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Response to EPA's Draft Fungicide Strategy on Behalf of Agricultural Stakeholders

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Introduction

The EPA is seeking public comment in response their "Draft Fungicide Strategy to Reduce Exposure of Federally Listed Endangered and Threatened Species and Designated Critical Habitats from the Use of Conventional Agricultural Insecticides." This strategy would impact the use of conventional fungicides across agricultural crops in the contiguous lower 48 states of the U.S. and represents another step in EPA's evolving approach to expediting protections for listed species. The Draft Fungicide Strategy benefits from extensive stakeholder feedback EPA received in response to the 2023 Draft Herbicide Strategy and the 2024 Draft Insecticide Strategy, and addresses fungicide impacts on a broad range of species, including in-field and off-field impacts on vertebrate species. EPA has requested specific input on the presence and habits of on-field listed species, expansion of spray drift adjuvants as a mitigation option, and information related to fungicide seed treatment usage, handling, best management practices, and potential for runoff.

We are aware of the challenges EPA faces in expediting protection of endangered species through FIFRA and the pesticide registration review processes. Through the prior Herbicide and Insecticide Strategies, EPA has greatly advanced their approach to incorporating endangered species protections while striving to maintain diverse mitigation options for growers. We appreciate this approach, and wish to re-emphasize the importance of a flexible, clear and workable regulatory program that includes grower-centered practices to protect listed species. We hope that our comments will support the development of viable approaches to listed species protections while also considering the practical concerns and challenges of growers and other stakeholders responsible for ensuring American food security.

These comments represent feedback from licensed Pest Control Advisors (PCAs), growers, seed industry representatives, researchers, Extension professionals and others on EPA's proposed approaches to protecting listed species, as outlined in the Draft Fungicide Strategy. Our comments focus primarily on Arizona agriculture because of the availability of pesticide use data

and our relationships with industry professionals on the ground, however, we believe that the principles identified apply broadly to agricultural production throughout the Desert Southwest.

The Arizona Pest Management Center has previously submitted comments on the use of several fungicides important to production of diverse crops. These comments highlight the importance of diverse fungicides to production in specific cropping systems. Many of these comments include detailed information about use patterns, potential alternatives, and cropping practices that impact the use of specific insecticides in specific crops. To the degree these kinds of details are relevant to EPA's understanding of the potential impacts of the proposed draft Fungicide Strategy on growers and cropping industries, we wish to incorporate these previous comments by reference.

Previous Fungicide Comments:

Fournier, A.J., W.A. Dixon II. 2020. Iprodione Use and Benefits in Arizona Agriculture. Environmental Protection Agency. Document ID: EPA-HQ-OPP-2012-0392-0071. 11/2/20. https://www.regulations.gov/comment/EPA-HQ-OPP-2012-0392-0071

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Fournier, A.J., B. Poudel, W.A. Dixon II. 2021. Famoxadone Use and Benefits in Arizona, Southeastern California and New Mexico. Document ID: EPA-HQ-OPP-2015-0094-0052. 5/7/21. https://www.regulations.gov/comment/EPA-HQ-OPP-2015-0094-0052

Fournier, A.J., B. Poudel, W.A. Dixon II. 2021. Mancozeb Use and Benefits in Arizona and Southeastern California. Document ID: EPA-HQ-OPP-2015-0291-0071. 5/22/21. https://www.regulations.gov/comment/EPA-HQ-OPP-2015-0291-0071

Fournier, A.J., W.A. Dixon II. 2021. Chlorothalonil Use and Benefits in Arizona and Southeastern California. Document ID: EPA-HQ-OPP-2011-0840-0095. 7/16/21. https://www.regulations.gov/comment/EPA-HQ-OPP-2011-0840-0095

Fournier, A.J., W.A. Dixon II. 2022. Response to EPA Proposed Interim Decision for Iprodione. Document ID: EPA-HQ-OPP-2012-0392-0071. 4/4/22. https://www.regulations.gov/comment/EPA-HQ-OPP-2012-0392-0071

Fournier, A.J., B. Poudel-Ward, A Hu, R. Norton, W.A. Dixon II. 2022. Use and Importance of Ametoctradin in Arizona Agriculture. Document ID: EPA-HQ-OPP-2021-0647-0007. 9/12/22. https://www.regulations.gov/comment/EPA-HQ-OPP-2021-0647-0007

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Fournier, A.J., W.A. Dixon II. 2023. Response to EPA's Proposed Interim Decision for Thiophanate-methyl. Document ID: EPA-HQ-OPP-2014-0004-0170. 3/26/23. https://www.regulations.gov/comment/EPA-HQ-OPP-2014-0004-0170

Fournier, A.J., C. Rock, J. Sughroue, D. Bishel, W.A, Dixon II. 2023. Use and Benefits of Peroxy Compounds in Arizona Vegetable Production. Document ID: EPA-HQ-OPP-2009-0546-0039. 6/5/23. https://www.regulations.gov/comment/EPA-HQ-OPP-2009-0546-0039

Our Data and Expert Information

Through cooperative agreements with the Arizona Department of Agriculture (AZDA), the Arizona Pest Management Center obtains use of, improves upon, and conducts studies with AZDA's Form L-1080 pesticide use data. Growers, pest control advisors and custom or commercial applicators complete and submit these forms to the state when required by statute as a record of pesticide use. These data contain information on 100% of custom-applied (i.e., for hire) pesticides in the state of Arizona. **Many grower self-applied pesticide applications do not require reporting and may be under-represented in the data we share in this document.**

The Arizona Pest Management Center is host to the University of Arizona's expert IPM scientists including Ph.D. entomologists, weed scientists and plant pathologists with expertise in the strategic tactical use of pesticides within IPM programs that protect economic, environmental and human health interests of stakeholders and the society at large. For over 20 years, we have committed resources to responding to pesticide registration reviews with substantive data on pesticide use and feedback from agricultural stakeholders in Arizona, neighboring desert regions of California, and other Southwest states.

Economic Importance

Arizona growers and agribusinesses contributed a total of over $31 billion in economic activity (sales) the state in 2022 (Montanía et al. 2024). Arizona is one of the leading producers of fresh-market vegetables in the U.S., producing vegetables and melons at an estimated total economic contribution of over $2.5 billion in 2015 (Kerna et al. 2016). This includes about 90% of all fresh lettuce consumed in the U.S. in the winter (Satran 2015). In 2025, the combined value of production for head lettuce, leaf lettuce and romaine exceeded $1.1 billion, with production on 38,270 acres (USDA NASS 2026). Major crops in Arizona include lettuce, spinach, brassica crops (including broccoli, cauliflower and cabbages), melons, alfalfa, cotton, corn, barley, durum wheat, dates, citrus and pecans (USDA NASS 2026). In addition, Arizona is a leading producer of high-quality seed onions, which are exported to many growing regions.

Fungicide Use in Arizona Agriculture

Fungicides play a critical role in controlling fungal, bacterial and virus-related pathogens on agricultural crops, protecting yield and food quality as well as consumer health (Fournier et al. 2021, 2023) Despite Arizona's arid climate, which helps to limit fungal disease pressure, bouts of damp or wet weather when they occur quickly create favorable conditions for downy mildew and a variety of diseases that cause economic damage and losses in a variety of crops. Several

diseases initiated by fungi, bacteria or viruses can lead to major yield losses or the production of unmarketable product. Fungicides are used to protect a broad range of Arizona crops (Table 1) and are especially important in the fresh produce industry. Between 2018 and 2025, fungicide use on lettuces, spinach, melons and brassica crops (including broccoli, cauliflower, cabbages, kale) accounted for 86% of acres treated with fungicides (Table 1). Fungicides are vital to the management downy mildew in lettuce, spinach, onions and brassica crops (Fournier et al. 2021). This persistent and regular disease of lettuce and other crops requires preventative treatments using rotations of mixtures of effective modes of action to provide control and manage resistance. As another example, biopesticide uses of the peroxy compounds, hydrogen peroxide and peracetic acid (PAA) help improve sanitation and protect human health in the production of fresh leafy greens (Fournier et al. 2023), and are among the top active ingredients used, based on Arizona agricultural pesticide use reporting data (Fournier et al. 2017).

Beyond these few examples, many diverse fungicides protect a broad range of economically important vegetables, melons, field crops and tree crops in Arizona and the Desert Southwest. It is critically important that we maintain a range of effective modes-of-action against pathogen-mediated plant diseases. Our industry of professional pest control advisors are aware of the importance of resistance management and maintain practices such as mixing and rotating chemistries to help maintain efficacy of these products. We have previously emphasized the important role these products play across diverse crop production systems in Arizona in prior comments submitted to EPA on a broad range of fungicides (i.e., Iprodione, Fenamidone, Famoxadone, Mancozeb, Chlorothalonil, Ametoctradin, Tebuconazole, Thiophanate-methyl, and Proxy compounds).

Table 1. Reported use of fungicide active ingredients on Arizona crops, cumulative acres treated by crop from 2018 – 2025.

Crop or Crop Group	Reported Applications	Acres Treated
LETTUCES (ALL TYPES)	177,232	2,682,732
SPINACH	52,276	487,252
MELONS (ALL TYPES)	12,437	359,184
BRASSICA CROPS (ALL TYPES)	26,515	290,473
CORN (ALL TYPES)	1,484	127,239
COTTON	1,807	97,300
ONION (ALL TYPES)	3,135	79,603
CELERY	4,637	56,061
ARRUGULA	13,250	52,601
POTATO	419	33,180
GRAINS (ALL TYPES)	469	22,037
CITRUS (ALL TYPES)	665	19,955
OTHER VEGETABLE SEED CROPS	1,097	18,884
CARROT	668	18,191
ALL OTHER CROPS	17,308	16,793
OTHER VEGETABLES	1,882	17,150
TREE CROPS (ALL TYPES)	299	16,014
BEANS (ALL TYPES)	395	13,231
CILANTRO	908	12,788
SWISS CHARD	4,118	11,190
BRASSICA SEED	680	8,810
ALFALFA	172	7,615
LETTUCES SEED	157	1,785
ALL SEED OTHER CROPS	100	1,751
PEPPERS	21	226

EPA noted in the Draft Fungicide Strategy that fungicide use patterns are not evenly distributed throughout the contiguous U.S. Similarly, in Arizona, fungicides use varies significantly across counties, with reported use in Yuma County accounting for 87.7% of acres treated statewide, based on cumulative reported fungicide use between 2018 and 2025 (Table 2). Several factors contribute to this uneven distribution. Yuma County is the primary production region for lettuce and other leafy greens, brassica crops, onions, and many other types of vegetables. Yuma is also by far the most productive region, with nearly continuous production of leafy greens and brassicas year-round except for the hottest summer months. This means that multiple crops are produced on the same acres within a one-year span. The rate of production, particularly for leafy

greens, is phenomenal. In comparison, central and eastern Arizona counties grow primarily field crops, especially alfalfa, cotton, Duram wheat and other grains, sorghum, and (in Southeastern Arizona) corn. Except for corn, and to some extent cotton, the crops grown in these regions have far fewer disease issues. Therefore, a combination of production, crops grown, and susceptibility to diseases across crops helps accounts for the uneven distribution of fungicide use.

Table 2. Reported use of all fungicides in Arizona counties, cumulative acres treated by county from 2018 – 2025.

County	Applications	Acres Treated
Yuma	287,502	3,906,582
Maricopa	13,069	224,150
Pinal	6,063	157,416
Coconino	889	129,213
LaPaz	409	18,647
Graham	90	10,436
Yavapai	325	3,287
Pima	40	2,148
Mohave	11	161
Navajo	2	6

Spray Drift Adjuvants

In the Draft Fungicide Strategy (Table F1), EPA has proposed expanding the availability of spray drift buffer reductions for oil emulsion Drift Reducing Adjuvants (DRAs) beyond herbicides to include insecticides and fungicides. In addition, EPA has proposed to allow buffer reductions for the use of guar gum (polysaccharide) DRAs across all three types of pesticides. Growers will appreciate the expanded options to help reduce spray drift buffers while protecting non-target species, as various types of adjuvants are used across a wide range of pesticide sprays.

According to EPA's Ecological Mitigation Document 2.0, oil-based emulsions include crop oils, crop oils concentrates, and methylated seed oils (Appendix B, B.1). However, beyond this, the Draft Fungicide Strategy does not provide a clear definition nor sufficient examples of the types of products that would qualify as oil-based emulsion DRAs. This led to some confusion in discussion with Pest Control Advisors (PCAs), although these professionals are experts in the customized use of diverse adjuvants to enhance pesticide effectiveness and to reduce spray drift.

Based on interviews with multiple PCAs, spray drift adjuvants are widely used in Arizona, especially with herbicides and insecticides, and at least occasionally with fungicides. Some pesticide labels already recommend or require the use of adjuvants. For example, the insecticide PQZ (pyrifluquinazon) calls for the addition of an adjuvant to maximize product performance. PCAs often use DRAs to reduce risk of drift and crop contamination, especially in cropping

systems in Yuma County, where diverse vegetables and melons may be interspersed with alfalfa or cotton or other field crops. This practice is important to preventing residues of non-labeled products, or products with MRL restrictions, onto neighboring crops. This protective attitude toward carefully managing spray drift is very much part of the culture. Seed oil blends or other oil-based adjuvants appear to be commonly used across different crops and regions of the state. However, some PCAs were not familiar with the term "oil emulsion" as a category DRAs, so clarification is needed on what types of products would qualify for the mitigation.

Other types of products used include "stickers." These help improve rain-fastness and are sometimes added to non-systemic pesticide applications during monsoon season. For example, one PCA mentioned using a sticker product with Intrepid (methoxyfenozide) applications for worm control. Surfactants are added to many applications and act as emulsifiers, wetting agents, and dispersants, allowing substances like oil and water to mix to improve spray results. Polymer-based DRAs are also commonly used in Arizona. They are sometimes blended with spray grade ammonium sulfate, which has an antifoam agent added in the mix, then applied with glyphosate. An example product is Fertizona AMS Premium Blend. However, we understand EPA's concerns about polymer based DRAs, based on their susceptibility to pump shear and reduced effectiveness over time, according to available research. We hope that additional research or refinement of application methods might show more promising results for polymer DRAs, which EPA could consider in the future.

PCAs interviewed were not familiar with the use guar gum as a drift reducing adjuvant.

With broad diversity among available and commonly used adjuvant products, **we request that EPA provide clear and concise guidelines on adjuvants and categories of products that qualify for spray-drift buffer mitigations, including example products, and an accessible process to help users verify product eligibility.** This will increase confidence of PCAs and applicators in the selection of qualifying products**. We further ask that EPA's definition include the broadest range of products and product types that scientifically qualify.** This will make compliance easier, as many types of adjuvants are in use here.

Seed Treatment Runoff

Fungicide seed treatments provide early-season protection against a soil- and seed-borne pathogens that can threaten emerging crop plants, helping ensure effective and uniform stand establishment. They protect young plants from disease damage without the need for early-season sprays. Fungicides are often combined with insecticides in packaged seed treatments. Seed treatments offer one of the safest forms of plant protection, low-dose fungicide applications directly on the seed, planted in the ground, where risk of exposure runoff or leaching is greatly minimized compared to in-furrow or post-emergence fungicide applications (Lamichhane et al. 2020). According to seed industry sources, fungicide seed treatments are used on a wide range of crops, including field crops, vegetable crops and other specialty crops. In some cases, these treatments are considered essential to achieving acceptable emergence and stand establishment, particularly in cool, wet, or disease-prone planting environments.

In Arizona, the use of on-farm seed treatments appears to be rare; growers who use them rely on seed treatment packages from distributors. According to Arizona Farm Bureau, many Arizona crops benefit from seed treatment technology, including barley, cotton, oats, triticale, Sudan grass, alfalfa, durum wheat, red wheat, lettuce, spinach, and brassicas. Maintaining access to effective seed treatments is therefore important to the production of both field and vegetable crops in the state. Although we could not directly quantify the extent of seed treatments used across different crops, some sources indicate that the adoption and deployment of fungicide treated seed in commercial lettuce production is relatively uncommon. Instead, growers typically rely on in-furrow spray or shank application systems at planting to deliver crop protection products, primarily insecticides, directly over or adjacent to the seed bed in each line of each row.

In the Draft Fungicide Strategy, EPA has determined that runoff/erosion is a relevant exposure pathway for seed treatments, positing that it could result in potential population-level species impacts related to fungicide-treated seeds. Therefore, EPA is requesting additional data and information on various factors related to these potential risks. The following example, provided by Dr. Christopher Detranaltes, University of Arizona Associate in Extension in Plant Pathology with Yuma County Cooperative Extension, pertains to typical seed treatments available for lettuce and demonstrates the very low potential for significant fungicide active ingredient expected to be available for runoff.

A typical two-line lettuce planting on 42-inch center-to-center beds requires approximately 1 to 8 pounds of pelleted seed per planted acre, depending on the target planting density. Using the upper end of this range (8 pounds per acre) to represent a high-rate scenario, we calculated the maximum amount of active ingredient applied per acre for the three principal fungicidal seed treatments used on lettuce when applied at their highest labeled rates.

Table 1: Comparison of labelled rates for fungicides registered as seed treatments with the EPA and approved for use on lettuce in the state of Arizona.

Trade name	**Max Labelled Rate**	**AI per acre (8lbs/ac - pelleted)**	**Active Ingredient**	**Target Crop**	**Manufacturer**	**Acute Toxicity Oral**
Maxim 480FS	11.34 g per 100 lbs seed	907 mg	Fludioxinil	Lettuce	Syngenta	LD50 (Rat): > 5,000 mg/kg
Apron XL	6.80 g per 100 lbs seed	544 mg	Metalaxyl	Lettuce	Syngenta	LD50 (Rat): estimated 1,154 mg/kg
Allegiance FL	6.91 g per 100 lbs seed	552 mg	Metalaxyl	Lettuce	Bayer	LD50 (Rat): > 2,900 mg/kg

These calculations demonstrate that the total quantity of fungicidal active ingredient made available to the environment as potential contaminant to runoff is extremely low. In fact, the amount of active ingredient applied to an entire acre planted to fungicide-treated lettuce falls short of acute oral LD_{50} values for each of the principal active ingredients. Eating 8 lbs of pelleted seed would kill a rat from overconsumption and gastric rupture far sooner than from toxicological effects from the chemistry on the seed coats.

Seed treatments should be recognized as one of the most precise crop protection technologies available because they deliver protection exactly where and when it is needed while minimizing the amount of pesticide introduced into the broader agricultural environment.

From a regulatory perspective, seed treatments align with the concept of precision agriculture because they deliver crop protection with high spatial precision. Precision agriculture is commonly defined as applying the right input, at the right rate, at the right place, and at the right time. Seed treatments satisfy all four criteria: the fungicide is applied at a safe rate, directly to the individual seed, before the period of greatest disease susceptibility, with virtually no treatment of areas where protection is unnecessary.

Seed industry contacts echo the benefits of seed treatment technologies and emphasize a commitment to quality control and product stewardship. According to one source, "the seed industry has invested heavily in improving treatment application technology and coating performance. Commercial seed treatment operations routinely utilize precision application systems, quality-control testing, and adherence standards designed to ensure uniform coverage and treatment." This includes "significant advances over the past two decades in dust reduction technologies, including improved formulations, polymer systems, and coating processes that substantially reduce the potential for treatment loss during transportation, handling, and planting." These technologies help minimize "dust off." Furthermore, EPA should factor into its calculations the extremely small portion of seed coat the represents extremely low rates of fungicide active ingredients, as discussed above.

We agree with Draft Fungicide Strategy comments submitted by USDA Office of Pest Management Policy that EPA should offer additional mitigation points for growers whose fields are planted using precision technology, which has been demonstrated to deliver seed to appropriate seedbed depths that would eliminate exposed seed on the soil surface and concerns about runoff.

EPA's scientific assessment of the risk of seed treatment runoff and the potential for exposure levels that could impact listed species populations need to account for all the factors identified which would reduce these risks: precision application and below-ground placement of seed treatments, extremely low rates of active ingredient which represent a small portion of seedcoat content, and impact of various planting methods on dustoff. In addition, industry stewardship and best management practices should be factored into EPA's risk assessment models. Based on these factors, we would expect risks to listed species from the responsible use of seed treatments to be exceedingly low.

On-field Vertebrates

In the Draft Fungicide Strategy, EPA has identified eleven species of vertebrates that they indicate may be present on agricultural fields and would require mitigations that would be communicated through Bulletins Live! Two. Based on information compiled by the FIFRA Endangered Species Task Force (FESTF)[1], an industry-led company formed to address endangered species location data requirements of the EPA in connection with product registration, none of the eleven species appear to have ranges that overlap with the Desert Southwest region including all of New Mexico and Arizona, southeastern California, and southeastern Nevada. Range maps presented by FESTF in a Draft Fungicide Strategy webinar in May 2026 are based on species data obtained from US Fish and Wildlife Environmental Conservation Online System (ECOS)[2].

Educational Resources for Growers, PCAs and Applicators

In Arizona and California, professional, licensed Pest Control Advisors provide pest management and pesticide recommendations for commercial agricultural growers. Both states have pesticide use reporting requirements, and under those requirements, PCAs, with grower approval, write up pesticide application "prescriptions" which provide instructions for applicators. For this reason, PCAs are a primary target audience for our Extension information and trainings related to endangered species mitigations, as they advise and assist growers with applications and regulatory compliance. They are seeking straightforward time-saving resources to help ensure effective compliance with endangered species mitigations within their busy workflows. For the past several years, Al Fournier has delivered trainings, presentations and publications to help keep PCAs and growers up to date on the Endangered Species Strategies and evolving mitigation measures. For example, in 2025, 13 Extension presentations covered topics such as Bulletins Live! Two, EPA's Mitigation Menu, and hands-on training on spray drift buffers, managed areas and runoff mitigation points. With coauthors, he delivered three Extension publications on Endangered Species Bulletins and runoff mitigation points and the Mitigation Menu (Fournier et al. 2025a, 2025b, 2025c). EPA's PALM tool has not been a central component of our education efforts, but we plan to introduce and promote this tool to PCAs and growers in future trainings starting in 2026.

We have documented increases in awareness and knowledge of Endangered Species Bulletin requirements and mitigations, though, a need for ongoing education and easy-to-use resources remains apparent. For example, in a 2025 pre-training survey of PCAs at the Arizona Crop Protection Association's annual statewide Desert Agriculture Conference (n=50) 32% of respondents had never heard of Bulletins Live! Two; an additional 36% were aware of it but had not used it to generate a bulletin. After the presentation, 78% indicated a great increase in knowledge about BLT and 22% indicated some increase in knowledge. In addition, according to our post-training survey, participants increased their knowledge of the following topics:

- EPA pesticide registration review (65% great increase, 25% some increase)
- Endangered Species Act (52% great increase, 43% some increase)

And 100% agreed they feel more informed about what to expect as EPA continues to address endangered species (77% strongly agreed, 23% somewhat agreed).

[1] https://festf.org/about

[2] https://ecos.fws.gov/ecp/

Advice to EPA on the PALM tool and other education resources to support endangered species mitigation compliance: **please make these tools and resources as straightforward and easy to use as possible.** One of the main concerns expressed by PCAs has been developing fast and effective workflows to enable compliance in the smoothest and least time-consuming manner possible.

Compliance and Enforcement
Under state statutory requirements, growers must submit records of agricultural pesticide use to the Arizona Department of Agriculture (AZDA) on form L-1080 for all custom (for hire) pesticide applications. In addition, submission is required for soil-applied products that are on Arizona Department of Environmental Quality's groundwater protection list, for odiferous compounds, and certain other applications as required on state-approved special registrations. As of Jan 1, 2026, AZDA has revised the L-1080 form[3] to include Yes/No boxes for BLT (indicating whether the label requires the grower to access Bulletins Live! Two) and PULA (indicating whether the application was within a PULA). This new requirement quickly raised PCA and grower awareness and has expanded training opportunities to help support compliance.

We appreciate this opportunity to comment on the Draft Fungicide Strategy, including technical considerations and potential impacts on agricultural stakeholders. Please feel free to contact me if you have any questions.

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