

Responding to Drift Damage

Dicamba and 2,4-D drift damage has captured national attention in recent years. Could your farm be at risk? And if so, will you be ready to respond to a drift incident? In this fact sheet, we look at recommended actions for documenting damage, along with tips for seeking reparation or behavior change.

Responses to Drift Damage

- Document observations, including plant damage, possible pesticide law infractions, and losses.
- Consult with crop and legal experts for advice, especially to rule out alternative causes.
- Contact neighboring businesses if you believe their activity may have caused drift damage.
- File a complaint with your state pesticide regulatory agency if you feel pesticide laws have been broken.
- Initiate legal action, if necessary, to recover losses.

Document Observations Quickly

If you believe your plants have been damaged by herbicide drift, it is critical to **document your observations immediately, carefully, thoroughly, and repeatedly**. Growers affected by drift damage have important decisions to make on how they will respond, but all of these options hinge on documenting damage and related observations.

Spray Events

- Note the date and time of application, the name or a description of the applicator if possible, crops or conditions of the sprayed field (soybeans, fallow ground, etc.), along with any equipment you observed.
- Use photos, videos, and notes to document a possible infraction (spraying during high winds or after a state cut-off date, for instance).
- Document weather conditions for the spray event and the 3-5 days following application. (If the spray event was not observed, document weather for the week before drift damage was noticed).
 - Include temperature, wind direction and speed, and other conditions such as fog.
 - The National Weather Service maintains historical weather data for a variety of locations, but weather conditions could be different on your site. Use a local or personal weather station if possible.

Field Damage

Plant tissue damage caused by a drift event can be alarming. Remember that foliar damage does not always result in reduced yield or permanent damage, but **you will not get a second chance to collect photos and data**. Play it safe and document any damage (or questionable spraying events) as soon as you see it. Symptoms of 2,4-D and dicamba injury may appear within a few hours after contact with drift or within a few days. Severity and timing of injury depends on the concentration of drifted product, the transpiration rate of affected plants, and the relative sensitivity of the non-target crop.

- When documenting damage, include the date and the growth stage of affected plants. Use drawings, video, and photographs to record what you see.
- Record the development and progress of symptoms over time.
- Indicate the locations of observed symptoms using a reliable to-scale map of your farm and surrounding area. (If you don't



FIGURE 1 | A landscape view that shows the scope and location of the damage. A grower could also use a flag or other marker at the end of the row to establish the location.



FIGURE 2 | A close-up showing the extent of damage on a single plant.



FIGURE 3 | A further close-up to show details of damaged leaves.

already have a map you can use a satellite service such Google Earth to create one.)

- Note field elevation. Runoff from a treated adjacent field can be a cause of damage, and drift influenced by temperature inversions tends to settle in low spots.
- Collect plant or soil samples and photos quickly. Initial tissue damage may become less evident as new growth replaces it and herbicide residues can break down or wash away.
- Err on the side of collecting too much detail and data. Photos, notes, and samples are easy enough to delete if not needed. Below are some additional tips.

Photographs and video.

- Add time and date stamps on any photos or videos.
- Use GPS stamping if you have it (available on most smart phones). If not, include landscape features (hills, silos, windbreaks, buildings) to help establish location.
- A coin or similar consistently sized item can provide scale if needed. Video showing the movement of a piece of paper or grass blades can document wind direction and speed.
- Video with commentary can be an easy way to capture visuals and notes together.
- Photograph the whole plant and successive close-ups of damaged areas.
- Use landscape shots to show the extent of damage across the field.
- Photograph the various severities of damage, including healthy plants in the same growth stage. Note the location for each.
- Photograph non-crop plants that show suspected damage. If you observe a clear path of damage, use photographs or video to document this.

- If you have access, a drone can effectively photograph patterns of damage and symptoms that might be missed from the ground level.

Rule out alternative explanations. Sample collection and other documentation is time sensitive but also time consuming. Enlist help from a resource guide and/or crop expert as soon as possible to rule out alternative causes of suspected drift injury.

- Examine the plants for insects as well as their casings or feeding marks. Some insect damage may resemble dicamba and 2,4-D damage (e.g., aphids may cause leaf curling, leaf hoppers may cause leaf burn.)
- Soybean mosaic virus can cause leaf cupping and bumpy leaf surfaces.
- Some fungicides and fertilizers, such as foliar urea, can cause leaf burn.
- Fertility deficiencies or water stress may cause chlorosis.
- If the damage happens early in the season, check weather records to rule out a frost event. Frost might damage exposed or developing leaves and buds. In this case, damage may be concentrated in low areas of your field.
- Could herbicide damage have come from your own operation? Many lawncare products contain 2,4-D, and other herbicide products may cause similar symptoms.

Crop consultants, extension specialists, experienced farmers, or other knowledgeable individuals may be able to help you rule out alternative explanations and provide advice such as steps to take and additional resources. Don't wait too long to ask for their assistance.

Be aware that herbicide disputes can create awkward situations for local farm service agencies (county extension, Farm Bureau, Soil and Water Conservation Districts, etc.).

Walk the perimeter of the field and look beyond it if possible. Can you trace the direction the damage came from?



Dicamba damage to a young pin oak

Dr. Kevin Braley, University of Missouri

However, farm service providers, other growers, crop insurance companies, and grower associations may be able to put you in touch with appropriate legal and expert assistance.

Plant tissue samples. If you are filing a state complaint or insurance claim, their representatives will want to collect samples, but you should also collect your own samples. Familiarize yourself with private labs and their specific requirements for sample collection, storage, and documentation. Involving a certified crop advisor, extension employee, or other impartial third party will avoid claims of biased sampling or procedural error.

If you do not have specific directions from your testing lab, follow these guidelines and collect samples as quickly as possible.

- Collect more than you think you will need. If the size of the field allows, collect several gallon-sized bags of plant tissue. Collect a mix of older and newer leaves, as well as stem and roots if possible.
- Use laboratory gloves to take samples, if available, starting with a fresh pair for each new area to prevent cross-contamination.
- If there is a clear progression of damage in your field, sample from these areas separately. Include a sample of healthy undamaged plant tissue, using the same collection and labeling techniques for all.
- South Dakota Agricultural Labs recommends using perforated paper bags to prevent molding. Secure the bags well and keep them dry.
- Label all bags with date and time, field location, and the name of the person who collected the sample. Add crop variety or growth stage if it varies on your farm.
- Plant samples should be frozen as soon after collection as possible and sent to the analytical lab on dry ice.
- Prepare at least one aggregate soil sample from an affected area. Mix together multiple samples from similarly damaged spots. Use the first 0–6” of topsoil (first 3” for an untilled field). Mix these together in a large bucket and submit a subsample of the mixture to a lab. Soil should also be frozen for storage and/or shipping.
- Track all employees who collect and handle each sample along with how and where samples are stored.

Look for, and document, patterns of crop injury. Crop injury from herbicide drift usually varies across a field depending on wind speed and direction, natural and man-made wind breaks, slope and lay of the land, etc. Patterns of damage can offer clues about how and where the drift entered the off-target field.

- Does the damage affect the entire field? Is it worse on one side or in low-lying areas?
- Walk the perimeter of the field and look beyond it if possible. Can you trace the direction the damage came from? Look for damage to plants in hedgerows, landscapes, meadows, yards, or other adjacent areas. Common plants that might show damage include broadleaf weeds, wild grapes, wild or cultivated roses, maples, dogwood, and oaks. Don’t forget to look up; you may spot foliar damage in the tree line.
- Look for patterns over time as well. See what changes in the coming weeks and keep a log of observations. Does the damage get worse or better? Dicamba and 2,4-D will generally move to new growth on affected plants, but rarely to adjacent areas of the field (unless another drift event occurs).
- Follow observations through harvest if appropriate. Not all types of damage are apparent immediately. Drift damage may have an impact on fruit ripening, yield, or cold hardiness in perennials. In soybean and potatoes, herbicide damage symptoms have been noted in plants grown from seed or tubers of damaged plants. (Jones et al. 2018; Geary et al. 2019).

Track Your Investigative Process

- Keep all reports from testing or on-site visits. If an expert comes out to examine your field, make sure you get something in writing from them in case you need it later. They may or may not be able to provide these for you several months after their visit.
- In addition to reduced yields, keep records on claims and losses under applicable contracts, lost crop premiums, testing, consultant fees, and other expenses related to the incident, including time spent by employees and yourself documenting or managing the damage.
- Detailed notes of any conversations, phone calls, or correspondence related to the incident should be retained.

- Special note on phone calls: In some (but not all) states it is legal to record conversations if at least one of the participants is aware of the recording. Either way, it's a good idea to inform the other person you are recording. In states where this is required, be sure to also record the other persons' verbal consent to record.

Action Steps

If you are considering an official complaint or a lawsuit, there are many practical, legal, economic, and social questions to discuss with advisors and business partners or family members.

- Are you satisfied that you have fully documented the situation and that the evidence points to the applicator you suspect?
- What is your history with the applicator you suspect caused the damage? Have there been problems in the past that you were unable to document?
- How will reporting affect the social fabric of your community?
- Weigh the time and costs involved in taking action against the price of inaction—especially if the problem has repeated itself or has affected others in your area.

Approach Neighboring Applicator(s)

Sharing concerns or observations with your neighboring farmer(s) is a good place to start. This discussion may turn out to be the only action you need to take. Initiating a state regulatory investigation or lawsuit without first talking with your neighbor is likely to damage relationships.

- Bring along a sample or photos of damage and educational materials to show why you think drift may have occurred. Ask for their input and opinion.
- Avoid direct accusations and assumptions of fault. Your neighbor may not be the source of your drift damage.
 - Your neighbor may have hired a commercial applicator to apply the product.
 - Roadside spray programs, golf courses, and landscapers also use these chemicals.
 - Some herbicides can enter your production area in composts, grass

clippings, hay, and even manure in some cases.

- Your neighbor may also genuinely not realize he is causing damage to your crop.
 - Farmers and professional applicators tend to be less familiar with temperature inversions and their effect on drift. (Bish and Bradley 2017)
 - New formulations of 2,4-D and dicamba have been marketed as “low-volatile” products less likely to move off-target. Farmers using these products may perceive less risk, but volatility is still possible, and the risk of other drift mechanisms is unchanged, including spray particle drift and contaminated runoff following a heavy rainfall.
- Once made aware, a farmer may be able to avoid future problems by changing their spray nozzle size or crop rotations, by switching herbicide formulations or brands, or by incorporating more integrated weed management strategies.
- Taking along an impartial third party might be advisable in some situations.
- Your neighboring farmers may have liability insurance that could cover your losses if the application error was the result of ordinary negligence rather than a failure to follow label directions and application rules. Don't rush to demand this before getting all the facts, but it is possible to resolve these problems through a neighborly agreement that involves insurance. Be aware of a few insurance issues though.
 - Owners of the farm where drift originated should contact their insurance adjuster immediately. This will allow insurance companies to investigate the claim for themselves. Quick action is important and in the farmer's best interests. If the insurance company denies a claim due to late reporting, a farmer may be personally liable for the damage to neighboring crops.
 - Many farms carry a limited amount of spray liability coverage (\$50,000-100,000), but with specialty crops, damages can quickly exceed these limits.
 - Farmers may think their umbrella coverage will help cover neighboring losses from drift, but most umbrella policies exclude “pollution” as a covered loss and would consider dicamba spray drift to be a “pollution” incident rather

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than an act of negligence. In those cases, coverage could still exist if the farmer has purchased a “pollution rider” to cover incidents deemed to be pollution.

- Specialty crop growers should expect very little from their own insurance coverage. Drift is typically not considered an “act of God” and is therefore not covered by crop insurance.

File a complaint with your state department of agriculture or state chemist

Filing a complaint with your state pesticide regulator is no trivial matter. Carefully weigh the pros and cons of reporting.

- Official state investigations provide important information for state regulators. Complaints have been used to recognize the need for additional state restrictions and limits on the use of certain problematic products.
- State investigations do not cost anything to the complainant grower but usually involve a site visit and interview. Check your individual state website for protocol, time limits, information release, and other details.
- Your state chemist or department of agriculture can only issue violations for misuse of a pesticide. *Recovering expenses from damaged or unmarketable crops requires additional legal action.*
- You are not required to file a complaint and doing so usually initiates a process that you cannot stop once started. Talk to your neighbor first—especially if the damage is light or if it is the first time you have had problems.
- Complaints are appropriate if you have crop damage which you believe was caused by an applicator’s failure to follow label instructions or state pesticide laws. Penalties may include a warning, fines, or loss/suspension of a pesticide applicator license.
- Dicamba complaints have doubled since 2016 in some states, overwhelming their regulatory investigators. State investigations could take a year or longer to complete. You will undoubtedly want to make a claim with insurance companies long before the state makes a final determination of damage. State complaint data is not required by insurance companies to make payments for losses.
- In some states, if the state regulatory agency does not determine the source of the drift or fails to detect herbicide residues, it may impair your ability to gain compensation.
- Because there are no established tolerance levels for dicamba or 2,4-D on most food products, residue documented by the regulator may impair your ability to sell a food crop. In some states, you may be asked to destroy your crop.
- States also vary on their policy to share records from an official complaint inquiry. In some states these become

public record. In other states, a court order is required to release records. Know your state laws and keep your own records, such as date of the initial complaint and your own notes from a state investigator visit.

Take Legal Action

Legal action can be a long and costly process but might be the only way to receive compensation for your harm. These tips may be helpful in deciding whether to pursue legal action.

- Consider first talking with an attorney, preferably one who works in agricultural law. Most attorneys will hold an initial consultation to review the situation before helping you decide if litigation could be useful.
- If your case is not very complicated and your damages are not very high, you might be able to utilize a “small claims” process. Many states have small claims courts for minor cases under a certain dollar amount. You can file the case and represent yourself, but you will have to present evidence of your harm and who caused the harm. These cases tend to move more quickly and cost less than cases filed through other courts.
- You will need thorough records of the drift incident along with your costs, time, and any paperwork, reports, or conversations related to the damage.
- Be careful about the timing of a potential settlement. Depending on your crop and the extent of damage, you may want to wait until harvest or even the following growing season to clarify an appropriate damage amount.

Helpful Resources

Herbicide Law and Drift Information

Air Temperature Inversions Causes, Characteristics and Potential Effects on Pesticide Spray Drift

North Dakota State Online Publication AE1705 (Revised Oct. 2019)

<https://www.ag.ndsu.edu/publications/crops/air-temperature-inversions-causes-characteristics-and-potential-effects-on-pesticide-spray-drift>

Herbicide Label Information

www.cdms.net

www.greenbook.net

State Pesticide Regulatory Agencies

Association of American Pesticide Control Officials

Links for all state regulatory agencies.

<https://aapco.org/2015/07/28/resources-2/>

U.S. Tolerances and Exemptions for Pesticide Chemical Residues in Food

Code of Federal Regulation, Title 40, Part 180

<https://www.govinfo.gov/content/pkg/CFR-2014-title40-vol24/xml/CFR-2014-title40-vol24-part180.xml#seqnum180.142>

Drift Symptoms and Diagnostic Tools

IPM Herbicide Symptoms database

University of California Division of Agriculture and Natural Resources
A searchable gallery of herbicide damage photos for a wide variety of crops and products, plus information on herbicide trade names, active ingredients, and modes of action.

<http://herbicidesymptoms.ipm.ucanr.edu>

Herbicide Injury Website

North Carolina State Extension
An excellent series of fact sheets on the symptoms of several common herbicides and a handy injury site visit check list.

<https://weeds.ces.ncsu.edu/weeds-herbicide-injury/>

Plant Injury from Herbicide Residue

Virginia Cooperative Extension Service Publication PPWS-77P
Discusses effects and persistence of several growth regulator herbicides, including dicamba and 2,4-D.

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/PPWS/PPWS-77/PPWS-77P-pdf.pdf

University of Missouri—Recent Research on Inversions and Dicamba Drift

Great photographs of damage at various driftable rates and findings on drift.

<https://ipm.missouri.edu/IPC/M/2019/4/dicamba/>

Diagnosing Herbicide Injury on Garden and Landscape Plants

Purdue Extension
Additional diagnostic tips.

https://www.ag.ndsu.edu/pdl/documents/ID_184_W.pdf

Herbicide Mode of Action and Sugar Beet Injury

North Dakota State University
<https://www.ag.ndsu.edu/publications/crops/herbicide-mode-of-action-and-sugar-beet-injury-symptoms>

Leaf Index and Severity Rating

Washington State
Created for grape growers to document the progression of damage but may be useful for other growers as well. Tips on damage terms, what to look for, and how and what to document over time.

<http://feql.wsu.edu/eb/>

Information Sources

Behrens R, Lueschen WE (1979) Dicamba volatility. *Weed Sci.* 27:5, 486-493.

Bish M, Bradley K (2017) Survey of Missouri pesticide applicator practices, knowledge, and perceptions. *Weed Technol.* 31:2:165-177, doi:10.1017/wet.2016.27

California Pesticide Use Enforcement Compendium Vol 5 Investigation Procedures. Chapter 3 Evidence Collection https://www.cdpr.ca.gov/docs/enforce/compend/vol_5/invstprc.htm

Geary ND, Hatterman-Valenti H, Secor GA, Zollinger RK, Robinson AP (2019) Response of 'Russet Burbank' seed tubers containing dicamba and glyphosate. *Weed Technol* 33:1, 9–16. doi: 10.1017/wet.2018.91

Jones GT, Norsworthy JK, Barber T. (2018) Response of soybean offspring to a dicamba drift event the previous year. *Weed Technology* 33:1, 41-50.

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