

WASHINGTON REPORT

September 15, 2017

Lee Van Wychen

Off-Target Movement of Dicamba. Where Do We Go From Here?

Unfortunately, there have been many reports and news stories about off-target movement of dicamba this summer. Dr. Kevin Bradley, WSSA Past President, from the University of Missouri has been dealing with this issue for the past two summers and has been appointed by the WSSA Board of Directors to chair a special committee on herbicide off-target movement created at the July summer board meeting. I have combined parts of two [University of Missouri IPM](#) extension articles that Dr. Bradley has recently written that addresses the current situation and includes his recommendations for Missouri next year.

Author: **Kevin Bradley**

Published: **August 21, 2017**

As of August 10, 2017 there were more than 2,200 dicamba-related injury investigations being conducted by various state Departments of Agriculture (Figure 1), and more than 3.1 million acres of soybean estimated with dicamba injury (Figure 2). In my opinion, we have *never* seen anything like this before; this is not like the introduction of Roundup Ready or any other new trait or technology in our agricultural history.

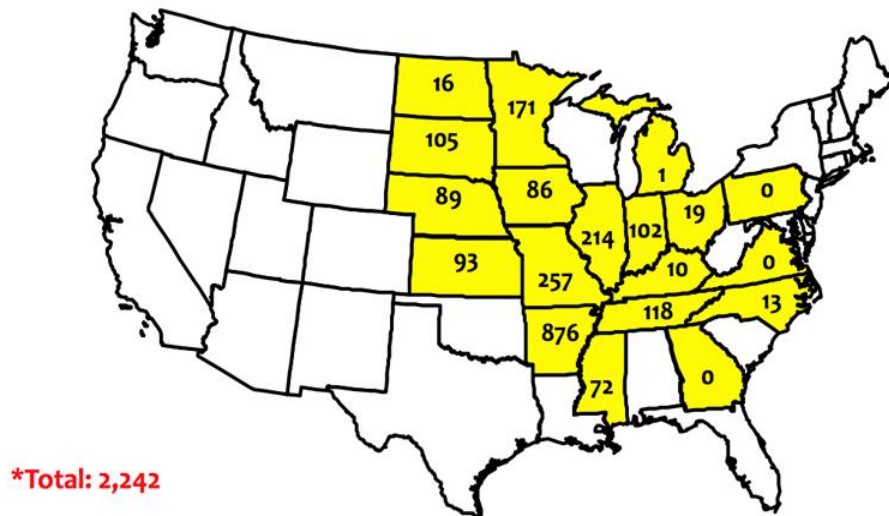


Figure 1. Official dicamba-related injury investigations as reported by state departments of agriculture (as of August 10, 2017).

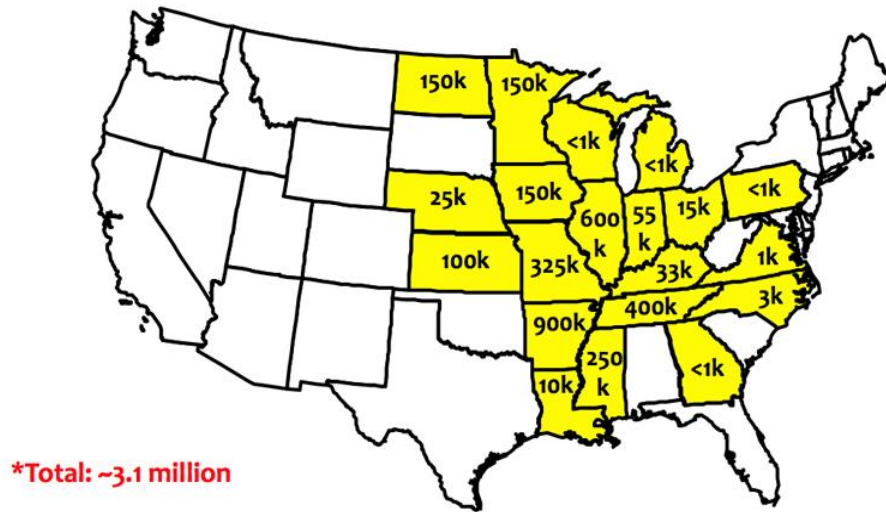


Figure 2. Estimates of dicamba-injured soybean acreage as reported by state extension weed scientists (as of August 10, 2017).

Reasons. In my opinion, there are basically four routes by which dicamba can move away from its intended target, and we have experienced every one of these in 2017. The real debate seems to be about what percent of the total off-target movement should be placed into each one of these categories.

First, dicamba can move off-target by way of physical drift at the time of application. This can occur due to spraying when wind speeds are too high, use of improper nozzles that produce fine droplets, or to a host of other factors that we can just chalk up to "bad sprayer decisions or set-up at the time of application." There's no doubt that physical drift of dicamba has occurred this season and that this is one of the major reasons for off-target movement of dicamba. But it isn't the only reason. I have visited and talked with many farmers and applicators who have done it right and still experienced movement of dicamba away from the direction of the prevailing winds at application.

A second way that dicamba can move off-target is through tank contamination. This usually occurs due to improper spray tank cleanout. Unfortunately, many have learned the hard way that it takes very, very little dicamba in the tank to cause problems on non-Xtend soybean that are sprayed after a dicamba application. There's no doubt that some portion of our issues with off-target movement of dicamba have been due to improper sprayer cleanout and tank contamination. However, many growers with injured soybean fields didn't even plant any Xtend soybean or spray a dicamba product through their sprayers. Some retailers also have dedicated sprayers for dicamba products only.

Another way that tank contamination can occur is through contamination of an actual herbicide product, such as what Monsanto says has occurred with a certain generic

glufosinate product. I'm not aware that any trade names of glufosinate products have been put forth or of any actual data presented about this potential problem at the time of this writing, but of course contaminated glufosinate could not explain any of the injury we have seen on Roundup Ready or conventional soybean, or any of the other vegetable or ornamental crops or trees that have been injured by dicamba.

A third way that dicamba can move away from its intended target is through temperature inversions. Temperature inversions usually occur in the evening hours around sunset when the air nearest the earth's surface becomes cooler than the air above it. This cooler air forms a stable mass that can be moved horizontally along the earth's surface and then can deposit anything that may have been in it once it dissipates. So for example, if an application of an approved dicamba product is made at 7 or 8 PM into a temperature inversion, any fine droplets that may have been part of this application may not land on the intended target, but instead may be redistributed some distance away once the temperature inversion dissipates the next morning. As a result of our work on temperature inversions over the past several years, our data indicates that we usually experience a temperature inversion at least one-half to two-thirds of the days in June and July, and that these inversions typically start around 6 to 8 PM and persist for 8 to 10 hours. Also as a result of funding from Missouri soybean growers, we now have a [network of weather stations](#) in Missouri that are able to tell users whether or not an inversion is occurring. There is some off-target movement of dicamba that occurred in 2017 that can be explained by spraying directly into a temperature inversion, but in my opinion most of our applicators are now very aware of this possibility and have avoided these evening or nighttime applications. However, another possible way that dicamba droplets could end up in an inversion is through volatilization, which brings me to the fourth point.

The final way that dicamba can move away from its intended target is through volatility. Dicamba is an inherently volatile herbicide. We know that the older formulations of dicamba are more volatile and are illegal to apply. So if illegal applications of the older generic dicamba products have been applied, I have no doubt that dicamba has moved off-site in those applications through volatility. But in my experiences and discussions with farmers and retailers throughout the state, it does not seem that illegal applications of these older formulations have occurred on a wide scale with any regularity. I do not believe that the scope and scale of this issue can be explained away by illegal applications of older dicamba formulations. As most on all sides of this issue are well aware, both BASF and Monsanto have taken steps and invested a lot of money to make these newly approved formulations less volatile. And they are less volatile. But as many have said, less volatile does not mean not volatile. We have been in the process of gathering volatility data on these newly approved dicamba products for several months. All of our results thus far indicate that we can detect dicamba in the air following an application of Engenia or XtendiMax/Fexapan for as many as 3 or 4 days following the application. University weed scientists in surrounding states are seeing similar results in their research. And so we come to the crux of the matter. I have yet to hear any manufacturer of the

approved dicamba products say that volatility is one of the possible ways that dicamba has moved away from its intended target in 2017. But yet many university weed scientists like myself believe this is one of the major routes by which off-target movement of dicamba has occurred, because our air sampling data, field volatility studies, and field visits indicate that to be the case. To say that all of these problems have occurred due to physical drift, tank contamination, or temperature inversions but not volatility is, in my opinion, disingenuous at best.

My recommendation. We are in the process of trying to understand how or if these cases can be correlated back to any particular environmental condition such as air or soil temperature, moisture, humidity, etc. That process isn't easy and it can't be done quickly, and any conclusions we can make will only be as good as the data we can get. I'm not sure what that process will yield, but from where I sit right now the only conclusions I can make are that the areas in Missouri that planted the most of the Xtend trait and sprayed the most Engenia, XtendiMax, or Fexapan are the areas where we saw the greatest amount of off-target movement and damage.

I know farmers are looking for answers and will soon be making decisions about their traits and weed management programs for next year. So my recommendation for those growers who wish to plant the Xtend technology is to go back to using dicamba at a timeframe and in a manner when it has been used "successfully" in the past. Based on our history of dicamba use in corn in April and May, and even on our experiences this year using these approved dicamba products in pre-plant burndown applications prior to June, we have seen far fewer problems with off-target movement of dicamba in that timeframe than what we experienced in June, July, and August. Even this season I was not notified of any problems with off-target movement of dicamba until early June, and the Missouri Department of Agriculture didn't receive their first dicamba complaint until June 13th. It seems that almost all of the problems with off-target movement occurred once in-crop, post-emergence applications started to be made for waterhemp and Palmer amaranth. Most of those occurred in June and July this season. I wish I had some definite date for a cutoff but at this time I do not; we will be conducting more weather analyses in the coming weeks and hopefully this process will help us understand which factors lead to more risk when applying these herbicides.

So for the sake of neighboring non-Xtend soybean fields, trees, vegetable crops, gardens, ornamentals, and our industry as a whole, my recommendation for those who want to plant the Xtend trait in 2018 is to use the approved dicamba products for the control of resistant horseweed (a.k.a. marestail), ragweed species and winter annuals in the pre-plant burndown where these products have a great fit, but to abstain from applying these products later in the season. In Xtend soybean, resistant waterhemp will have to be managed using an integrated approach that includes cultural practices like cover crops, narrow row spacings, etc. along with an overlapping residual herbicide program. For more information on managing waterhemp in different soybean system, see this multi-state publication: [Waterhemp Management in Soybean](#).

House Passes All 12 FY 2018 Appropriations Bills

On Sept. 14, the House of Representatives passed a package of 12 funding bills (H.R. 3354) to provide all discretionary funding for the federal government for the 2018 fiscal year. The bill, also known as the Make America Secure and Prosperous Appropriations Act, was passed on a vote of 211-198.

On the Senate side, the Appropriations Committee has passed 8 of the 12 spending bills, but none of them have made it to the Senate floor for amendments and votes. Four of the spending bills in the Senate have yet to be marked up in committee.

The Senate Appropriations Committee did pass their agriculture spending bill at the end of July. Both the House and Senate ag spending bills provide much more favorable numbers than the President's budget request. The Senate numbers are particularly favorable with increases in FY 2018 funding for USDA's National Institute of Food and Agriculture (NIFA), Agricultural Research Service (ARS), Economic Research Service (ERS), National Agricultural Statistics Service (NASS), APHIS, and NRCS compared to FY 2017. The final endgame for the FY 2018 appropriations process is still a big question mark, but given the House and Senate numbers for USDA programs important to weed science, we should be ok.

Selected USDA Discretionary Appropriations Accounts

Program	2015 Final	2016 Final	2017 Final	2018 President	2018 House	2018 Senate
	----- Millions of Dollars -----					
NIFA	1289	1326	1362	1253	1341	1373
Hatch Act	244	244	244	243	244	244
Smith-Lever 3b & c	300	300	300	299	300	300
AFRI grants	325	350	375	349	375	375
IR-4	11.9	11.9	11.9	11.9	11.9	11.9
CPPM*	17.2	17.2	20	14	20	20
ARS**	1132	1143	1170	993	1133	1182
ERS	85	85	86	77	77	86
NASS	172	168	171	186	184	192
APHIS	871	894	946	810	906	953
NRCS	846	850	864	766	859	874

* Crop Protection and Pest Management (CPPM): Addresses high priority pest issues using IPM.

** House and Senate Appropriators rejected the White House proposal to close 17 of ARS's 112 research facilities, estimated to be at least \$1 billion behind in deferred maintenance needs.

ID'ing Palmer Amaranth Seed in Conservation Seed Mixes

A great example of the value of USDA capacity funds return on investment is the work done by Dr. Patrick Tranel's lab at the University of Illinois that was supported by Hatch Act funds. They developed and validated a qPCR assay for distinguishing Palmer amaranth from 12 other

Amaranthus species. The assay can consistently detect a single Palmer amaranth seed when present in a pool of 100 Amaranthus species' seeds. The key is to make sure every seed is ground up during the extraction process. [The 100 seed test only costs \\$50](#). The only option available prior to that was a California company that tests individual seeds using DNA sequencing that costs \$100 per seed. Tranel said the qPCR assay is available to other testing labs for free. The testing protocol is published in Pest Mang Sci: [A quantitative assay for Amaranthus palmeri identification](#).

National Academies Seek Input on Future of Food and Agriculture Research

[Science Breakthroughs 2030: A Strategy for Food and Agricultural Research](#) is a new National Academies of Science study to identify ambitious scientific opportunities in food and agriculture research. They are asking for input from scientists to identify emerging opportunities. You can submit your ideas on [IdeaBuzz](#) and "vote" and comment on ideas that have already been submitted.

USDA Moves OPMP to the Office of the Chief Economist

WSSA applauds Secretary Perdue's decision to move USDA's Office of Pest Management Policy (OPMP) from the Agricultural Research Service (ARS) to the Office of the Chief Economist, which advises the Secretary of Agriculture on the economic implications of policies and programs affecting the U.S. food and fiber system and rural areas. OPMP's focus does not match up well with the mission of ARS and will be better situated in the Office of the Chief Economist.

OPMP was established in September 1997, with the mandate to:

- Integrate USDA's strategic planning and activities related to pest management
- Coordinate USDA's role in the pesticide regulatory process and related interagency affairs, primarily with the EPA
- Strengthen USDA's support for agriculture by promoting the development of new pest management approaches that meet the needs of an evolving and sustainable U.S. agricultural system

OPMP is directed by Dr. Sheryl Kunickis and currently has a staff of eight pest management specialists, including Dr. Jill Schroeder, a past president of both WSSA and WSWS.

John Deere Buys Blue River's Precision Weeding Technology

On September 6, John Deere announced it was spending \$305 million to acquire [Blue River Technology](#), a developer of crop-spraying equipment that relies on machine learning. The acquisition also gives John Deere a 60-person team in the heart of Silicon Valley where it just opened an office to focus on high tech agricultural solutions.

[Blue River Technology](#) was founded in 2011 by **Jorge Heraud**, the former head of precision agriculture at Trimble, and Lee Redden, a Stanford PhD student and roboticist who grew up in Nebraska detassling corn on his father's and grandfather's farms. Together, they built and tested their idea in California's Central Valley - proving the applicability of machine learning, computer vision, and robotics to the field of agriculture. With an idea, support from friends & family, and a

grant from the National Science Foundation's (NSF) Small Business Innovation Research (SBIR) program, Blue River Technology was born.

On a side note, **William Patzoldt, Senior Agronomist (and Weed Scientist) with Blue River**, will be speaking at the upcoming WSSA annual meeting in Arlington, VA as part of Steve Fennimore's symposium titled "The State of the Weed Control Industry In 2018."

Blue River Technology's products have integrated computer vision and machine learning software that enables "See & Spray", a real time precision spot treatment of weeds. Blue River's first smart machine was "LettuceBot", which was developed for precision lettuce thinning. Blue River is also developing an unmanned aerial system that can survey a field of crops and sense various plant and environmental characteristics. Through using a drone, this technology can enable their See & Spray technology to be more accurate - measuring and learning every step of the way.

Blue River has been conducting See & Spray demos in cotton the past couple of years and has developed a labeled image database of plants and weeds. The Blue River system brings together a great deal of computing power into a single system that not only sprays precisely within a crop row, but essentially checks its work on the way by and autocorrects to be even more precise.

This level of precision is growing for the industry as lower cost sensor technology becomes available. And once mated to machine learning systems that can take in the information to make decisions, more precision tools are possible.

FFAR Contributes \$15 Million Towards Photosynthetic Efficiency Research

The Foundation for Food and Agriculture Research (FFAR), along with the Bill & Melinda Gates Foundation and the U.K. Department for International Development (DFID) announced on September 15 they are co-funding a five-year, \$45-million research project that will continue the work of Realizing Increased Photosynthetic Efficiency (RIPE) for sustainable increases in crop yield.

RIPE, <http://ripe.illinois.edu/>, was formed in 2012 and built on 50 years of photosynthesis research. RIPE is led by the University of Illinois in partnership with the USDA-ARS, University of Essex, Lancaster University, Australian National University, Chinese Academy of Sciences, Commonwealth Scientific and Industrial Research Organization, University of California, Berkeley, and Louisiana State University.

RIPE has simulated the 170-step process of photosynthesis from the inner workings of enzymes to interactions between neighboring plants in the field. RIPE has used these models to identify seven potential pipelines to improve photosynthesis and turn their ideas into sustainable yield increases. Last year, RIPE published work in *Science* that described how these pipelines could increase crop productivity by 20 percent - a dramatic increase compared to typical annual yield gains of just one percent or less. Two other RIPE pipelines have now shown even greater yield improvements in greenhouse and preliminary field trials. Researchers anticipate commercial seeds benefiting from this research will be available to farmers within approximately 15 years.

Australia's "WeedSmart" Program Helping to Stem Herbicide Resistance Tide

In an August 30 [article in Seed Quest](#), Australian agricultural consultant and WeedSmart representative Peter Newman discusses how Australia is succeeding in stemming the tide of herbicide resistance. This success, he says, is partly attributable to an industry-wide education initiative called WeedSmart (<https://weedsmart.org.au/>).

WeedSmart was established by Australia's agricultural sector about 5 years ago after surveys showed a serious lack of awareness among Australian growers about herbicide resistance, in particular glyphosate resistance. The goal is to enhance on-farm weed management practices and promote the long term sustainability of herbicide use. WeedSmart is guided by an advisory committee and supports the work of three staff members who conduct an ongoing communication program targeted at growers. WeedSmart includes an online resource hub with research and practical solutions for growers on herbicide resistance, webinars, podcasts, social media presence, visits to field days and most recently, WeedSmart Week. WeedSmart is also backed by university research and thus helps researchers communicate directly to growers about the latest findings.

WOTUS Rule Rescinded

On July 27, the EPA and Army Corps of Engineers published their proposed rule, "Definition of "Waters of the United States (WOTUS)" - Recodification of Pre-Existing Rules." This is the first step of a two-step process intended to review and revise the definition of "waters of the United States" consistent with President Trump's Executive Order of February 28, 2017.

This first step rescinds the WOTUS rule that was issued by EPA and the Army Corp in 2015. That rule is in judicial limbo as it was stayed by the 6th Circuit Court in a lawsuit brought by states that opposed it. Re-codifying the regulations that existed before the 2015 Clean Water Rule will provide continuity and certainty for regulated entities, the States, agency staff and the public. Nothing in the proposed rule issued on July 27 restricts the ability of States to define the scope of "navigable waters" more broadly than the federal law definition.

Comments on the reinstatement of the pre-existing WOTUS rule are **due on September 27, 2017** and should be limited to the appropriateness of the rescission and not on the scope of the definition of WOTUS. Comments can be submitted at:

<https://www.regulations.gov/docket?D=EPA-HQ-OW-2017-0203>

Public Stakeholder Sessions for New WOTUS Definition Begin Sept. 19

In step two of President Trump's Executive Order, the EPA and Army Corp of Engineers will pursue notice-and-comment rulemaking in which the agencies will conduct a substantive re-evaluation of the definition of "waters of the United States" (WOTUS).

The agencies will hold 11 stakeholder input sessions on the proposed revised definition of WOTUS. Nine sessions will be two-hour long teleconferences that will be tailored for specific sectors, one will be open to the general public and one will be an in-person session for small entities.

The stakeholder sessions will be held on a weekly basis beginning Sept. 19 and will continue each Tuesday thereafter for ten weeks. Each will run from 1 to 3 p.m. eastern time. Information on how to register for each of these meetings is available <https://www.epa.gov/wotus-rule/outreach-meetings>.

Registration for each webinar will close a week prior. Those wishing to provide verbal recommendations during the teleconference will be selected on a first-come, first-serve basis. Due to the expected volume of participants, individuals will be asked to limit their oral presentation to three minutes.

Stakeholder Sessions Schedule:

- Sept. 19, 2017 – small entities (small businesses, small organizations and small governmental jurisdictions)
- Sept. 26, 2017 – environment and public advocacy
- Oct. 3, 2017 – conservation, e.g., hunters and anglers
- Oct. 10, 2017 – construction and transportation
- Oct. 17, 2017 – agriculture
- Oct. 24, 2017 – industry
- Oct. 31, 2017 – mining
- Nov. 7, 2017 – scientific organizations and academia
- Nov. 14, 2017 – stormwater, wastewater management and drinking water agencies
- Nov. 21, 2017 – general public

The agencies will be accepting written recommendations on the step two rulemaking effort through a non-regulatory docket at <https://www.regulations.gov/docket?D=EPA-HQ-OW-2017-0480>. The agencies ask that this information be submitted on or **before Nov. 28, 2017**.

U.S. FWS Provides Update On Assessing Monarch Butterfly Status

In August, the U.S. Fish and Wildlife Service (FWS) provided an update via a webinar on its Species Status Assessment (SSA) framework for the monarch butterfly. The FWS is developing a status review using the SSA framework as the scientific foundation for their decision on whether the monarch butterfly should be listed under the Endangered Species Act, which is due June of 2019.

[Watch the species status assessment update webinar](#) - August 2017 (24 minutes)

For more info on the monarch butterfly assessment process:

<https://www.fws.gov/savethemonarch/SSA.html>

During the webinar, the U.S. FWS discussed their initial work in creating their Monarch Conservation Efforts Database (MCED). Their goal is to capture all monarch conservation efforts that are ongoing and planned. One of the key components of the MCED is milkweed and blooming nectar plant metrics. U.S. FWS will continue to provide updates and webinars on the MCED through June 2018 when they expect the MCED will be open for data entry.

Fostering Reproducibility in Industry-Academia Research

Policy Forum: published in *Science* 25 Aug 2017: Vol. 357, Issue 6353, pp. 759-761.

Authors: B. R. Jasny, N. Wigginton, M. McNutt (corresponding author), plus 16 others.

<http://science.sciencemag.org/content/357/6353/759.full>

Many companies have proprietary resources and/or data that are indispensable for research, and academics provide the creative fuel for much early-stage research that leads to industrial innovation. It is essential to the health of the research enterprise that collaborations between industrial and university researchers flourish. This system of collaboration is under strain. Financial motivations driving product development have led to concerns that industry-sponsored research comes at the expense of transparency. Yet many industry researchers distrust quality control in academia and question whether academics value reproducibility as much as rapid publication. Cultural differences between industry and academia can create or increase difficulties in reproducing research findings. We discuss key aspects of this problem that industry-academia collaborations must address and for which other stakeholders, from funding agencies to journals, can provide leadership and support.

To continue reading: <http://science.sciencemag.org/content/357/6353/759.full>

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Meetings of the National and Regional Weed Science Societies

Dec. 4 - 7, 2017 North Central Weed Science Society (NCWSS), St. Louis, MO www.ncwss.org

Jan. 9 - 11, 2018 Northeastern Weed Science Society (NEWSS), Philadelphia, PA www.newss.org

Jan. 22 - 24, 2018 Southern Weed Science Society (SWSS), Atlanta, GA www.swss.ws

Jan. 29 - Feb. 1, 2018 Weed Science Society of America (WSSA), Arlington, VA www.wssa.net

Mar. 12-15, 2018 Western Society of Weed Science (WSWS), Garden Grove, CA www.wsweedscience.org

Jul. 15 - 18, 2018 Aquatic Plant Management Society (APMS), Buffalo, NY www.apms.org