WASHINGTON REPORT
April 4, 2016
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National Weed Survey

Last year, the National and Regional Weed Science Societies conducted a survey of the most common and troublesome weeds in 26 different cropping systems and natural areas across the U.S. and Canada. **Common** weeds refer to those weeds you most frequently see, while **troublesome** weeds are those that are most difficult to control (but may not be widespread). There were nearly 700 responses from 49 states, Puerto Rico, and eight Canadian provinces. The entire data set for 2015 is available for download at: http://wssa.net/wp-content/uploads/2015-Weed-Survey_final.xlsx

The lists below are based on an aggregation of their responses, based on my interpretation of the 2015 data. For example, none of the foxtail species (giant, green, & yellow) would have made the top 10 list individually, but since their biology and management is fairly similar, I combined them into one category.

TOP 10 WEEDS IN THE UNITED STATES					
Rank	**Most Troublesome**	**Times Listed**	**Rank**	**Most Common**	**Times Listed**
1	Palmer amaranth	123	1	foxtails (giant, green, yellow)	152
2	morningglory (ivyleaf, pitted, tall, sharppod)	100	2	common lambsquarters	137
3	common lambsquarters	87	3	crabgrass (large, smooth)	117
4	waterhemp (common, tall)	86	4	Palmer amaranth	93
5	horseweed (marestail)	85	5	morningglory (ivyleaf, pitted, tall, sharppod)	92
6	nutsedge (yellow, purple)	84	6	pigweed (redroot, smooth)	85
7	kochia	69	7	common ragweed	75
8	giant ragweed	68	8	waterhemp (common, tall)	73
9	Canada thistle	67	9	horseweed (marestail)	71
10	foxtails (giant, green, yellow)	63	10	kochia	68

*"Times Listed" is the number of survey respondents who listed that weed as one of their top five species in any of the 26 cropping systems or natural areas that were sampled in the United States.

Seven weeds appeared on both the "most troublesome" and "most common" lists in the United States, including common lambsquarters, waterhemp spp., foxtail spp., horseweed, kochia, morningglory spp. and Palmer amaranth. More than 650 weeds were mentioned at least once by survey respondents.

For Canada, the weed species in the Alberta, Saskatchewan, and Manitoba prairies tended to dominate the survey. I only included the "top 5" list for Canada because we had a smaller sample size. The most troublesome weed species were from the genus *Galium* which includes cleavers (a.k.a. catchweed

bedstraw) and false cleavers. The most common weed in Canada was wild buckwheat, which appeared on both the "common" and "troublesome" lists along with wild oat.

TOP 5 WEEDS IN CANADA					
Rank	**Most Troublesome**	**Times Listed**	**Rank**	**Most Common**	**Times Listed**
1	*Galium* spp.	25	1	wild buckwheat	30
2	wild oat	23	2	wild oat	28
3	Canada thistle	21	3	pigweed (redroot, smooth)	27
4	kochia	19	4	foxtails (green, yellow, giant)	27
5	wild buckwheat	18	5	common lambsquarters	25

*"Times Listed" is the number of survey respondents who listed that weed as one of their top five species in any of the 26 cropping systems or natural areas that were sampled in Canada.

Weed species in the *Amaranthus* genus ranked high on the United States list. I grouped them into three main categories: Palmer amaranth, tall & common waterhemp, and redroot & smooth pigweed. However for Canada, there was not one single survey response that listed Palmer amaranth or tall & common waterhemp. Only redroot & smooth pigweed were listed by Canadian survey respondents.

Not surprisingly, almost every weed species listed above has confirmed resistance to at least one herbicide mechanism of action.

Finally, I picked 12 representative crop/ecosystem categories below and listed the most troublesome weed and the most common weed for each, based on the number of times that species was listed by survey respondents for that crop/ecosystem category across both the U.S. and Canada:

Crop/Ecosystem	**Most Troublesome Weed**	**Most Common Weed**
Aquatic systems	hydrilla	watermilfoil spp.
Cereal grains, spring	wild oat	wild oat
Cereal grains, winter	downy brome (cheatgrass)	downy brome (cheatgrass)
Corn	waterhemp (common, tall)	foxtail (giant, green, yellow)
Cotton	Palmer amaranth	Palmer amaranth
Forestry	*Microstegium vimineum*	Micros*tegium vimineum*
Fruit and nut crops	eastern poison-ivy	red sorrel
Parks, wildlife refuges	Canada thistle	downy brome/cheatgrass
Pasture, rangeland, R.O.W.	Canada thistle	Canada thistle
Soybean	horseweed (marestail)	foxtail (giant, green, yellow)
Turf	annual bluegrass	crabgrass (large, smooth)
Vegetables	nutsedge (yellow, purple)	common lambsquarters

Going forward, the National and Regional Weed Science Societies will conduct this survey every year, but split it into a 3-year rotation. The 2016 survey will cover the most common and troublesome weeds in broadleaf crops (i.e alfalfa, canola, pulse crops, etc…), fruit & nut crops, and vegetables. **The 2016 survey is currently open and available at**: https://www.surveymonkey.com/r/2016weeds. In 2017, the

survey will cover weeds in grass crops/pasture/turf. In the 3rd year of the rotation, 2018, the survey will cover weeds in aquatic/non-crop/natural areas.

EPA Inspector General Investigating Herbicide Resistance

The EPA's Office of Inspector General (OIG) has launched an evaluation of how effective the agency is at delaying or preventing the spread of herbicide resistance weeds. While this evaluation was not part of EPA OIG's original FY 2016 annual work plan, my understanding is that it is a logical offshoot of an EPA-OIG evaluation of the Office of Pesticide Programs' Genetically Engineered Corn Insect Resistance Management Program which they expect to finish up this summer. I had a very pleasant interview with the EPA OIG team conducting the herbicide resistance evaluation on March 29. The overall objective of the meeting was to obtain external perspectives on federal work to address herbicide resistance, particularly as it pertains to emerging issues and potential opportunities for improvement. The OIG team asked many excellent questions about herbicide resistance, including:

- Please discuss your perspective on federal regulation of GE crops and herbicides.
    - Do you have any opinion on or knowledge of the coordination and interactions between FDA, USDA, and the EPA on GE crops?
    - How well do you feel federal regulators work with and incorporate the perspectives of outside organizations?
    - How well does the regulatory system work to allow farmers and manufacturers to be nimble in adapting to herbicide resistance?
- In your opinion, does the federal community do a good job of managing GE crops and protecting against herbicide resistance?
- What is the extent of the problem of herbicide resistant weeds in agriculture? Please quantify this in financial terms, if possible.
- What are the issues facing in the agricultural community in conveying issues of resistance to federal regulators?
- Please discuss what you see as the greatest challenges facing the agricultural community in herbicide resistance. Are there any instances of resistance emerging in the past about which you can talk, specifically how farmers were affected, how herbicide manufacturers addressed resistance, and what, if any, federal actions were taken in response?
- Please discuss your thoughts on the registration and then withdrawal of Enlist Duo. What were the problems in the registration process? What is the impact of this on farmers?
- What are the areas where more work is needed or missed opportunities that the federal government should encourage?
- How well do you feel issues of risk are communicated by the federal government when it comes to GE crops and herbicide resistance?

The weed science community has been dealing with many of these herbicide resistance issues for several decades and I would encourage you to share your expertise with the EPA OIG herbicide resistance team if they reach out to you.

EPA Proposes New Paraquat Restrictions

EPA has proposed new restrictions and mitigation measures for paraquat, which is currently undergoing registration review. Paraquat is an important option for non-selective weed control. It is widely used in non-crop areas and fallow and as a defoliant for crops like cotton and potatoes. We also know that paraquat is highly toxic in mammalian systems and can be lethal if ingested in small amounts. Since 2000, there have been 17 deaths caused by accidental ingestion of paraquat. These cases have resulted

from paraquat being illegally transferred to beverage containers like Gatorade bottles and coffee cups, and later mistaken for a drink and consumed. EPA is proposing the following changes:

1. New closed-system packaging designed to make it impossible to transfer or remove the pesticide except directly into the proper application equipment;
2. Special training for certified applicators who use paraquat to emphasize that the chemical must not be transferred to or stored in improper containers;
3. Changes to the pesticide label and warning materials to highlight the toxicity and risks associated with paraquat.
4. Prohibiting application from hand-held and backpack equipment; and,
5. Restricting the use to certified pesticide applicators only (individuals working under the supervision of a certified applicator would be prohibited from using paraquat).

Paraquat is already a Restricted Use Pesticide for use only by certified applicators or persons under their direct supervision. We support increased education and enhanced warning materials for paraquat, but have concerns about application prohibitions or restrictions. EPA's proposed restrictions on paraquat will be available for comment until **May 9, 2016**. If you have specific concerns or suggestions, please contact me. EPA will consider all public comments before finalizing these proposed actions later this year. For more details: http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2011-0855

EPA Seeks Comments on Decision to Register Dicamba-Tolerant Crops

EPA is making available a 30-day public comment period for a proposed regulatory decision to register dicamba for use in controlling weeds on genetically-engineered (GE) dicamba-tolerant cotton and soybeans. After the comment period closes on **April 30, 2016**, EPA will review all of the comments and reach a final decision, which they expect to issue in late summer or early fall. In other words, **dicamba will not be registered for use on dicamba-tolerant varieties in the 2016 growing season.** USDA-APHIS has already announced its final decision to allow the sale dicamba-tolerant GE crop seeds on January 20, 2015.

EPA's proposed decision outlines a Herbicide Resistance Management Plan (HRMP) to ensure that use of dicamba on GE cotton and soybeans successfully manages weed resistance problems. The proposed HRMP includes: 1) robust monitoring and reporting to EPA; 2) grower education; and 3) remediation programs. In addition, EPA is proposing a time limited registration of the proposed uses that would **expire in five years**. At the end of 5 years, EPA can work to address any unexpected weed resistance issues that may result from the proposed uses before granting an extension or allow the registration to terminate if necessary. The label will also contain information on resistance management consistent with **WSSA's Best Management Practices** (BMPs) for comprehensive resistance management approaches.

EPA's human health risk assessment showed no exceedance of their levels of concern for human health, resulting in a determination that the pesticide's use, as approved, will not cause health risks to people living near treated fields, even at the edge of those fields. Even so, EPA added protective measures to ensure there is reduced off-field movement of the herbicide:

- The herbicide may not be applied from aircraft.
- The herbicide may not be applied when wind speed is over 15 mph.
- A **within-field buffer that ranges from 110 to 220 feet in all directions**, depending on application rate, has been set to protect endangered plants and will also further protect bystanders and non-target plants.

EPA's proposed registration of the new use for dicamba on GE cotton and soybean **will allow use in 34 states**: Alabama, Arkansas, Arizona, Colorado, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, and Wisconsin. (**States NOT** on the proposed label: AK, HI, WA, OR, CA, NV, ID, MT, WY, UT; and CT, RI, MA, VT, NH, and ME.) Additional states may be added to the labeling once an endangered species assessment is completed and demonstrates that a no effects determination is appropriate for any such state.

Public comments on the EPA's proposed regulatory decision must be submitted no later than **April 30, 2016**. Comments may be submitted to the EPA docket EPA-HQ-OPP-2016-0187 at www.regulations.gov. For more details: https://www.epa.gov/ingredients-used-pesticide-products/epa-seeks-comment-proposed-decision-register-herbicide-dicamba

WOTUS- Congress Doesn't Have 2/3rds Majority to Repeal; Federal Courts Will Decide

The majority of the House and Senate supported legislation (H.R.1732; S.1140, S.J.Res.22) that would have forced the Obama administration to rewrite the controversial Clean Water Act rule that expanded "Waters of the United States (WOTUS). However, neither chamber had the necessary 2/3's majority needed to override an Obama veto.

On February 22, the Sixth Circuit Court of Appeals concluded that it has jurisdiction to review challenges regarding the administration's rule that expanded the scope of WOTUS under the Clean Water Act. Given the Sixth Circuit Court's decision from October 9, 2015 to put the controversial WOTUS rule on hold nationwide, things would seem to look good for those challenging the rule such as the American Farm Bureau Federation and the National Association of Manufacturers. However, there are still on-going legal proceedings regarding court jurisdiction that have to be resolved.

NPDES Fix Possible as Part of Bipartisan Sportsmen's Bills

Last year the House Agriculture Committee passed The Reducing Regulatory Burdens Act of 2015 (H.R. 897). This legislation had passed the House in two previous sessions of Congress but failed to get floor consideration in the Senate. H.R. 897 clarifies Congressional intent and eliminates the duplicate regulatory requirement of a National Pollutant Discharge Elimination System (NPDES) permit for the use of herbicides in, over, or near waters of the United States that are already approved for use under FIFRA. In the Senate, Crapo (R-ID) and McCaskill (D-MO), along with 14 other Senate Co-sponsors, introduced S. 1500 as a companion bill to H.R. 897, but it has not gotten a vote on the Senate floor. However, S. 1500 was offered and accepted as an amendment to the long awaited "Bipartisan Sportsmen's Act of 2016" (S. 659) by the Senate Environment Public Works (EPW) Committee on Jan. 20. We're hoping that S.659 gets a vote in the Senate sometime soon. Similar legislation called the "Sportsmen's Heritage and Recreational Enhancement Act of 2015" (SHARE Act, H.R. 2406) was passed by the House of Representatives on Feb. 26 by a 242-161 vote.

Glyphosate Not Found in Breast Milk

Results of a study commissioned by the German Federal Institute for Risk Assessment (BfR) in which renowned research laboratories in Europe developed two independent analytical methods with high sensitivity to test 114 breast milk samples showed that none of the analyzed samples contained glyphosate residues. The BfR confirmed in its opinion that based on the physicochemical properties of glyphosate and on data on the toxicokinetics and on metabolism in laboratory and farm animals that no relevant transfer of glyphosate to breast milk occurs. The study results were published in the January 25, 2016 issue of the Journal of Agricultural and Food Chemistry.

Overwintering Monarch Butterfly Numbers Triple, Then Hit with March Snowstorm

On February 27, the World Wildlife Fund and the Mexican National Commission of Protected Natural Areas reported that the total forest area in central Mexico occupied by overwintering monarch colonies was 4.01 hectares. This is up from last year's number of 1.13 hectares and 0.67 hectares the year before that. This year's reported population is estimated to be 200 million monarchs compared to the long-term average of 300 million. The National Strategy to Promote the Health of Honey Bees and Other Pollinators has set a short-term target of 225 million monarchs overwintering in Mexico (approximately six hectares of covered forest) by 2020 through national/international actions and public/private partnerships.

Many anti-GMO groups have been plastering the internet with all kinds of misinformation about the impact of herbicide tolerant crops on milkweed numbers, and thus on monarch numbers. But the fact remains that milkweed spp. have never been a dominant "driver" weed species in farm fields across the Midwest. Farmers have been effectively managing milkweed patches in their fields with tillage and/or herbicides long before the advent of genetically-engineered crops. When I was a crop scout and research assistant in college, the places where I always saw the most milkweed species was in the road ditches, right-of-ways, and other non-tilled, non-farmed areas.

To me, the major factors dominating monarch butterfly population fluctuations are the loss of overwintering habitat in Mexico (the oyamel fir forest is reportedly only 2% of once it once was) and the weather. Unfortunately, only 2 weeks after the overwintering monarch population numbers were announced in February, a March 11 snowstorm with subfreezing temps and 50 mph wind gusts hit Mexico's overwintering grounds for the monarch. Only time will tell how many monarchs perished, but the estimates range from 3 – 50% of the reported overwintering population of 200 million.

Weed scientists can advocate steps to promote habitats where pollinators or iconic insects such as the monarch butterfly can flourish, beginning with the adoption of a prudent approach to weed management. While it is crucial that we control invasive, noxious, and herbicide-resistant weeds that can overtake crops and native plants, other weeds such as common milkweed might be left to grow in areas where it is likely to do no harm. The key is to exercise good judgment about which weeds to control, when and where. Let's hope that science and facts prevail in people's decisions for promoting monarch butterfly habitat.

National Invasive Species Awareness Week (NISAW) was February 21-27, 2016. Invasive weeds alone represent a multibillion dollar annual drain on our economy, so it's important that we educate ourselves, become mindful of invasive species and use what we know to guide our actions throughout the year. Here are some tips for staying informed and making wise decisions:

- Learn about invasive species, especially those found in your region. Your county extension office and the National Invasive Species Information Center are both trusted resources.
- Fully comply with all U.S. government regulations regarding the transport of agricultural products into the country through U.S. Customs.
- If you camp, don't bring firewood along. Instead, buy wood where you'll burn it, or gather it on site when permitted.
- Clean hiking boots, waders, boats and trailers, off-road vehicles, and other gear to stop invasive species from hitching a ride to a new location.

The following webinars were recorded during NISAW and are available at www.NISAW.org

- "Let's Take a Hack at 'Hack and Squirt' Individual Plant Treatments"
- "Volunteers Make a Difference in an Early Detection Rapid Response Citizen Science Program"
- "Protecting the Sierra Nevada from Invasive Plants: Incorporating Climate Adaptation into Wildland Weed Management"
- "Treating Firewood is a Hot Topic: Seasoning, Solarizing, Kiln Drying and Heat Treatment"
- "Weed Wrangle: A Template for Engaging Local Communities through Citywide Invasive Plant Events"

In addition to those webinars, February 22 was "rollout day" in Washington, D.C., for the CAST Commentary: **A Life-cycle Approach to Low-invasion Potential Bioenergy Production**. With the assistance of the National Coalition for Food and Ag Research (NC-FAR), CAST presented the timely paper to a morning session of Senate staffers and then at a lunch gathering of House staffers where I served as moderator. In the afternoon, CAST and the Environmental Law Institute co-hosted a presentation regarding bioenergy and invasive species where CAST EVP Kent Schescke served as moderator. Jacob Barney (Virginia Tech) and Read Porter (Environmental Law Institute) presented key information from the new commentary and commenters included Aviva Glaser (National Wildlife Federation), Anthony Koop (USDA/APHIS), and Jonathan Jones (USDA/APHIS). The webinar was recorded and is available HERE.

National Invasive Species Awareness Week concluded with a Congressional Reception and Fair on Capitol Hill were many of the Federal Agencies presented information and educational materials on their invasive species activities. Welcoming remarks were given by Congressional Invasive Species Caucus Co-Chairs, Reps. Dan Benishek (R-MI) and Mike Thompson (D-CA), in addition to remarks by Rep. Cynthia Lummis (R-WY). The keynote address was given by the Administrator of USDA-APHIS, Kevin Shea.

Perfect Herbicide? Don't Expect Help From New Chemistry and This is Why

By Stanley Culpepper and William Vencill, University of Georgia (reprinted with permission).

Ever wonder why weed scientists are so aggressive about protecting herbicide chemistry? Growers are constantly being told to protect the chemistry available today because who knows when, or if, they will get anymore. But why is that? In short, any new chemistry would have to be 'the perfect herbicide.'

But let's say we want to try to bring new chemistry to the farm today and make that perfect herbicide. What do we need to do?

To get our new herbicide chemistry venture started, we need at least $250 million. After Brad Haire (reporter for Southeast Farm Press) donates the money, we will begin our research and development of the perfect herbicide. Brad needs to understand he will have to wait 10-15 years to begin getting any of

his investment back and then only has 14 years before others can start selling the same product. Let's say by some miracle Brad coughs up the $250 million. What do we need to do next to get to growers new herbicide chemistry?

Environmentally friendly is a requirement for our new product. It cannot pose a threat to surface waters, ground waters, wildlife, fish and most every other critter on earth. And for sure, it cannot pose any risk to endangered species: to plants as well as animals that eat plants. Persistence of the herbicide also must be understood early in development, or in other words we need the herbicide to last just long enough to help growers, but then we need the herbicide to break down into friendly natural compounds that will not harm the environment or people. The herbicide certainly can't pose any carryover risk to the crops our growers rotate into either! Additionally, we have to:

1) Make sure the product does not cause unacceptable crop injury under a million different environmental conditions and grower production practices.
2) Make sure the product has an extended shelf life for storage, so it doesn't go bad in a few years or separate out in the tank.
3) Understand how soil/water pH, as well as other water and soil characteristic, influence the activity or life of our product.

We need to focus on making sure our new herbicide chemistry does not have any potential for an unfriendly odor or be prone to volatilization or drift. And, of course, we have to check every potential tank mix partner for compatibility and impact on spray droplet size. If a mixture influences droplet size by just the tiniest amount, we may have the EPA increasing our buffers as well as restricting our use pattern, which could threaten a grower's ability to implement a sound weed management program.

As our product is nearing commercialization, we will need to develop a resistance management plan and strategically figure out the most effective use patterns to maximize weed control, minimize crop injury and prevent resistance development. We have to make sure we can produce the appropriate amount of the product and have perfect, timely distribution across the world, because we'll need access to the global market if we hope at all to get our initial investment back.

We're almost there. We almost have the perfect herbicide. But wait, there's one more hurdle and it can come out of the blue at any time: We better be prepared for various groups to challenge our label in the Ninth U.S. Circuit Court of Appeals of California in attempts to delay or prevent our new tool getting to the growers who desperately need it as they strive to feed the world.

"Hmmm…..maybe those weed science guys are on to something. Seems pretty smart to protect the herbicide chemistry we have today by making wise decisions, implementing diversified herbicide modes of action into an integrated program that uses cover crops, tillage and/or hand weeding." At least we hope this is what you are thinking now if you haven't thought something similar already. Of course, we still need to be concerned that even if our growers do all the right things to protect current herbicide chemistries in the field today, will the products we do have now survive the current rigorous regulatory processes.

As you can see, to develop and then bring to market a new herbicide chemistry is nothing short of miraculous, which is why we haven't had any new chemistry in more than two decades. A new chemistry today would have to be perfect. And very few things are perfect. If agriculture and those who like to eat can't come together to support the development of new effective tools that are friendly

within sound-science reason to the consumer, the environment or for our growers, wonder who really will feed our kids and grandkids……. They'll have to do it 'perfectly.'

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