches the V9 leaf stage (about 30 inches tall), only 19 lbs/ac N (equivalent to 5 ppm soil NO₃-N in a 1-foot deep sample) have typically been taken up the plants (Mengel, 1995). But, by the time a healthy crop reaches shoulder-high (~V15 or 60 inches tall), approximately 116 lbs/ac N (equivalent to 29 ppm soil NO₃-N in a 1-foot deep sample) have been taken up by the plants. With later corn the amount of N in the plant should be considered when evaluating soil N.

The following examples give you an idea of how the tabular information may be used to make this decision.

Example calculation when only NO₃-N is determined:

Fertilizer N was applied at 160 pounds of N per acre in April as 28% UAN. Only soil NO₃-N analysis was requested because it was assumed that most of the urea- and ammonium-N had been converted to nitrate since temperatures were warm prior to the excessive rainfall. The expected NO₃-N level from the table above for a 160-lb N application is 35 ppm.

Laboratory results indicated only 20 ppm NO₃-N. The suggested N application rate would be:

$$((35 \text{ ppm} - 20 \text{ ppm}) / 2) \times 10 = (15 \text{ ppm} / 2) \times 10 = 7.5 \times 10 = 75 \text{ pounds per acre}$$

Example calculation when both NO₃-N and NH₄-N are determined:

Anhydrous ammonia was applied at 160 pounds of N per acre in March. Since the N application was relatively recent, both NO₃-N and NH₄-N analyses were requested. The expected NO₃-N plus NH₄-N levels listed in the table for a 160-lb N application is 41 ppm.

Laboratory results indicated 15 ppm NO₃-N and 20 ppm NH₄-N for a total measured N level of 35 ppm. The suggested N application rate would be:

$$((41 \text{ ppm} - 35 \text{ ppm}) / 2) \times 10 = (6 \text{ ppm} / 2) \times 10 = 3 \times 10 = 30 \text{ pounds per acre}$$

Evaluating Your Decision

Loss of N due to excessive rainfall and response of corn stressed by excess water and N deficiency is difficult to predict. Unfortunately we frequently find ourselves in this

same situation asking how much N is needed and what will be the yield increase. Although we have conducted some planned experiments that apply N to N stressed corn it is difficult to plan experiments to evaluate N application to N stressed corn caused by excess rainfall. But now we have another opportunity.

If you decide to apply additional N to corn, consider leaving 3 applicator-width strips without additional N through the length of the field to evaluate the response to the additional N. The strips should be distributed randomly across the field, not positioned side-by-side. Compare the yield of these unfertilized strips to adjacent fertilized strips to determine the change in yield and profit due to fertilization. Collecting this data will help in making future decisions related to N loss and potential profit from supplemental N fertilization. For assistance in planning an evaluation of supplemental N consult: Purdue On-Farm Nitrogen Rate Trial Protocol at

<http://www.agry.purdue.edu/ext/ofr/protocols/PurdueNTrialProtocol.pdf>

Sidedress N Application Rates

If no fertilizer N has been applied this season or soil N measurements suggest little N remains from fall- and spring-applied N, consider using our current N rate guidelines based on results of field trials conducted since 2006 throughout the state and based on the use of efficient methods and timings of N fertilizer application. This information is summarized at <http://www.kingcorn.org/news/timeless/NitrogenMgmt.pdf>.

The average Agronomic Optimum N Rate (AONR) for corn/soy in 53 trials conducted on medium- and fine-textured soils in southwest, southcentral, southeast, and westcentral Indiana was 208 lbs N / ac. The average AONR for 30 trials conducted on medium- and fine-textured soils in northwest and northcentral Indiana was 212 lbs N / ac. The average AONR for trials conducted on medium- and fine-textured soils in other regions of the state were 232, 251, and 263 lbs N / ac for central (23 trials), eastcentral (26 trials), and northeast (11 trials) Indiana, respectively. The average AONR for 16 trials on nonirrigated sandy soils was 202 lbs N / ac. At five Purdue Ag. Centers where we conducted paired trials of corn following soybean (corn/soy) and corn following corn (corn/corn) from 2007 to 2010, the average AONR for corn/corn was 44 lbs greater than for corn/soy while average corn/corn yields were 18 bu / ac less than the corn/soy yields. Economic optimum N rates for various combinations of N cost and grain price can be obtained from the article referenced above or the Corn Nitrogen Rate Calculator [<http://cnrc.agron.iastate.edu>].

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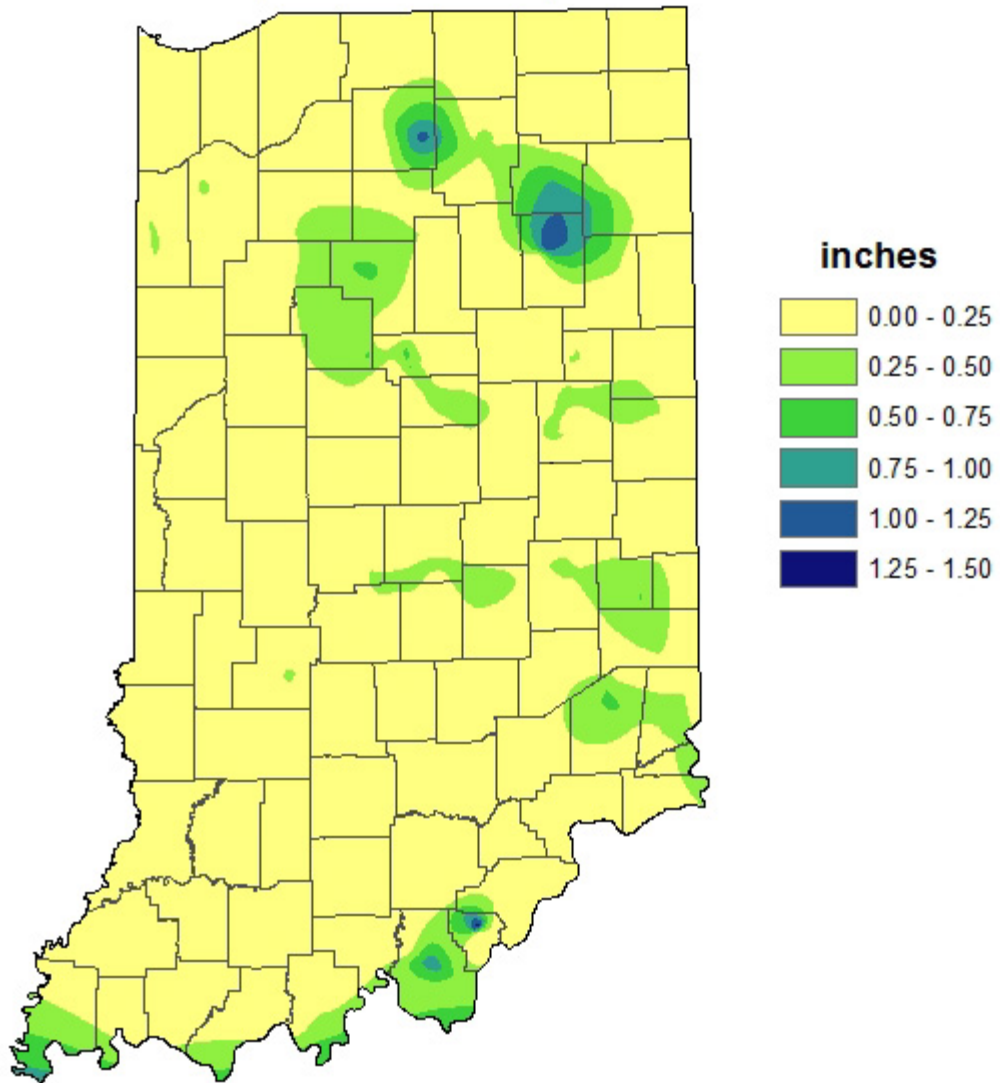
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WEATHER UPDATE

Precipitation

Total Rainfall Jun 1 - 7 2017 CoCoRaHS network (333 stations)

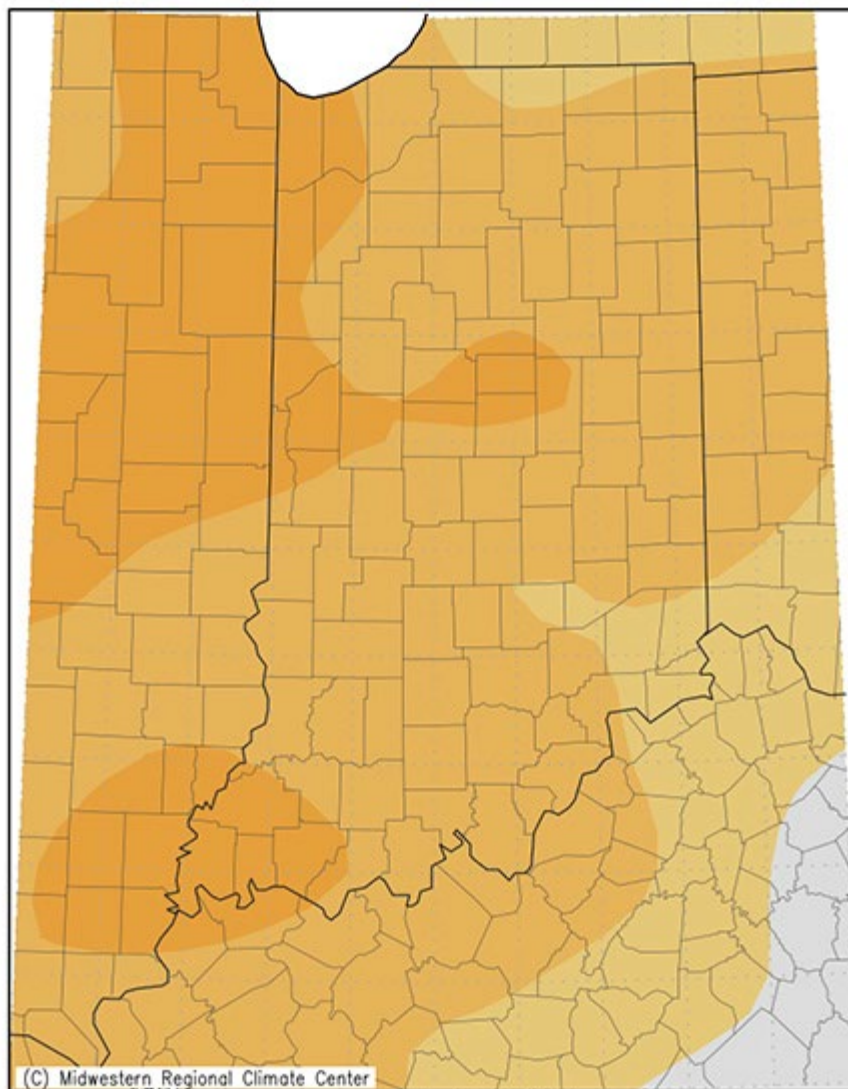


Analysis by Indiana State Climate Office
Web: <http://www.iclimate.org>

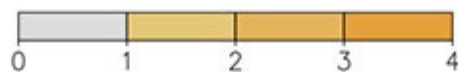
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Temperature

Average Temperature (°F): Departure from Mean May 30, 2017 to June 5, 2017



Mean period is 1981–2010.



Indiana State Climate Office www.iclimate.org

Purdue University, West Lafayette, Indiana

email: iclimate@purdue.edu

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Contact Information

□ Purdue Extension Entomology

901 W. State Street

West Lafayette, IN, 47907

□ (765) 494-8761

□ luck@purdue.edu

□ [@PurdueExtEnt](#)

□ [PurdueEntomology](#)

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