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

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Introduction

The EPA is seeking public comment in response their "Draft Herbicide Strategy Framework to Reduce Exposure of Federally Listed Endangered and Threatened Species and Designated Critical Habitats from the Use of Conventional Agricultural Herbicides." This ambitious and broad strategy would impact the use of conventional herbicides across all agricultural crops in the contiguous lower 48 states of the U.S. and represents another step in EPA's new and evolving approach to expediting protections for listed species. In addition to the Strategy document itself (96pp), the federal docket included several other technical documents summing to many hundreds of pages of material relevant to understanding EPA's rationale, methodology, proposed mitigations on herbicide use, and broad plan for implementation of the Strategy. In order to better support EPA's intention of providing broad protections of listed species while providing flexibility to growers (and despite the 30-day extension), we recommend more time be provided for engagement of stakeholders on future issues and proposed decisions as complex as this one, to support better-informed and more substantive input.

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 18 years, and with support from the Western IPM Center, 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. We are well aware of the challenges EPA faces in expediting protection of endangered species through its FIFRA and pesticide registration review processes. We hope that our comments will support the development of viable approaches to listed species protections. We support EPA's obligations to comply with the ESA while fully considering the real, practical concerns and challenges of growers and other stakeholders on the ground. Our goal is to ensure we sustain the viability and stability of agricultural industries that produce the food and fiber U.S. citizens and communities rely on.

These comments represent feedback from growers, licensed Pest Control Advisors (PCAs), representatives from grower and PCA organizations, state pesticide regulators, Extension professionals and others. Data were obtained in meetings and discussions and through an online survey. Our responses are not comprehensive in scope and representation of all parties the Strategy will impact, due to time constraints. Our comments focus specifically on Arizona agriculture and highlight concerns, questions, need for clarification, as well as providing data on the potential applicability of many of the specific proposed mitigations for our grower industries. We also examined statewide herbicide use data to better understand the potential impacts of proposed mitigations for the 12 case study herbicides on a crop-by-crop basis.

The Arizona Pest Management Center has previously submitted comments on several of the herbicides used in the case studies to develop the Strategy. Our comments highlight the importance of these herbicides 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 herbicides in specific crops. To the degree these kinds of details are relevant to EPA's understanding of the potential impacts of the proposed Strategy on growers and cropping industries, we wish to incorporate these previous comments by reference.

Previous Comments

Fournier, A.J., J. Dias, K. Umeda, W.A. Dixon II. 2022. Dicamba Use and Benefits in Arizona and the Southwest. Docket ID: EPA-HQ-OPP-2016-0223. 10/17/22. https://acis.cals.arizona.edu/docs/default-source/ipm-assessment-documents/arid-swpmc-info-requests/comment-reponses/dicamba_ra_comments_apmc_10-17-22_vf.pdf

Fournier, A.J., W. McCloskey, B, Evancho, P.C. Ellsworth, W.A. Dixon II. 2021. Diuron Use and Benefits in Arizona Agriculture. Docket ID: EPA-HQ-OPP-2015-0077. 6/7/21. https://acis.cals.arizona.edu/docs/default-source/ipm-assessment-documents/arid-swpmc-info-requests/comment-reponses/diuron_comments_apmc_6-7-21_vf.pdf

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Fournier, A.J., W.A. Dixon II. 2021. Response to EPA Proposed Interim Decision for Oxyfluorfen. Docket ID: EPA-HQ-OPP-2014-0778. 10/04/21. https://acis.cals.arizona.edu/docs/default-source/ipm-assessment-documents/arid-swpmc-info-requests/comment-reponses/oxyfluorfen_pid_10-04-21.pdf

Fournier A.J., W. McCloskey, P.C. Ellsworth, A. Mostafa, W.A. Dixon II. 2019. Paraquat Dichloride Use and Benefits in Arizona Agriculture. University of Arizona, Arizona Pest Management Center. 12/16/19. https://acis.cals.arizona.edu/docs/default-source/ipm-assessment-documents/arid-swpmc-info-requests/comment-reponses/paraquat_comments_apmc_12-16-19.pdf

Fournier A.J., P.C. Ellsworth, W. McCloskey, W.A. Dixon II. 2017. Pendimethalin Use in Arizona and New Mexico Crops. University of Arizona, Arizona Pest Management Center. https://acis.cals.arizona.edu/docs/default-source/ipm-assessment-documents/arid-swpmc-info-requests/comment-reponses/pendimethalin_use_az_nm_vf.pdf

Background

Arizona growers produce an array of crops and livestock that contribute over $23.3 billion of economic impact to the state. 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). In 2022, Arizona produced nearly 21,000 acres of broccoli, cauliflower, and cabbage combined, with an estimated farmgate value over $270 million (USDA NASS 2023). Major crops in Arizona include lettuce, spinach, cole crops, melons, alfalfa, cotton, corn, barley, Durham wheat, citrus and pecans (USDA NASS 2023). In addition, Arizona is a leading producer of high-quality seed onions, which are exported to many growing regions, including the Pacific Northwest.

Herbicides are a critical tool for managing weeds in crop production. If weeds are not controlled quickly and effectively, they can choke out a crop by competing for light, nutrients, and water and serve as a refuge for insects and diseases. Herbicides are also valuable tools in fallow fields to reduce weed seed banks, which impact the success of a future crop.

Herbicide Use in Arizona Agriculture

The Arizona Pest Management Center maintains a database of agricultural pesticide use, based on reports submitted to the Arizona Department of Agriculture as required under state statue. While growers are required to submit data on all custom (for hire) applications, including aerial applications, grower applied pesticides often do not require reporting. Because many growers use their own equipment to apply herbicides, we know that data submitted generally under-represent actual herbicide use. Nonetheless, a review of reported herbicide applications by crop type provides representative data that highlights the potential impacts of proposed mitigations on various crops. We examined use of the 12 herbicides which EPA used to develop the case studies from 2017 to 2021 and the number of reported acres treated by crop type (Figure 1). These data demonstrate the importance of some of the 12 herbicides to Arizona crop production. Active ingredients not shown in Figure 1 either had no use or very low use across crop types.

CROP_GROUP	DICAMBA	DIURON	MCPA	OXYFLUORFEN	PARAQUAT	PENDIMETHALIN	S-METOLACHLOR	TRIFLURALIN
ALFALFA	VERY LOW	HIGH	VERY LOW		LOW	HIGH	VERY LOW	HIGH
ALFALFA, SEED					VERY LOW	LOW		VERY LOW
BEANS				VERY LOW	VERY LOW	MEDIUM	HIGH	VERY LOW
CITRUS					VERY LOW	VERY LOW		
COLE CROPS	VERY LOW	VERY LOW		HIGH	VERY LOW	LOW		HIGH
COLE SEED CROPS				VERY LOW		VERY LOW		
CORN	MEDIUM		VERY LOW			MEDIUM	HIGH	VERY LOW
COTTON	MEDIUM	HIGH	VERY LOW	LOW	HIGH	HIGH	VERY LOW	VERY LOW
GARLIC						LOW		
GRAINS	HIGH		HIGH		VERY LOW	HIGH		
LETTUCES	VERY LOW	VERY LOW			LOW			
MELONS		VERY LOW	VERY LOW		VERY LOW	LOW		LOW
NONCROP	LOW	VERY LOW		VERY LOW	HIGH	VERY LOW	VERY LOW	
ONION, DRY					VERY LOW	LOW		VERY LOW
PECANS					LOW	LOW		
SORGHUM, ALL USES	VERY LOW					VERY LOW	MEDIUM	
SPINACH							HIGH	
TREE CROPS		VERY LOW		VERY LOW	LOW	LOW		
WHEAT, BARLEY, OATS			HIGH					
WHEAT, UNSPECIFIED			HIGH					
ALL OTHER CROPS	HIGH		LOW	VERY LOW	LOW	MEDIUM	MEDIUM	LOW
ALL SEED OTHER CROPS	VERY LOW				VERY LOW	LOW		VERY LOW

Figure 1. A general overview of reported herbicide use (sum of acres treated) by crop type in Arizona, 2017-2021. Exact numbers are not provided because the majority of herbicide applications are grower-applied and do not require reporting under state statute. However, the data provide a relative estimate of use across crops, with the highest reported use levels highlighted in red. *Source: Arizona Pest Management Center Pesticide Use Database*

Structural & Environmental Protections Already Present in Arizona Agriculture

Arizona's low desert agriculture is characterized by a variety of structural and environmental factors that impact movement of pesticides of all kinds. National models that are derived from the Pacific Northwest and the Eastern Seaboard, such as have been used by US-EPA in the past, are extremely poor predictors of pesticide fate in desert ecoregions, including Arizona agriculture production zones. Arizona's irrigated agriculture is in a desert environment where rainfall averages less than 25 cm per year. Because of the importance of irrigation water in our system, farmers are important stewards of this natural resource. This includes nearly 100% use of laser-leveling technology (since the 1970s) to control slope in fields for the management of irrigation water. This means that little to no water leaves the site of application, the agricultural field (Ellsworth et al. 2016).

Related to our arid, desert climate is the dearth of water bodies that might be present to receive any off-target movement of pesticides. Most of agriculture in our State is devoid of running streams or rivers, and natural lakes or ponds. Furthermore, even the small amounts of pesticides that might reach our soils are subject to intense solar radiation (and heat) and the associated degradation processes. As one example, published studies of environmental fate for organophosphates including chlorpyrifos distinguish from dry areas (or seasons) and wet areas (or seasons) with far lower levels (and risks) measured under dry conditions (Jaipieam et al. 2009).

Herbicide Strategy Survey
We modified and implemented a detailed online survey developed by Danielle Lightle at Oregon State University to solicit stakeholder input on EPA's Herbicide Strategy. The Qualtrics survey mainly focused on proposed herbicide use mitigations but also included questions about the use of Bulletins Live! Two and opportunities to provide additional comments. The survey was sent out via an email list dedicated to EPA pesticide registration review topics, and via University of Arizona Cooperative Extension agent email lists and newsletters. The survey was also promoted by the Arizona Crop Protection Association, the state organization for licensed Pest Control Advisors. We received 39 responses. 45% of respondents were growers, 32% were PCAs, 13% were agricultural industry representatives. The survey was only available stakeholders for about nine days.

Proposed Spray Drift Buffers and Mitigations to Reduce Buffer Size

Clarity is needed on when the buffer requirement applies

EPA is proposing a spray drift buffer between an application and downwind adjacent habitats where listed species could be exposed. While stakeholders understand and support the intention of the buffer zones, there were some questions and concerns about identifying situations where the buffer zones would apply.

- Would this be only for instances when EPA has identified a critical habitat for a listed species, or would it apply to any natural habitat that is adjacent to a field application?
- If this applies only in instances when EPA has identified a critical habitat for a listed species, would the requirement be communicated through Bulletins Live! Two?, or is EPA's intention to broadly implement spray drift buffers as described in the Strategy through the general labels?
- If it applies to listed species but will be implemented through the general label, is it the grower's responsibility to determine whether natural areas adjacent to fields have been identified as critical habitats for listed species, and if so, what is EPA's process for connecting growers to the needed information to make this determination?
- Any ambiguity about whether or not the buffer zones apply to a particular field is of course problematic and poses a potential liability to the grower. **EPA must provide exacting clarity on *when* this requirement applies in order to support grower compliance with the buffer zones. Furthermore, EPA must provide efficient access to decision making information to minimize confusion surrounding these requirements.**

Applicability of mitigations to reduce buffer size to Arizona agriculture

We surveyed stakeholders to determine the feasibility of EPA's proposed mitigation tactics to reduce buffer size in Arizona agricultural production. Our finding are summarized below.

Ground Applications (n=35)
Regarding the proposed spray drift mitigation options to reduce spray drift buffers, our survey revealed the most viable of these options for ground applications in Arizona production systems would be (1) coarser droplet sizes; (2) the use of hooded sprayers, and to a lesser extent (3) application rate reductions.

- 30% of respondents indicated "Yes" and 53% "Maybe" to use of coarser droplet sizes.
- 22% of respondents indicated "Yes" and 48% "Maybe" to use of hooded sprayers.
- Only 4% of respondents indicated "Yes" for application rate reductions, 23% indicated "Maybe," and 73% indicated "No."

We interpret "Maybe" to indicate that in certain situations growers may be able to adopt a practice. Downwind windbreak and relative humidity >60% do not appear to be viable mitigations for ground sprays for most growers, with 77% and 85% respectively responding "No."

Aerial Applications (n=26)
The most viable spray drift mitigation options identified by respondents for aerial applications in Arizona crops were (1) coarser droplet sizes and (2) wind speed of 3-7mph, and to a lesser extent, (3) application rate reductions.

- 5% of respondents indicated "Yes" and 79% "Maybe" to use of coarser droplet sizes.
- 29% of respondents indicated "Yes" and 52% "Maybe" to use of wind speed of 3-7mph.
- 0% of respondents indicated "Yes" for application rate reductions, 16% indicated "Maybe," and 84% indicated "No."

None of the other options appear to be viable, with "No" responses of 84% and 95% for downwind windbreak and relative humidity >70%, respectively.

Desert conditions can have a dramatic impact on weed plant characteristics, such as a thickened cuticle that makes absorption, penetration and efficacy of our herbicides that much more challenging. This may be why our uses of herbicides are often at the higher ends of the rate ranges. Thus, rate reductions for individual sprays are less likely to be an effective mitigation tactic in many cases for Arizona growers.

Aerial Applications (n=6)
Only six respondents indicated the use of airblast applications. Downwind windbreaks and application rate reductions appeared to be viable, at least in some situations, for more than a third of respondents.

- 17% of respondents indicated "Yes" and 33% "Maybe" to use of downwind windbreaks.
- 0% of respondents indicated "Yes" and 40% "Maybe" to use of application rate reductions.

Other Potential Mitigations to Reduce Spray Drift
We learned in our discussions with PCAs that Drift Reduction Adjuvants (DRAs) are commonly used for certain herbicide applications to help reduce the potential for drift onto neighboring crops. We are aware that EPA requires the addition of an approved DRA for every application of XtendiMax (dicamba), as indicated on the product label. This requirement suggests that EPA has examined scientific evidence and concluded that DRAs are effective for reducing drift. Based on feedback from PCAs, DRAs are fairly commonly used in Arizona, and we expect that they could

be adopted to a greater extent. Because different crops with different herbicide sensitivities are often grown adjacent to each other, the industry in Arizona is already heavily invested in making sure herbicides are delivered to their targets without drift to prevent adjacent crop damage and potential liability. This demonstrates the capacity and professionalism of the application industry here. **We ask that EPA consider adding DRAs to the list of mitigations on Table 6-2 to help reduce spray drift buffer.** This would provide at least one additional option to help reduce buffer sizes and to curb potential economic losses to growers.

Runoff & Soil Erosion Mitigation Menu & Point System

Which practices on the Mitigation Menu may be viable for Arizona agriculture?

We understand that EPA has developed a very broad list of potential mitigations, some of which may be applicable only in certain geographies, topographies or cropping situations. Based on our survey of agricultural stakeholders and comments from discussions with growers and PCAs, the following Mitigation Menu items as defined in EPA documents are generally not applicable to Arizona agriculture:

- Contour farming
- Grassed waterway
- In-field vegetative filter strip
- Mulch amendment with natural materials
- Terraced farming
- Riparian forest buffer or vegetative buffer
- Vegetated ditch
- 30-ft. vegetated filter strip adjacent to field

Many of the remaining Mitigation Menu items were only situationally applicable—for certain crops or fields, or certain products or types of applications. We list below each of the potentially useful mitigation practices in rough order of applicability, with additional clarifying comments.

Western Agriculture (1 point).
Always applies, based on geography.

Laser leveled or slope <2% (1 point).
Due to broad adoption of laser leveling as a water conservation practice throughout much of Arizona agriculture, this condition would apply to many growers and fields. 44% of survey respondents indicated a definite "Yes" and an additional 40% indicated it "might" apply. Based on conversations with growers and Pest Control Advisors (PCAs), there is a higher proportion of laser leveled fields in the Yuma production region (probably 90% or higher) than in some other areas of the state. Particularly for more remote desert production areas, away from river areas, a much lower percentage of fields would qualify for this point.

Question for EPA: **Would EPA consider even a slightly higher than 2% slope to qualify for a mitigation point?** We spoke with growers for whom some fields were likely only slightly (1-3%) outside of the 2% range.

Irrigation water management (1 point).
Several water conservation practices are eligible, including drip tape irrigation, micro-irrigation, and precision irrigation practices. 24% of survey respondents indicated a definite "Yes" and an additional 52% indicated it "might" apply. This determination may depend mainly on the crop as well as the established irrigation systems and practice in place. These are part of farm infrastructure and changes can require significant investments. That being said, Arizona is on the leading edge of water conservation in agriculture.

Recent water shortages and use limitations have intensified grower focus on careful stewardship of this limited resource, particularly in the central part of the state. In 2022, the Arizona State Legislature allocated $23mil to a Water Irrigation Efficiency Program implemented through University of Arizona Cooperative Extension and providing direct funding to growers to support adoption of water conservation practices in agriculture aimed at reducing water use in crop production by at least 20%. As of September 2023, the program has had a significant impact, saving 36,418 acre-feet of water. In 2023, the state legislature appropriated an additional $15.2 million to this initiative (UA 2023). The program includes installation and verification of the efficiency of conservation irrigation practices by Cooperative Extension professionals. Though these irrigation methods may not be applicable to all cropping systems, we anticipate that over the next few years the number of fields that qualify for this mitigation will only continue to increase. However, it should be noted that a large fraction of Arizona agriculture is grown on leased land. Sometimes leases are of short enough duration that growers cannot justify the costs of these infrastructural improvements, even with subsidy.

Residue tillage management (2 points).
According to EPA's Technical Support document (p.62), "this category of practices includes no-till, strip-till, ridge-till, and mulch-till." This was the next highest ranked practice for us, with 25% of survey respondents indicating a definite "Yes" and an additional 50% indicated it "might" apply. The most widely used of these practices is strip-till, which has good adoption in some areas of the state for certain row crops. The crops are planted into grain stubble, or in some cases alfalfa stubble, after removing a stand. Strip tillage reduces soil erosion, conserves soil moisture and reduces runoff. It is a "common practice" for these crops, according to PCAs and growers we spoke with. The practice is generally limited to corn, cotton and sorghum, but might be adopted more broadly for other crops in the future.

Note: One stakeholder noted that it seems like the 3 mitigations discussed prior to residue tillage management are all germane to western agriculture and may in fact be of greater value than residue tillage management in actually limiting off-target movement of herbicides. **We ask EPA to review its data and to consider whether Western agriculture, <2% slope, and irrigation water management should be elevated to 2 points as well.**

Soil Incorporation (2 points).
Soil incorporation is a standard practice in the industry. Several herbicides are routinely incorporated into the soil either by mechanical means or through irrigation immediately following application. 28% of survey respondents indicated a definite "Yes" and an additional

28% indicated that soil incorporation "might" apply. Examples include major uses of Trifluralin, Pendimethalin, Diuron and Oxyfluorfen in various crops. For all these herbicides, performance and residual control is greatly improved through soil incorporation. We understand that for instances when soil incorporation is a label requirement, growers would not be eligible to claim these mitigation points.

Trifluralin is volatile and immediate incorporation into the soil is critical to retaining product efficacy. Soil incorporation is done either mechanically (e.g., in cotton) or through irrigation (e.g., in alfalfa). Pendimethalin also requires incorporation to be effective, though it is less volatile than Trifluralin, so you have more time to integrate it. Soil incorporated applications are done on established alfalfa, over the stubble of the growing crop immediate after cutting. For cotton, applications can be done at layby, but the more common practice is preplant incorporation at planting. In all cases, the herbicide will not be effective if is not incorporated into the seed zone. For both Pendimethalin and Trifluralin in alfalfa, after cutting the herbicide is applied followed by irrigation over the top to incorporate the herbicide into the soil. Less commonly, if center pivot irrigation is used, herbicide may be applied by chemigation.

Layby applications of diuron were widely used in cotton prior to widespread adoption of Roundup Ready varieties. In this case, diuron is applied as a directed spray under the cotton canopy, then watered in to provide soil residual control of weed seeds in the soil. In recent years, more growers have been returning to layby applications of diuron, due to the evolution of glyphosate resistant weeds, particularly, Palmer amaranth (pigweed) (Fournier et al 2022). University of Arizona experts urge growers to maintain a variety of weed control practices in cotton to slow the development of herbicide resistance (McCloskey et al. 2012, Evancho et al. 2021). Diuron is also used for semi-dormant (winter) season applications in alfalfa. It is sprayed over the top of the field after cutting and watered in.

Oxyfluorfen is an important herbicide in cole crop production which also requires soil incorporation to work effectively. This herbicide, the active ingredient in GoalTender, has become even more critical to producers since Dacthal (DCPA) was taken off the market. Typically, oxyfluorfen is sprayed on the field prior to transplanting broccoli or cauliflower, then the field is irrigated to incorporate the herbicide into the soil.

Sand, loamy sand, or sandy loam soil (1 point).
Although soil types can vary significantly even within a particular production region, overall Arizona has a fairly high portion of soils with sand content. 26% of survey respondents indicated a definite "Yes" and an additional 30% indicated that these sandy soil types "might" apply.

Questions for EPA:

- **Would a sandy-clay-loam mixture be eligible for these mitigation points?** One grower asked this, noting that these mixtures occur in some areas of the state.
- **Has EPA determined a specific percentage of sand that would need to be present to qualify for the points?** This might be a more precise and verifiable way to communicate the requirements of soil conditions that qualify.
- **Are caliche and/or clay considered a "restrictive layer" for the purposes of the Mitigation Menu?**

Cover cropping / continuous vegetation (1 point).
15% of survey respondents indicated a definite "Yes" and an additional 42% indicated that these practices "might" be applicable. In discussion with growers and PCAs, examples of practices mentioned included double cropping of cotton and planting cotton into grain stubble. We seek clarity from EPA whether these practices are eligible for the mitigation point.

Questions for EPA:

- **Would planting of cotton or other row crops into grain stubble be considered an eligible practice under this mitigation?**
- **Does alfalfa, a perennial crop, count as continuous cropping?**

Reduced rates / Application parameters
16% of survey respondents indicated a definite "Yes" and an additional 32% indicated that these practices "might" apply. Growers and PCAs identified several situations where either application rates or the area to which an herbicide is applied would qualify for mitigation menu points. They also raised relevant questions and concerns highlighted at the end of this section.

Banded applications and spot treatments have the potential to help some growers by reducing the points needed to comply with mitigation menus. Banded applications are fairly common for some crop/herbicide scenarios. Dicamba was mentioned as an herbicide for which banded treatments are often used.

Adoption of precision application technology, although not currently widespread in Arizona agriculture, is expected to continue to expand. Some growers already use these technologies to reduce herbicide use based on GPS soil maps. The sprayer deposits a higher rate of herbicide for heavier soils in some areas of the field than in other areas with sandier soils. Interest in these variable rate technologies, such as GreenSeeker sprayers (https://www.vantage-nz.com/portfolio/greenseeker-system/) is increasing as some systems are becoming more affordable. However, they still would require a significant up-front investment for the majority of growers in Arizona.

Reduced application rates. Although herbicides are often applied at full label rate, there are some instances when less than full rates are used. For example, pendimethalin is often applied at a 50% rate and used twice during the season in alfalfa and cotton. This split-treatment would earn a 5-point discount for each spray.

Special Case: Diuron defoliant use in cotton.
The dominant use of diuron in Arizona is as a defoliation treatment in cotton. Growers rely on diuron for effective cotton defoliation in Arizona and adjacent production regions of California. Diuron is an active ingredient (along with thidiazuron) in Ginstar and Redi-pik, the main defoliants used throughout Arizona's cotton growing regions. Dr. William McCloskey, retired University of Arizona Associate Professor and Extension Specialist in Weed Science, estimates that about 75% of Arizona cotton acres receive a diuron defoliation treatment most years. Based on pesticide use reporting data, 94.6% of reported diuron sprays on cotton between 2010 and 2019 were with defoliation products containing only 6% diuron (Fournier et al. 2022).

In its Proposed Interim Decision (PID) for diuron (EPA 2022), EPA concluded that diuron "has high benefits for defoliation in the Pima cotton production regions of California and Arizona." In its PID (p.28), EPA noted the extremely low application rates for diuron defoliant use in cotton, "a typical application rate of 0.025 lbs a.i./A and a maximum application rate of 0.0625 lbs a.i./A" compared to much higher rates, e.g., 2.0 lbs a.i./A, for diuron herbicide use in cotton. In its PID (p.34), EPA further stated, "if all conventional herbicide uses [of diuron] are terminated, as proposed in this PID, and the cotton defoliant use and residential tablet applications to aquariums and containerized ponds are the only remaining conventional uses…there would be no remaining risks to bees, fish, or benthic invertebrates."

Given the extremely low use rate for diuron in cotton defoliants, and that this is such a significant use in Arizona, much discussion ensued among PCAs and growers in one of our meetings around **how EPA would interpret diruon defoliant applications relative to the Mitigation Menu**. **It was argued that defoliant uses of diuron should be considered "reduced rate" applications and should be eligible for point reductions on the Mitigation Menu.** However, the method for calculating percent reduction on points refers to the maximum application rate for the specific product, in this case, a premix defoliant containing an already ultra-low maximum use rate of diuron. Participants in discussions asked whether it would be more appropriate to compare the diuron use rate from the defoliant application to the maximum rate for the herbicide use of diuron, which resides on an entirely different label. While this may not be practical, as it goes against the proposed method for calculating points, **we strongly urge EPA to consider that the low use rates of diuron in defoliant applications should not require growers to accumulate the full number of points prescribed by the label**, which we assume are based on maximum herbicide rates for diuron.

For example, one cotton grower in our meeting went through the entire menu of potential mitigations and was only able to come up with 4 points (1 for Western Ag; 1 for <2% slope; 2 for water retention system). He could not use a defoliant containing diuron, which would require 6 points on the general label in a terrestrial area. We ask, why should such a low rate of diuron require an unattainable number of points? We don't believe this is necessary in this scenario. The question is, **could this grower qualify for some reduction in the total points needed, based on the fact it is defoliant use and not an herbicide use of diuron? We ask that EPA carefully consider this situation, as this use pattern is so significant in cotton here, it will impact the large majority of our growers.** We remind EPA that they have already determined that "there would be no remaining risks" to several nontarget species from cotton defoliant uses of diuron. Perhaps there should be a blanket exemption for diuron used at rates below 0.07 lbs ai / A per application that do not require additional mitigations.

Water retention systems (2)

The final practice from the Mitigation Menu with some use in Arizona is water retention systems / tailwater recovery. 4% of survey respondents indicated a definite "Yes" and an additional 33% indicated that these practices "might" be applicable. This practice as defined by EPA has viability for some farms. One grower we spoke with collects all his tailwater for re-use. He also captures water that runs off from a neighboring farm and reuses it on his farm. Some farms on lower ground have sump systems in place to catch neighboring water runoff. At least this is true

for larger farms on low ground. The Paloma Irrigation district catches all the tailwater for the district and shares it back among growers, who re-use it. While this would only apply on relatively small portion of farms, and in some cases not on all of their fields, it would benefit some growers.

Comments, questions and concerns related to the Mitigation Menu
In our discussions, growers and PCAs expressed several concerns related to the complexity and practical implementation of the point system. In Arizona nearly all commercial agriculture is professionally scouted by licensed Pest Control Advisors (PCAs), who make pesticide use recommendations to the grower. Some aspects of the mitigation menu fall under the responsibility of the PCA, such as potential rate reductions, but the majority of practices are either field characteristics or farm production practices more in the purview of the grower (though in most cases, PCAs would be aware of these).

More generally, **we are concerned, based on exercises with growers, that in some cases it will not be possible for growers to attain enough points through the adoption of relevant available mitigation measures currently outlined in the Strategy.**

Data management tools. Most PCAs, whether independent or working for one of the large companies, such as Helena or Fertizona, rely on data management tools (software) such as Agrian (from TELUS Agronomy) or CDMS to manage information and decision making related to pest management. A major benefit of these services is that their databases are fully integrated with EPA label information. These tools provide independent verification to ensure that users do not make any off-label applications. The system would not let you submit, for example, an application that was over maximum rate, or not labeled on a particular crop. A major reason companies use these services is for liability protection, as well as compliance. However, an added benefit is the efficient management of information. Presuming the runoff and soil erosion Mitigation Menus can be and are integrated into these systems once they are requirements of the label, hopefully tools for calculating mitigation points, etc., may be integrated into these systems. This would take time. Until this happens (or if it doesn't happen), it would fall to the PCA to make the determinations, calculating mitigation points to determine whether a particular pesticide could or could not be used. This would be a time burden and would expose the PCAs and their companies to potential liability if any aspect of the requirements or the field characteristics are incorrectly interpreted. One PCA commented, “Agrian doesn’t put anything out in their program unless they know a grower can comply with it.” Some expressed concern that the information needed to ensure compliance with the Mitigation Menu is “a bit all over the place.” Unless there is absolute clarity in EPA’s mitigation requirements, easy access to the needed information, and no room for misinterpretation, it may be difficult for companies to integrate the complex suite of mitigations into the software applications that PCAs and distributor companies rely on. **We urge EPA to make the requirements black and white and something that could be implemented with compliance verification by a third party like Agrian or CDMS. Otherwise, these mitigations represent a huge liability to growers and their PCAs.**

Within-farm complexity. Discussions with growers and PCAs revealed that on a single farm, not all mitigations would apply equally across all fields. For example, one PCA explained that

for a particular grower's farm (in central Arizona), about half the fields have a slope <2%, and the balance have a larger slope. This would necessitate the PCA to calculate points differently across different fields on the farm. Besides the investment of time developing field by field recommendations that may different based on the points that can be attained, this could lead to situations where a needed herbicide could only be applied to a subset of a grower's fields, leading to the need for different practices across fields and thus complicating spray operations. Even more concerning would be the potential for economic losses due to weeds in fields without enough qualifying points for herbicide application.

Costs of compliance. Apart from the costs mentioned above, many growers would need to make additional investments to ensure they could consistently qualify for enough mitigation points to apply the herbicides their crops rely one. For example, some may invest in precision application technologies, or install water retention systems at great cost to ensure they can stay in business and obtain effective weed control under the new requirements. Although time was lacking to develop an economic analysis, as one person put it, "the cost of compliance on this is huge."

Other Potential Mitigations to Reduce Soil Erosion and Runoff

Polyacrylamide. In areas where fields may have a significant slope, some growers are using Polyacrylamide (PAM) to reduce soil erosion. Soil-Fix is an example of a product that is used. The polymer material is metered into irrigation water. One grower with a 5-6% slope on his field says these products are highly effective at retaining soil on the field. The water at the far end of the field is completely soil-free. These products can be used on any crop during initial irrigation. They are mainly used during stand establishment, a time at which herbicides often are applied. Once the plants are up, PAM has the effect of slowing irrigation rates and so are typically is not used. **We suggest that EPA consider adding the use of PAM to the runoff and erosion Mitigation Menu as another option to help growers accumulate points to support herbicide use.**

Mitigation Point for Professional Herbicide Stewardship. As previously described, in Arizona (and California), professionally trained Pest Control Advisors are hired by growers to provide advice and to write prescriptions for pesticide applications which are often (in Arizona) or always (in California) submitted to the state regulatory authorities. Because nearly all Arizona agricultural acres are scouted by professional Pest Control Advisors who are licensed by the state Department of Agriculture and require continuing education credits to keep their licenses current, and furthermore, because the majority of these professionals use data management systems to ensure that every application made complies with federal and state regulations, we suggest to EPA that **this level of professional stewardship is surely worthy of a mitigation point.** Although this type of professional industry servicing growers is rare outside of California and Arizona, we would argue that it provides the benefit of professional oversight of the decision to apply an herbicide along with the application specifics, and, because of record keeping practices, it would make all herbicide applications auditable by state and federal agencies where enforcement could be considered. In our opinion, this should be worth a point.

Mitigation Point for Voluntary Reporting of Herbicide Applications. As noted elsewhere in this document, herbicide applications which are made by growers using their own equipment do not require reporting in the state of Arizona. As a result, most of these applications go

unreported. A potential proposal that could be considered in Arizona is the idea of crediting growers with one mitigation point for reporting herbicide applications that otherwise do not require reporting to the state Department of Agriculture. PCAs are already writing up these herbicide recommendations on pesticide use reporting forms, which the grower is required to maintain in their records for three years. Offering a point for reporting these applications would provide a tangible benefit for growers that would require no change in on the ground practices. The benefits of reported pesticide use are enormous. Among other things, it allows us to understand use patterns and to provide EPA with valuable scientific data to help inform pesticide registration reviews.

Exemptions to Following Runoff & Soil Erosion Mitigation Menu

The EPA has identified measures that they and/or the Services have determined are essentially equivalent to up to 9 points. EPA proposed that the following circumstances qualify growers for an exemption from following the Mitigation Menu requirements:

1. When the application is more than 1000 feet away from a habitat for listed species.
2. When subsurface drainage tiles are installed, and the drainage is released into saturation buffers or collected in a water retention system to minimize offsite runoff and erosion.
3. When a grower is following recommendations from an expert conservation specialist to reduce offsite transport from the field. This could potentially include federal, state or local conservation programs (subject to EPA review and approval).

We discussed these exemptions with growers, PCAs and other stakeholders and identified the following questions, comments and concerns.

Application is more than 1000 feet away from a habitat for listed species

When taken literally, it seems that this exemption would likely be available to the majority of growers in Arizona, at least based on our current limited knowledge of the locations of listed species habitats. (Maps at the FWS website currently show very few areas for listed species in the state.) But it seems counter-intuitive that EPA would develop the elaborate Mitigation Menu approach, and that this would be implemented through the general label (as well as through BLT, when necessary), and then create an exemption that would apply (at least in Arizona) to most growers.

We sought clarity on this apparent contradiction from contacts at the USDA Office of Pest Management Policy (OPMP). They indicated that they had asked similar questions of EPA and concluded from those discussions that the 1000-foot exemption refers to ***any natural habitat***, regardless of whether or not listed species are present. As they put it, only agricultural fields that are surrounded for 1000 feet in all directions with "managed areas" (e.g., other fields, roads, buildings, etc.) would be exempt from complying with the Mitigation Menu requirements.

We are requesting clarification from EPA on the applicability of this exemption. We also have the following additional questions/comments:

- How is a grower expected to know whether they are eligible for this exemption?
- For general label applications that do not require growers to use BLT, what are the resources EPA is making available to determine the location of a listed species habitat, relative to a field? How can the grower verify whether they quality for this exemption?

- If a listed species is expected to be impacted by an application, shouldn't the user be directed to BLT and made to comply with the pesticide use limitations indicated there?
- Is a grower responsible for documenting the absence of habitat if he is claiming the 1000-foot exemption? And does this have to be certified by FWS, EPA or another authority?
- How is 1000 feet measured (e.g., from the center of a field, from the corners, from each edge)? **We suggest that EPA provide tools such as GPS maps that delineate protected habitats, or conversely, areas that would be exempted.**
- **Clarity is also needed on the definition for terrestrial habitat.** Whereas earlier in the framework document EPA appears to broadly say that any terrestrial areas except for agricultural fields are considered to be "terrestrial habitat," later in the document exceptions are provided for *"… roads …, mowed grassy areas adjacent to fields, … areas of bare ground … contiguous with the treated area; … areas occupied by a building and its perimeter … or other man-made structure with walls and/or roof; … areas maintained for runoff or drift control; and, Conservation Reserve Program (CRP) and Agricultural Conservation Easement Program (ACEP) areas."*

<u>Subsurface Drainage Tiles</u>

Responses to our survey suggest that at least a small percentage of fields may qualify for this exemption. 15% of survey respondents indicated a definite "Yes" to subsurface drainage tiles and an additional 26% indicated that this condition "might" apply. We expect this is an overestimate of fields that would fully qualify by releasing effluent into saturation buffers or collecting it in a water retention system. Growers and PCAs we spoke with indicated that subsurface drainage tiles are mainly installed on certain fields in areas with a high watertable or in cases where there are heavy soils and potential for hard rain, in order to reduce runoff and soil erosion.

Installation of subsurface drainage tiles would be a very significant financial investment for growers.

<u>Conservation programs and recommendations</u>

The EPA has indicated that, potentially, many federal, state and local conservation programs could qualify a grower for this exemption. We asked survey participants to identify (write-in) the names of conservation programs they use. Only two programs were mentioned by name, although several participants took the time to list conservation *practices* they routinely use (shared further down). The programs mentioned were:

- USDA-NRCS Environmental Quality Incentives Program (EQIP)
- Arizona Department of Water Resources Best Management Practices Program (AZ DWR BMP)

When the possibility of this exemption was mentioned at a discussion with stakeholders, including leadership from some state agricultural associations, there was an immediate buzz in the room. Many of the comments and ideas generated are captured below:

- A lot of Arizona growers already work with NRCS on soil and water conservation practices. This is "very commonly done." Many growers obtain grant funding to work with NRCS to improve soil and water conservation practices through the development of a farm plan. Anyone who wants to put in a new ditch is required to work with NRCS. The

state NRCS office has a very networked relationship with growers statewide. **How can a grower verify whether specific interactions with NRCS qualify them for the exemption?**

- **If a grower is working with NRCS and has developed a farm plan, would all fields on the farm be covered by this exemption?** For example, NRCS may recommend changes or practices to some fields on a farm but determine that no changes are needed on a different field. **If a grower is spraying the "unimproved" field, which was deemed sufficient in the NRCS review, would the grower qualify for this exemption?**
- What is needed is a third-party state training and certification program that would verify grower compliance with soil and water conservation practices to a sufficient level to qualify for the exemption. NRCS may be a natural fit for this certification. Apart from NRCS, several other possibilities were mentioned.
    - Arizona Cotton Growers Association is considering the possibility of a collaboration with University of Arizona Extension Specialists who would be qualified to develop standards for the cotton industry that would meet EPA requirements. Perhaps a program like this could work more broadly across a range of crops.
    - The University of Arizona Water Efficiency Program (mentioned above under Irrigation Water Management) provides grants and expertise to growers to install water conserving irrigation systems.
    - The Arizona Department of Agriculture (ADA, state lead agency) runs an Agricultural Consultation and Training Program, a non-regulatory program within ADA. They provide (or have in the past provided) trainings and certification for Worker Protection Standard and for dust management (PM10 program). It was suggested that this office of ADA could have a professional trained by NRCS to interact with the growers to review and certify their fields and farms for compliance with EPA standards for soil and water conservation practices.
    - Another option mentioned was third-party industry certification. An example was provided of an industry consultant who provides hydrology advice to growers.
    - It was commented that these options may all be redundant with what NRCS already provides.
- From the perspective of a PCA or grower: Most growers already comply with many of these conservation practices but could fall short of the requirements of a full program that would qualify for the exemption. If there is a third-party service that determines whether a grower's fields 'fully comply' or 'partially comply' with the exemption requirements, might it be an option that that the service provides the grower with a baseline number of points for each 'partially compliant' field, limiting the number of additional mitigation points needed to spray a particular herbicide? (Fully compliant fields would qualify for the exemption.) The existing PM10 management program in Arizona, administered by the Arizona Department of Agriculture, works something like this, and could provide a framework for this kind of approach.
- We urge EPA to allow a broad range of entities and technical experts to develop conservation plans, including the Natural Resources Conservation Service (NRCS), state departments of agriculture, university extension, and certified crop consultants, to ensure plans are completed in a timely manner for growers across the state.

Stakeholder comments about conservation practices they routinely use

Below are listed most of the comments made by survey participants about conservation practices they use. We recognize that many of these are eligible for points under the Mitigation Menu. We think it is valuable for EPA to hear from the growers and farming professionals in their own words on this topic.

- We use all laser leveled fields, with tailwater collected in tail water ditches. We utilize drift control nozzles and practice current best management practices that already work
- Planting into a cover crop and using sprinklers to irrigate
- We farm in an arid/desert climate. Most if not all of our fields are drip, flood or furrow irrigated. Most of our fields are laser leveled and have little to zero slope. Rainfall in our desert farming areas is low (less than 10" per year) and erosion and runoff are not a general issue here.
- I currently use winter cover cropping systems to rebuild flood irrigated soils and I have little to no runoff even after a heavy tillage event. In addition, since my soils have rebuilt their organic matter, the water holding characteristics do not allow for run off until the soil is completely saturated.
- Pivot irrigation and subsurface drip result in very little runoff of irrigation water when managed correctly. Also, our area does not have the runoff potential, little rainfall, that other areas do.
- Laser levelling slows down water velocity and reduces runoff and erosion.
- Most of these [mitigations] do not apply to desert agriculture
- We do not have any tail water or runoff water. All water is contained within the field. It would seem this should be an exemption [from the need for additional mitigations]

Bulletins Live! Two

While conducting the survey and interacting with growers and PCAs, we took the opportunity to collect information on their awareness of and interactions with the Bulletins Live! Two (BLT) website for obtaining Endangered Species Bulletins.

Survey Results

Only 39% of respondents had heard of BLT prior to completing the survey.

We asked, “What concerns do you have about using BLT?” Results are summarized below along with additional comments.

It is difficult to find the BLT platform using the link on a pesticide label	32%
Applicators or others using BLT may require languages other than English	28%
I'm concerned the mitigation language on BLT will be too confusing	44%
I have difficulties accessing or using computers or the internet	24%
My only access to the internet is through a mobile device	24%
I don’t understand the record-keeping requirements	16%
I use custom applicators and don’t think this applies to me	36%
Other (please specify)	16%

Other Survey Comments:

- I don't have confidence in the website being kept up to date, especially when endangered species may no longer be in the area.
- Adding more layers of complexity to accomplish a job does not inherently make it a higher quality finished product.
- It is an extension of the label that basically is a living document that can change at any point, requiring the applicator to constantly be looking for updates.
- Chemical search option is limited to the EPA Reg number. It should be possible to search based on product name.

Comments from discussions with growers and PCAs:

- The last point on the survey comments was echoed by participants in our discussions with growers and PCAs. **It was suggested that typing the product name could result in a drop-down menu of registered products from which the user would select the applicable product.**
- Participants also stressed the need for a Spanish language version of BLT.
- There is a need for the BLT system to interface directly with agricultural data services like Agrian and CDMS (mentioned above). This would allow a PCA working in the field and writing up a herbicide recommendation to directly connect to BLT and obtain the required Endangered Species Bulletin. These systems are already designed to provide a printable PDF of the product label at the time of the application, which is kept with the grower's records. Making BLT accessible through these systems would allow the PCA / grower to also print the Endangered Species Bulletin with applicable pesticide use limitations for their records. Without this linkage, extra work and time needs to be invested by the PCA, who works with many grower clients.
- Another suggestion was that BLT should provide optional notifications to users who wish to be alerted when new information is added to the website. Notifications could be narrowed down based on county or Zip Code, to minimize irrelevant updates for users.

Additional Stakeholder Comments

Additional Survey Comments

- Planting and maintenance of cover crops is costly, especially in water deficient desert areas. Irrigating crops with sprinklers/micro sprinklers/drip which is becoming more widespread should make runoff and erosion issues a non-factor throughout much of Arizona.
- The loss of chemistries like diuron would have a major impact on our cotton and alfalfa growing decisions. This would also cause quality issues which would lead to a lower valuation to the grower for their commodities.

Other Comments and Questions from Stakeholders

Implementation of mitigations. Growers, PCAs and state agriculture associations expressed concern over the complexity of implementation of the herbicide Strategy practices and mitigations. Some elements of the Strategy seem to lack sufficient clarity, leaving growers or

PCAs responsible for implementation in uncertain territory. One stakeholder complained, "this is a massive regulation with many components and documents that potentially are being interpreted individually by everyone who is involved. What is needed is clarity on the specifics of the regulation, then enough response time to get all parties trained on how to comply. [The information presented in the Strategy] is not centralized. There needs to be a straightforward set of guidelines that is easy for users to follow."

For this program to be effective and to attain EPA's goals of early mitigations for listed species, the diverse elements and requirements should be streamlined as much as possible. For example, currently a PCA using Agrian or a similar service can feel confident that they are in compliance with all legal requirements. Also, all pest management data is handled in a streamline process (online tool) that makes the compliance determination. However, the different information required to adequately assess compliance with EPA's proposed strategy is diverse, and in many cases it is unclear where the information can be found (such as how to confirm locations of critical habitats relative to a grower's field). PCAs will need to determine mitigation points for a specific application on a field-by-field basis, all of which would have to occur outside of the data management tools (at least initially). **EPA must strive to make the requirements more "black and white," and should place all needed resources and information at the fingertips of those responsible for implementation.** This will be critical to successful implementation of the Strategy.

Obviously, it will take time and resources to educate all parties in the agricultural community about the requirements, and to establish statewide procedures for third-party certifications,

Liability. Stakeholders expressed concerns and questions around "who is responsible" for ensuring compliance. This is again why some sort of third-party system for (a) determining whether a grower is exempt from the Mitigation Menu requirements and (b) determining qualifying points is so important. Liability is the main reason why so many Arizona companies use services like Agrian. As part of a food safety plan for fresh produce, these data management programs are a requirement to help monitor compliance.

Compliance and Enforcement. We had only a brief conversation with the state lead agency about the Herbicide Strategy, which raised several questions about compliance monitoring and enforcement. It was commented that it would be difficult for regulators to monitor compliance and it would be difficult for an applicator to know enough about field conditions, etc., to know whether a particular herbicide application would be in compliance with the Mitigation Menu. Arizona Department of Agriculture staff also commented on the need to update their own educational documents and guidelines that currently support compliance.

We are also concerned about how state regulators with primacy for enforcing the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) will enforce such a complex set of regulations. Many state regulatory agencies are already faced with resource constraints, and Arizona Department of Agriculture is no exception. A new and complex regulatory regime for herbicide application would undoubtedly require that additional resources related to monitoring and enforcement be put into place. **We suggest that EPA clarify how it intends to work with state regulators to address these issues.**

Who We Are

The Arizona Pest Management Center (APMC) 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.

Dr. Al Fournier is Associate Director of the APMC / Associate Specialist in Entomology, holds a Ph.D. in Entomology, and has expertise in evaluating adoption and impact of integrated pest management and associated technologies. He serves as an Integrated Pest Management Network Coordinator through the Western IPM Center Signature Program, representing stakeholders in the desert Southwest states in EPA registration reviews. Dr. Peter Ellsworth is Director of the APMC, State IPM Coordinator for Arizona and Professor of Entomology / Extension IPM Specialist with expertise in developing IPM systems in cotton and other crops and measuring implementation and impact of IPM and pest management practices.

These comments are the independent assessment of the authors and the Arizona Pest Management Center as part of our role to contribute federal comments on issues of pest management importance and do not imply endorsement by the University of Arizona or USDA of any products, services, or organizations mentioned, shown, or indirectly implied in this document.

Our Data and Expert Information

Through cooperative agreements with Arizona Department of Agriculture, the Arizona Pest Management Center obtains use of, improves upon, and conducts studies with ADA's Form1080 data. Growers, pest control advisors and 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. Grower self-applied pesticide applications may be under-represented in these data. In addition, we actively solicit input from stakeholders in Arizona and other Southwest states (Nevada, Colorado, New Mexico and Southeastern California), including those in the regulated user community, particularly to better understand use patterns, use benefits, and availability and efficacy of alternatives. The comments within are based on the extensive data contained in the Arizona Pest Management Center Pesticide Use Database, collected summary input from stakeholders and the expertise of APMC member faculty.

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