
# IN THIS ISSUE

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## Pest&Crop Survey 2017

**Dear *Pest&Crop* reader, your input on the following survey will help us gauge the value of this newsletter to you and to make any improvements needed. It will only take a few moments to complete, and it will help us to justify our effort to produce this weekly publication. This survey is voluntary and anonymous. All information collected is confidential and no hidden tracking of individual responses is being used. Won't you please take a few minutes to give us your feedback? Thank you!**

Pest&Crop 2017 Survey

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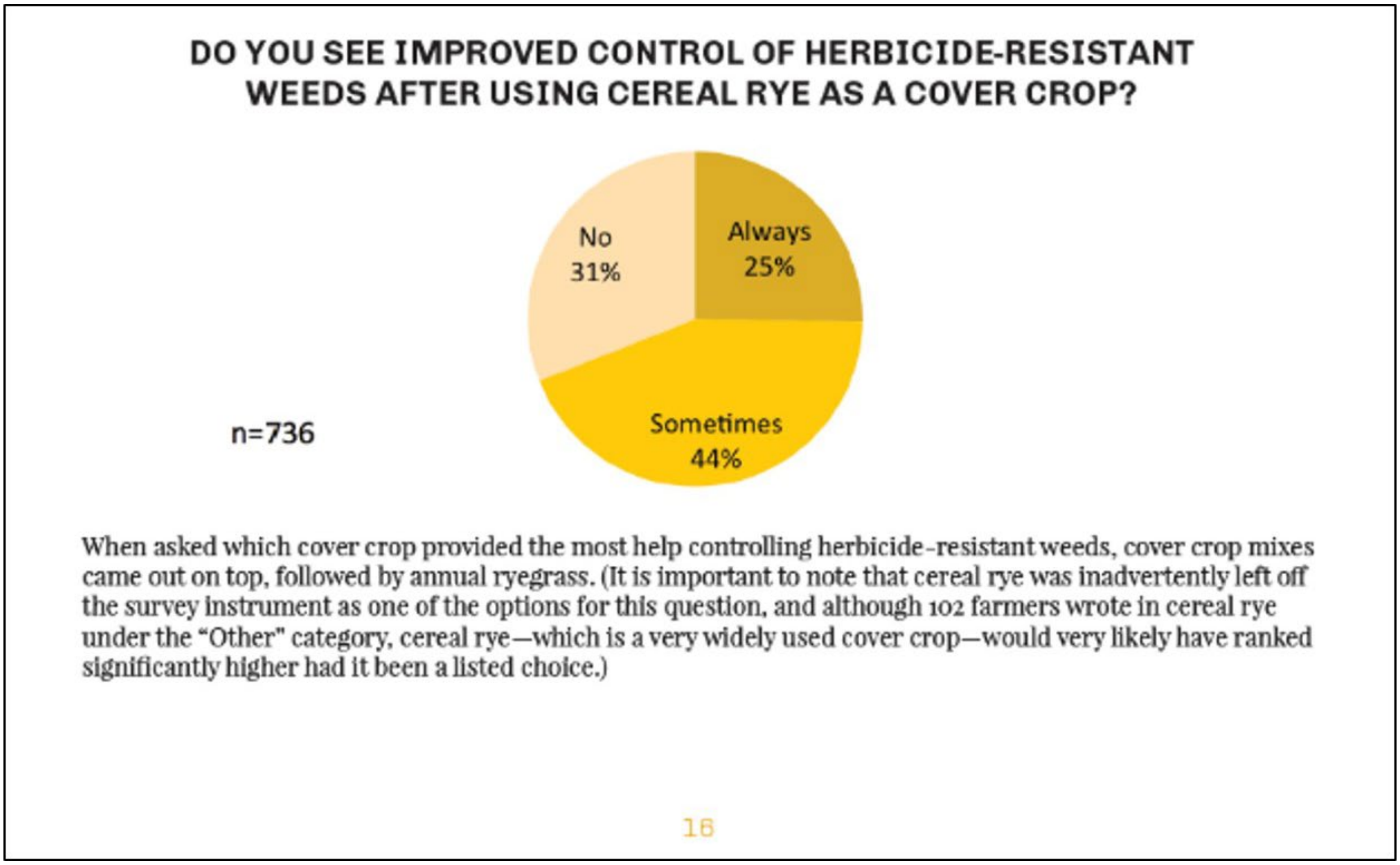
## Dangers of Confirmation Bias with Data Interpretation - Weed Control with Cover Crops – *(Joe Ikley and Bill Johnson)* -

**Recently, the Conservation Technology Information Center (CTIC) and North Central Sustainable Agriculture Research and Education (SARE) program released the results of their 2016-2017 Cover Crop Survey. This document reported results of a broad array of questions asked of cover crop users about their perceptions on the many reasons cover crops are used. Since we have extensive experience with cover crop research and weed science, we were very interested in the results of the "Herbicide-Resistant Weeds" section. In the abstract for the survey (Survey found here; Press release found here), it was reported that 66% (sic) of surveyed cover croppers reported that weed control was improved after a cereal rye cover crop (Figure 1). However, a quick look at the actual data in the report shows a different story, depending on who and how the data is interpreted (See Figure 2).**

> Other benefits explored in the survey were the help cover crops provided in controlling herbicide-resistant weeds (66% reported that weed control was improved after a cereal rye cover crop. In another question, cover crop mixes were rated as the top cover crop species for weed control).

***Figure 1. Excerpt from the abstract found on Page 3 of the 2017 CTIC Cover Crop Report.***


DO YOU SEE IMPROVED CONTROL OF HERBICIDE-RESISTANT WEEDS AFTER USING CEREAL RYE AS A COVER CROP?

No 31%
Always 25%
Sometimes 44%
n=736

When asked which cover crop provided the most help controlling herbicide-resistant weeds, cover crop mixes came out on top, followed by annual ryegrass. (It is important to note that cereal rye was inadvertently left off the survey instrument as one of the options for this question, and although 102 farmers wrote in cereal rye under the "Other" category, cereal rye—which is a very widely used cover crop—would very likely have ranked significantly higher had it been a listed choice.)

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*Figure 2. Pie chart of results from the survey asking Do you see improved weed control of herbicide-resistant weeds after using a cereal rye cover crop? Found on Page 16 of the 2017 CTIC Cover Crop Report.*

**The report states that 736 people responded to the question "Do you see improved control of herbicide-resistant weeds after using cereal rye as a cover crop?" The results show that 25% responded "Always", 31% responded "No", and 44% responded "Sometimes". It appears that the individuals in charge of compiling data for the abstract simply added the "Always" and "Sometimes" numbers to show that the majority of cover crop users see improved weed control after cereal rye. If someone with a more negative view on cover crops were to analyze this data, they might suggest that 75% of cover crop users do not see improved weed control after using a cover crop if they added up "No" (31%) plus "Sometimes" (44%). But the most unbiased way to read this data is to simply state how it is presented in the pie chart: 25% of cover crop users believe they always see improved weed control, 31% do not see improved weed control, and most survey respondents (44%) experienced mixed results with cover crops and herbicide-resistant weed control.**

**This chart is just one set of data compiled by this survey. We do not doubt the results of the survey, but the interpretation that was stated in the abstract and press release is what is troubling to a trained weed scientist. When analyzing and reporting data, one must take an objective view of the data. Adding the "Always" and "Sometimes" responses is a good way to tell cover crop promoters what they want to hear, but in our opinion it is not the correct way to read that set of data. In fact, we have seen the data presented this way by cover crop promoters (Figure 3).**


***Figure 3. Tweet from Practical Farmers that highlights the combined always and sometimes responses to suggest that 69% of farmers think cover crops improve herbicide-resistant weed control.***

**Our point in writing about this is that this is a good example of the different ways data can be interpreted, and is a great example of how we would explain confirmation bias. If you google this term, here is a definition of confirmation bias and some good reading on this human phenomenon <https://www.britannica.com/topic/confirmation-bias>.**

**Confirmation bias is the tendency to process information by looking for, or interpreting, information that is consistent with one's existing beliefs. This biased approach to decision making is largely unintentional and often results in ignoring inconsistent information. Existing beliefs can include one's expectations in a given situation and predictions about a particular outcome. People are especially likely to process information to support their own beliefs when the issue is highly important or self-relevant.**

**While we are very supportive of all of the efforts of CTIC and NCSARE, we do want to emphasize that it is important to send the most accurate message to our growers regarding this weed control practice. Our past research with horseweed (aka marestail) and palmer amaranth would support the survey results shown in figure 2.  Sometimes we get better control of herbicide-resistant weeds with cover crops and sometimes we don't. We have seen some very promising and consistent results in being able to suppress marestail with cereal rye and wheat.  We have not been able to see a consistent trend with annual ryegrass and Palmer amaranth suppression.  Currently the Purdue Weed Science group has a number of fairly extensive projects ongoing with various cover crop species and mixtures at sites with herbicide-resistant weeds. We will be incorporating these results into our weed control recommendations as we determine which program provide the most reliable results. But, to do this research correctly, it takes time to fully assess the impact of the cover crop on an established weed population. So, be patient, and continue**

**using cover crops for the other benefits they provide. But in the short term, we just want to throw out some caution about the weed control claims that seem to be pervasive in some of the popular press.**


## The "Zipper" Pattern of Poor Kernel Set in Corn – *(Bob Nielsen) -*

**The occurrence of severe photosynthetic stress (severe drought, extreme heat, severe nutrient deficiency, severe foliar disease) during or shortly after pollination in corn often results in poorly filled ears due to incomplete pollination or abortion of young kernels. Often such poor "kernel set" occurs primarily on the tip end of a cob, but some times the problem manifests itself down one side of the cob, affecting several rows of potential kernels. Such a pattern of poor kernel set is euphemistically referred to as a "zipper ear".**

**The absence of kernels on the tips of ears as a result of stress can be explained physiologically from the standpoint that tip silks are usually the last to emerge from the husk during pollination and, thus, are usually the last to capture pollen if pollen is still available. If pollen is no longer available when the tip silks emerge, then the tip ovules are never fertilized (in a sexual context) and no kernels develop (i.e., blank cob tips or "tip back"). If pollen capture by the later emerging tip silks is successful and the tip ovules are fertilized, then the tip kernels are younger relative to the others on the cob. Younger kernels at the tips of ears are more vulnerable to abortion when severe photosynthetic stress occurs early in the grain fill process... thus, the usual pattern of poor kernel set at the tips of ears.**


*Fig. 1. "Zipper" pattern of poor kernel set (stress due to severe defoliation shortly after pollination).*


*Fig. 2. "Zipper" pattern of poor kernel set (stress due to nitrogen deficiency).*

**A less common pattern of poor kernel set is one that is often described as the "zipper" pattern wherein 1 or more entire rows of kernels along one side of a cob are absent due to some combination of pollination failure and kernel abortion. A subsequent symptom that often develops on such "zipper ears" is a noticeable curvature of the cob, sometimes to the extent that folks describe it as a "banana ear". These curved ears are a consequence of the absence of kernels on one side of the cob coupled with the continued development of kernels on the other side that "force" the cob to bend or curve.**

**While most recognize that the absence of kernels down one side of the ear is the result of severe photosynthetic stress, it is less obvious why the problem occurred along one side of the ear rather than being localized at the tip of the ear. The cause(s) of the "zipper" pattern of kernel abortion is not well understood nor well documented. Following are a couple of ideas.**

## Silks "Shading" Other Silks?

**In a number of fields where I have observed the "zipper" pattern, the side of the ear with the kernel set problem is the same side over which the silks draped during the pollen shed period. This leads me to speculate that perhaps the draping of the silks resulted in the underlying silks being "shaded" from initial contact with pollen, causing those silks to either a) never capture pollen and the connected ovules never fertilized or b) capture pollen later than the rest, resulting in delayed**

**kernel development and, thus, being more vulnerable to abortion under subsequent stress. The connection between silk "draping" and "zipper" ears would be more likely in situations where silk emergence occurs several days prior to pollen shed, allowing for silk elongation and "draping" to occur.**

**Note: Some modern drought-tolerant hybrids have an aggressive silking habit that resists the usual delay in silk emergence under extreme drought. When soil moisture is not limiting, these hybrids often silk 3 to 4 days prior to the beginning of pollen shed. In that period of time, the first emerging silks can elongate upwards of 4 to 8 inches before pollen shed begins (Nielsen, 2015).**

## Differential Heating Around Circumference of Ears?

**Another possible contributing factor was suggested by an acquaintance of mine at DuPont Pioneer who indicated that drought researchers within that company reportedly documented that cob / ovule / kernel temperature can vary around the circumference of a developing ear of corn, with upper side of the ear potentially warmer than the lower side of the ear. If true, I presume such a difference would be caused by more exposure to sunlight on the upper side of the ears during daylight hours.**

**That observation reminded me of a research article published in 2001 that looked at the effects of differential heating on silk timing and kernel survival in corn (Cárcova and Otegui, 2001). In that research, the authors applied electrical heating strips at the tips or along one side of ears for a 14-day interval from about 2 days before silk emergence to about 12 days after silk emergence. The heating strips were designed in such a way as to raise the temperature of the affected area of the ear by about 9 degrees F with respect to the ambient air temperature.**

**Neither of the heating treatments affected silk emergence timing or the number of emerged silks, probably because the heating treatments were imposed after silk elongation had already begun within the husks. Heating the tips of ears also had no effect on final ovule numbers.**

**However, heating one side of the ears resulted in significant kernel abortion on the opposite, non-heated side. The authors speculated that the heating treatment may have enhanced kernel metabolic activity and increased the partitioning of photosynthetic assimilate to the developing kernels on the heated side of the ear, at the expense of lesser photosynthetic assimilate available to the developing kernels on the non-heated side of the ear.**

**The results of this research, coupled with the observations from DuPont Pioneer researchers that the upper sides of ears are often warmer than lower sides, would certainly offer a possible explanation of the "zipper" pattern of kernel abortion in years where the crop experiences not only excessive heat but also drought stress during or shortly after pollination. In addition to delayed metabolic rates and restricted photosynthetic assimilates, the development rate of the cooler kernels would be slower and, thus, the kernels somewhat "younger" and more vulnerable to the effects of severe stress.**


***Fig. 3. Silks draped toward bottom side of ear.***


*Fig. 4. "Zipper" pattern of poor kernel set (excessive heat & inadequate sil moisture).*

**As I have looked more closely at "zippered" ears in recent years, though, the "zipper" pattern does not always occur on the lower (and possibly cooler) sides of the ear. However, the concept of differential heating of ears around their circumference certainly seems plausible as a factor contributing to the "zipper" pattern of kernel abortion.**

## Related Reading

**Cárcova, Jorgelina and Marıa E. Otegui. 2001. Ear Temperature and Pollination Timing Effects on Maize Kernel Set. Crop Sci. 41:1809–1815.**

**Nielsen, RL (Bob). 2013. Effects of Stress During Grain Filling in Corn. Corny News Network, Purdue Extension. http://www.kingcorn.org/news/timeless/GrainFillStress.html [URL accessed Oct 2017].**

**Nielsen, RL (Bob). 2015. Unusually Long Silks in Corn. Corny News Network, Purdue Extension. http://www.kingcorn.org/news/timeless/LongSilks.html [URL accessed Oct 2017].**

**Nielsen, RL (Bob). 2016. Silk Development and Emergence in Corn. Corny News Network, Purdue Extension. http://www.kingcorn.org/news/timeless/Silks.html [URL accessed Oct 2017].**

**Nielsen, RL (Bob). 2017. Estimating Corn Grain Yield Prior to Harvest. Corny News Network, Purdue Extension. http://www.kingcorn.org/news/timeless/YldEstMethod.html [URL accessed Oct 2017].**

**Nielsen, RL (Bob). 2017. Kernel Set Scuttle-Butt. Corny News Network, Purdue Extension. http://www.kingcorn.org/news/timeless/KernelSet.html [URL accessed Oct 2017].**

**Thomison, Peter. 2017. "Zipper Ears". *in* Troubleshooting Abnormal Corn Ears, Ohio State Extension. https://u.osu.edu/mastercorn/zipper-ears/ [URL accessed Oct 2017].**

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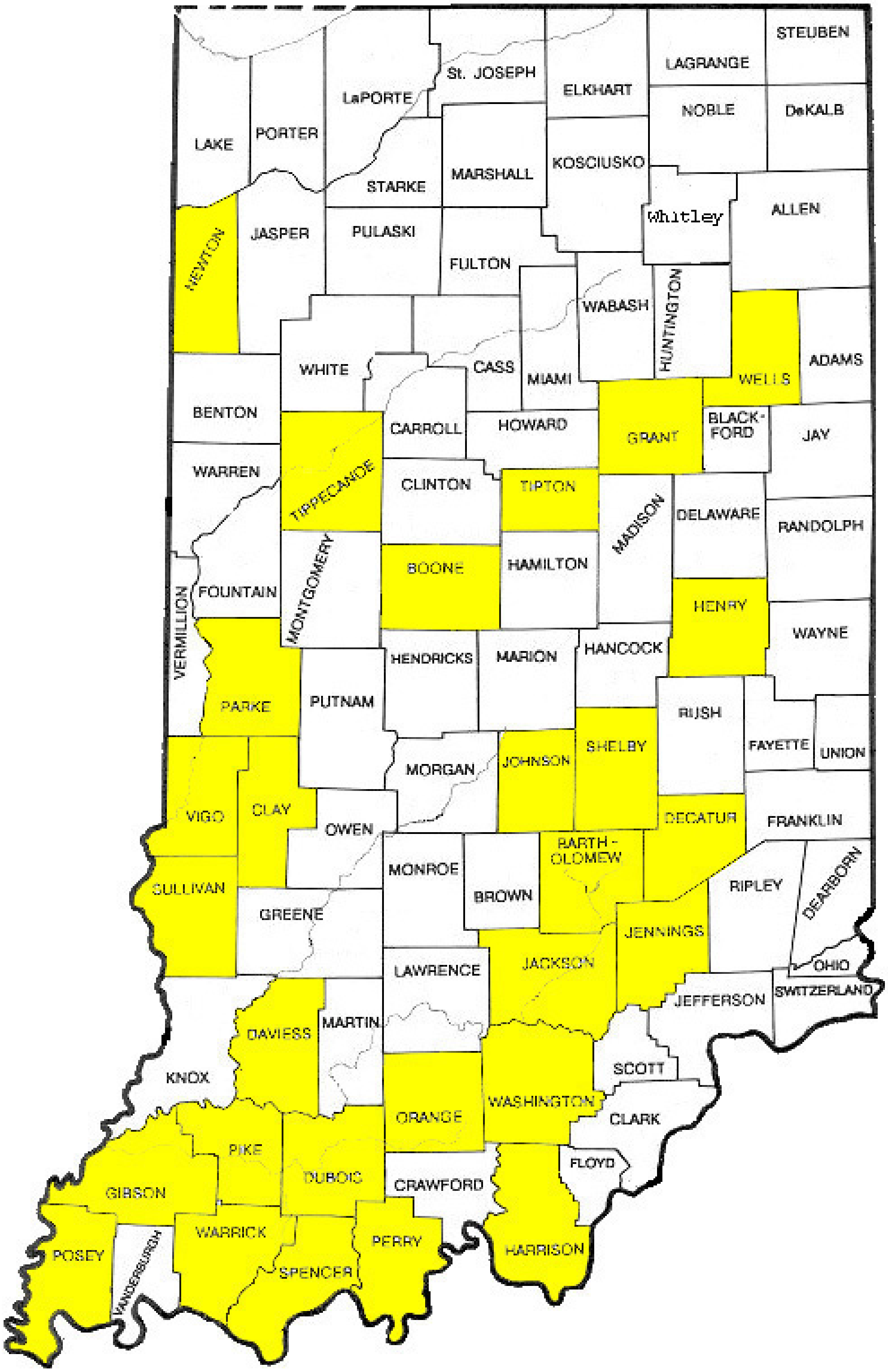
## Updated Map of Confirmed Indiana Counties with Southern Rust – *(Gail Ruhl and Tom Creswell) -*

**The following map is continually being updated as samples are received and analyzed by Purdue's Plant and Pest Diagnostic Lab. See the links below for sample submission and more information on southern rust.**




***Counties confirmed for the presence of southern rust, October 6, source P&PDL and iPiPE .***

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## Keeping Grain in Good Condition Through the Winter – *(Klein E. Ileleji) -*

**Harvest is already in full swing, but has slowed down due to the constant rainfall in the last few days. It appears that the corn and soybean crop had a pretty good field dry-down on average, and USDA crop progress report for the Midwest rated 64% of the corn crop as good to excellent. What is important now is ensuring that the crop is dried to safe moisture and cooled down appropriately so that it remains in good condition until prices are favorable enough to sell.**

**Table 1. Maximum moisture contents for grain harvest and safe storage recommended in the Midwest. (Source: Grain Drying, Handling and Storage handbook, third edition, MWPS-13). Values for good quality, clean grain and aerated storage. Reduce safe storage moisture content by 1% for poor quality grain.**

| Grain Type | Max Moisture Content, %wb At Harvest | Max Moisture Content, %wb Storage Period Up to 6 Months* | Max Moisture Content, %wb Storage Period 6-12 Months** | Max Moisture Content, %wb Storage Period >1 Year** |
|---|---|---|---|---|
| Shelled corn and grain sorghum | 30 | 15 | 13 | 13 |
| Soybeans | 18 | 13 | 12 | 11 |
| Wheat, barley and oats | 20 | 14 | 13 | 12 |
| Flaxseed | 15 | 9 | 7 | 7 |
| Canola | 14 | 9 | 8 | 8 |
| Sunflower | 17 | 10 | 8 | 8 |
| Edible beans | 16 | 16 | 13 | 13 |

***Up to 6 months from harvest refers to storage under winter conditions.***
*****6-12 months and >1 year storage refers to storage into the warm summer months.***

**First of all, make sure your bins have been cleaned out thoroughly off old grain and foreign material. Applying an empty bin treatment on the bin wall and floor to control for insect pests is a good precautionary measure to implement. A list of grain protectants approved for stored grain in Indiana can be found on Purdue Extension bulletin entitled "Stored Product Pests", E-66-W (accessed at: https//extension.entm.purdue.edu/publications/E-66.pdf). Second, the initial grain quality and moisture content dictates how long grain should be held in storage. Harvesting timely and drying adequately to safe moisture content are two key decisions that could affect how well you will be able to manage your grain in storage. Unfortunately, the late replanting of some fields mean some of the harvest will be done late**

**into the fall. In rainy weather, check to see whether binned dry grain is not getting rewetted from rain drifts coming in through vents or open manholes. Provide adequate ventilation to the headspace above the grain to control condensation and prevent high humidity environment favorable to mold growth using roof exhaust fans. Check bins for rain drifts or water leakage, especially after a heavy rain event.**

**Table 1 shows recommended maximum moisture content values for grain harvest and safe storage for some grains grown in the Midwest. It is important to note that storing beyond the following spring means that the grain will be held over the warm summer months. Therefore, factor in the exposure of grain to warm storage conditions in the warm summer months, which reduce grain storability. Dry grain down to moisture levels based on your long-term storage plan.**

**Table 2. Aeration phases for stored grain in the fall (Source: Dr. Dirk Maier, Iowa State University, Ames, IA)**

- **Phase 1: Fall Cool Down**
  - Lower grain temperatures stepwise
    - October – 40-45 $^{\circ}$F
    - November – 35-40 $^{\circ}$F
    - December – 28-35 $^{\circ}$F
- **Phase 2: Winter Maintenance**
  - Maintain low temperatures with intermittent aeration: January, February- 28-35 $^{\circ}$F
- **Phase 3: Spring Holding**
  - Keep grain cold from winter aeration
    - Seal fans
    - Ventilate only headspace intermittently

* Note that the grain shouldn't be warmed up in the spring or summer

**The last point I would like to make is cool stored grain adequately upon drying and after binning. Cooling grains to low winter temperatures as fast as possible will retard all biological activities that are detrimental to stored grain quality. Cooling stored grain to at least 40 degrees by December (weather permitting) should be your goal. Ensure fans are ready for use and have been sized to deliver sufficient airflow, at least 0.1 CFM per bushel for bins in the Midwest with grain depths up to 21 feet, and 0.03 to 0.05 CFM per bu for large bins over 50ft depth. Follow the stepwise three-phase aeration strategy shown on Table 2 to cool grain to next spring.**

**Finally, be safe when working around grain bins. Remember, a grain bin is a confined space and pose a hazard to personnel working inside it. Follow recommended guidelines for safely working in grain bins; never work alone. Make sure you discuss the dangers and precautionary measures taken while working around grain bins to your family and all your staff.**


***Grain bins.***

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## The Post Harvest Update and Recertification Workshop – *(Linda Mason)* -

**The Post Harvest Update and Recertification Workshop will be held December 13, 2017 at the Beck Agricultural Center, Purdue Agronomy Center for Research and Education, 4540 U.S. 52 W., West Lafayette, IN 47906. Pre-register and save money, $95.00 by December 6 and $110.00 after. Registration is limited.**

**The schedule of the day:**

- **8:30 AM Registration, Coffee & Donuts**
- **9 AM - 11:30 PM Sessions**
- **11:30-12:15 PM Catered Lunch Provided**
- **12:15 - 4 PM Sessions**
- **4 PM Complete Certification Forms**

**Session include:**

- **Alternative Strategies to Control Insects**
- **Proactive Grain Management**
- **Monitoring: A Great Pest Management Tool**
- **Fumigation Update**
- **Insect and Resistant Management Strategies**

**CCH's applied for - Catetories: 1 (1 CCH's); 7A (6 CCH's); 7D (6 CCH's); RT (4 CCH's). Download the registration form:**

**http://extension.entm.purdue.edu/grainlab/content/pdf/postharvest2017.pdf**


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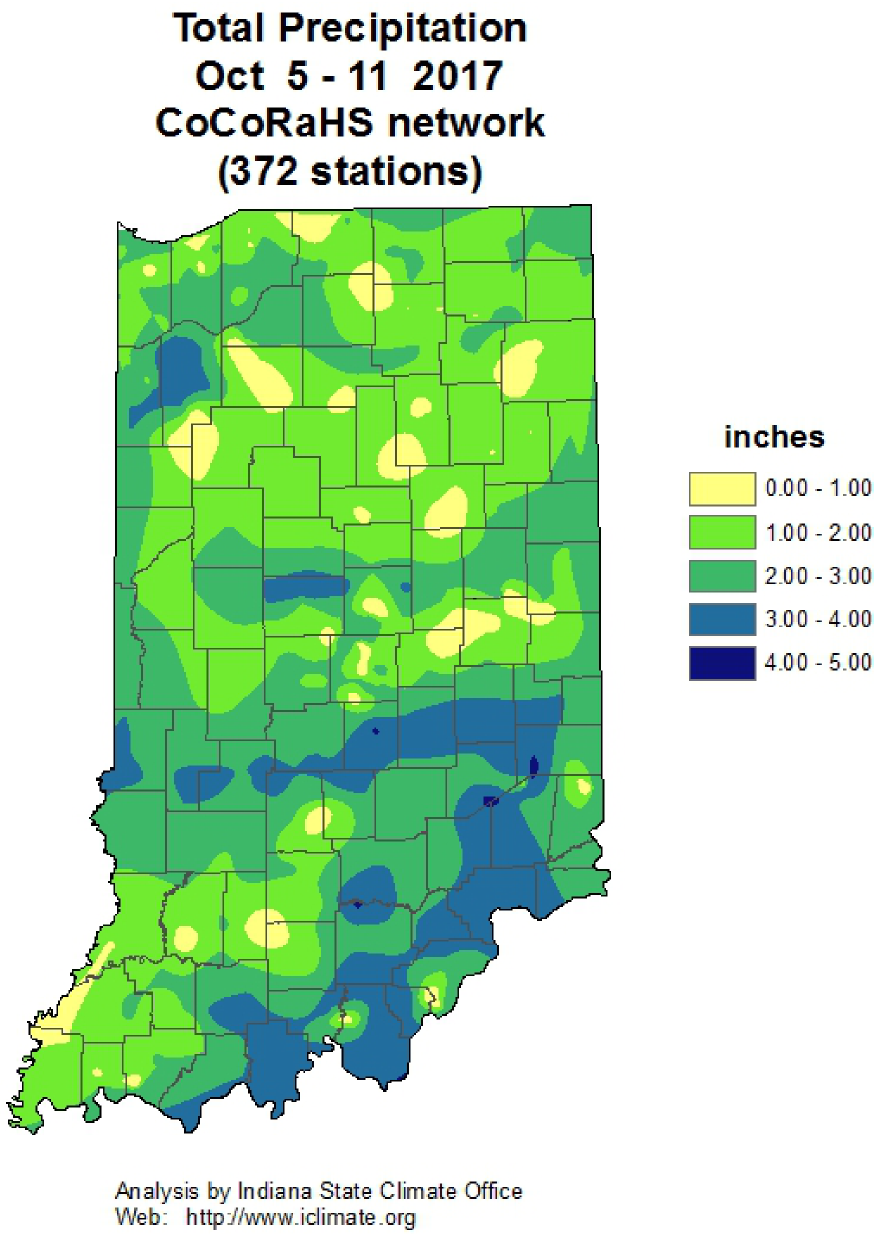
## Precipitation


Total Precipitation
Oct 5 - 11 2017
CoCoRaHS network
(372 stations)
inches
0.00 - 1.00
1.00 - 2.00
2.00 - 3.00
3.00 - 4.00
4.00 - 5.00
Analysis by Indiana State Climate Office
Web: http://www.iclimate.org

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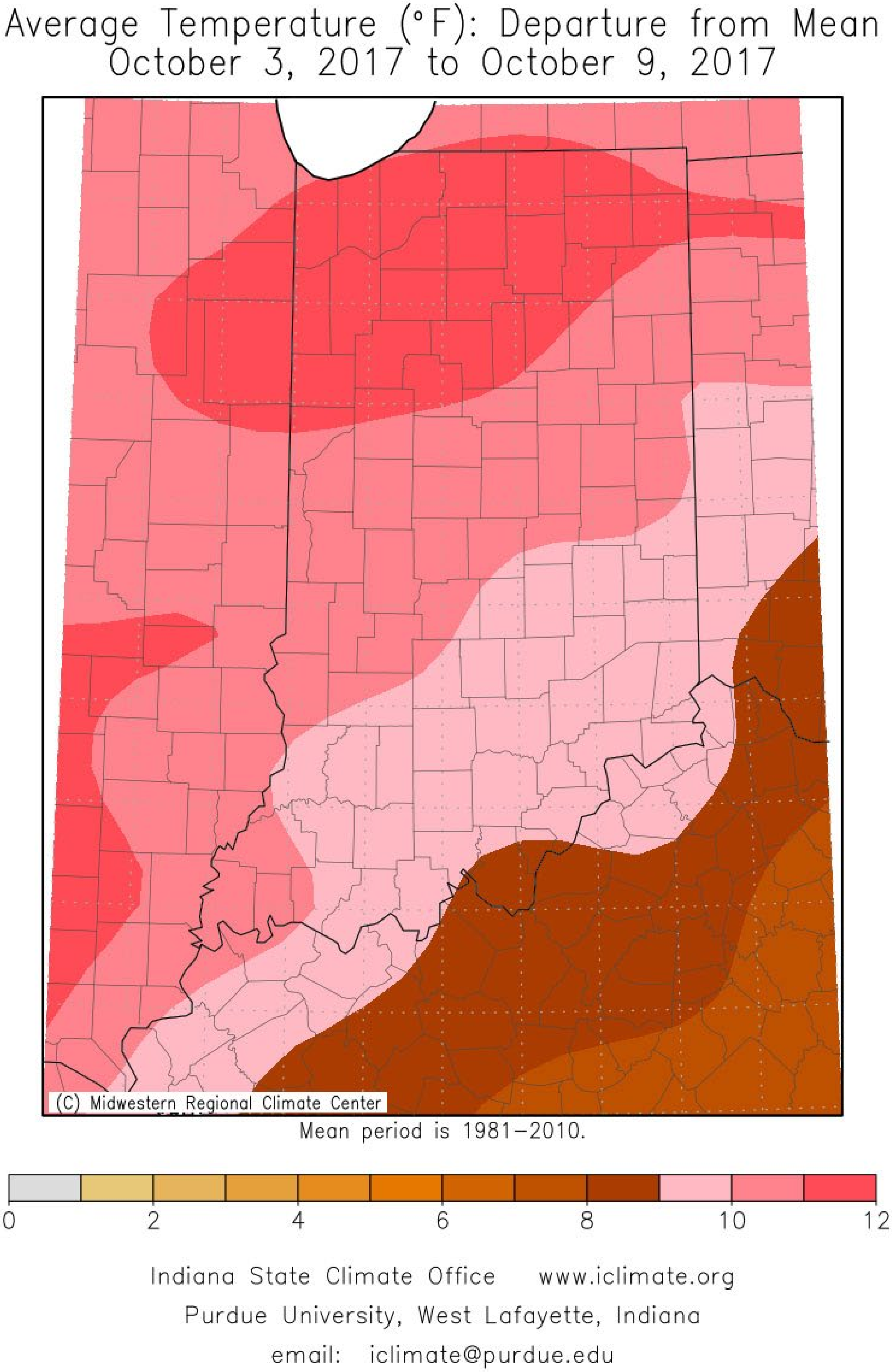
# Temperature


Average Temperature (°F): Departure from Mean
October 3, 2017 to October 9, 2017
(C) Midwestern Regional Climate Center
Mean period is 1981–2010.
0
2
4
6
8
10
12
Indiana State Climate Office www.iclimate.org
Purdue University, West Lafayette, Indiana
email: iclimate@purdue.edu

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# THANKS FOR READING

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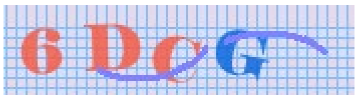

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