CENTER for BIOLOGICAL DIVERSITY Because life is good.

April 4, 2025

OPP Docket
Environmental Protection Agency Docket Center (EPA/DC), (28221T)
1200 Pennsylvania Ave. NW.
Washington, DC 20460-0001

Re: Comments on the EPA's proposed updates to the mitigation in the interim registration review decision for atrazine (Docket #: EPA-HQ-OPP-2013-0266)

Please accept the following comments on behalf of the Center for Biological Diversity ("Center") in response to the Environmental Protection Agency's ("EPA") Proposed Revisions to the Atrazine Interim Registration Review Decision Memorandum.

The Center is a non-profit environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has 1.7 million members and online activists dedicated to the protection and restoration of endangered species and wild places. The Center has worked for many years to protect imperiled plants and wildlife, open space, air and water quality, and overall quality of life. The Center's Pesticides Reduction Campaign aims to secure programmatic changes in the pesticide registration process and to stop toxic pesticides from contaminating fish and wildlife habitats.

We appreciate the opportunity to provide comment.

Atrazine is the second most widely used pesticide in the United States with roughly 70 million pounds being sprayed every year, mostly in the Midwest. Atrazine is a known hormone-disrupting pesticide linked to birth defects, multiple cancers, and fertility issues, such as low sperm count and irregular menstrual cycles. Atrazine is one of the most widespread pesticide water contaminants in the country, causing devastating environmental harms, particularly to aquatic species such as frogs and fish.

In 2020, the agency reapproved atrazine in a process called registration review. Following that, the EPA decided to reevaluate its water-quality benchmark for aquatic wildlife and update its reapproval with the findings of this reevaluation.

We are now in the second iteration of that reevaluation. The first iteration occurred in 2022, where EPA confirmed the findings of its 2016 ecological risk assessment that the Concentration Equivalent Level of Concern (CE-LOC) equaled 3.4 parts-per-billion ("ppb") averaged over 60

days. The CE-LOC is the threshold concentration of atrazine that the agency believes to demarcate safety to aquatic wildlife – above which is harmful and below which is safe.

EPA has now proposed to raise its previously proposed CE-LOC from 3.4 ppb to 9.7 ppb in an endlessly tiring charade of scientific analysis followed by industry temper tantrums and ultimate cowering by the EPA in a manner that harms public health, water quality and the broader environment. Notably this one change has resulted in 6,832 impaired watersheds throughout the country to be reclassified as being below the CE-LOC and no longer subject to any runoff mitigation (see Supplemental File A, Sheet 1). That is 8% of all the watersheds in the continental U.S. that just incorrectly got a clean bill of health.

We could spend 100 pages outlining why the EPA's weakening of the CE-LOC and changes to its proposed mitigation plan in 2022 to the current day are unlawful. But the fact of the matter is, we did not believe the agency's previous proposal was lawful and we will play no part in defending that plan. Both proposals failed in their purpose. More importantly, both of EPA's proposals only focus on the highly specific aspect of the CE-LOC and subsequent mitigation, leaving an unlawful interim decision largely untouched.

While we appreciate the EPA's work to try to reduce the harm from atrazine through a proposed "pick list" mitigation plan and a modest annual application rate reduction, this plan is not even close to sufficient to reverse the Interim Registration Decision's violations of the Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA"), the Endangered Species Act ("ESA") and the Federal Food, Drug, and Cosmetic Act ("FFDCA").

What has been overlooked in every single attempt to "fix" the atrazine problem that EPA has released to date is the sheer enormity of the problem. Even with the less-protective CE-LOC EPA is proposing, atrazine contamination is so widespread that dangerous levels of the pesticide are predicted in waterways in 11,249 U.S. watersheds. 11,249 watersheds out of 82,921 watersheds in the continental U.S. **That is 1/8th of the landmass of the entire continental U.S.** The contaminated areas include about 20% of all land used for U.S. agriculture – roughly 250 million acres feeding into contaminated waterways throughout the country. 84% and 88% of watersheds in the entire states of Iowa and Illinois do not meet EPA's proposed water quality standard. That is frightening.

We are unaware of another pesticide water contaminant that is this widespread. But EPA does not even mention this or attempt to provide the public with an idea of the scale of harm that is happening here. Regardless of whether it is the position of the agency at large that the purported "benefits" of atrazine outweigh the immense harms, we have to believe that many individuals at the agency are absolutely disgusted and horrified by what they see happening here.

Given the scale of harm, the specifics of EPA's mitigation plan are all that more important. However, the EPA's proposed mitigation plan is sorely inadequate, the mitigation menu is unvetted

and will be ineffective at reducing runoff, the agency's new CE-LOC is highly under-protective, and the proposed changes from the 2022 mitigation proposal are unjustified and will result in more illegal harm.

Importantly, in these comments we show quantitatively that EPA's proposed atrazine mitigation plan is completely hollow – resulting in just 1% of contaminated watersheds to drop below the proposed CE-LOC of 9.7 ppb averaged over 60 days. Additionally, we also present a granular analysis of runoff-vulnerable fields in Illinois and find that, even at the individual field-level, EPA's proposed runoff mitigation plan would not reduce atrazine runoff in 99.9% of these fields.

This is mainly a function of the low number of atrazine users who would be impacted by the EPA's proposed annual rate reductions and a runoff mitigation menu that is littered with so many exemptions as to be wholly ineffective. It's smoke and mirrors – it has the guise of looking like a decent mitigation plan, but when the haze dissipates you realize that there is nothing there.

It's noteworthy that EPA never attempted this quantification itself. We did our national-level analysis with information EPA has available. In fact, almost all of the information used in this analysis was compiled by the agency for its "benefits" analysis, and the rest was easily attained through other sources. This is an analysis the agency could have *easily* conducted but chose not to.

For many of the pesticides that the EPA has jurisdiction over, we believe that changes to the pesticide label can be sufficient to reduce environmental harm to within acceptable levels. However, in the case of atrazine, no label changes will be sufficient. For the last 20-30 years, the EPA has been gradually restricting the atrazine label by classifying it as a Restricted Use Pesticide, reducing the maximum labeled corn use rate from 4 lbs a.i./A to 2.5 lbs a.i./A, prohibiting chemigation, prohibiting use near wells and water sources, and prohibiting use on certain crops under the assumption that simply imposing stricter label requirements on atrazine is sufficient to ensure that it can be used safely.[1]

Once again, the EPA has found with an updated analysis that *all of the previous label changes combined* were still not enough to mitigate the harm done by atrazine. This is a recurring theme with atrazine: slap on some inadequate mitigations and later find they are not working, then repeat over and over and over again. There is a reason it's banned in 60 countries throughout the world: because, in order for atrazine <u>not</u> to destroy water quality, one would have to use it at levels that are so low that the pesticide would no longer be effective at managing weeds. This is the inherent problem with atrazine. Keeping it out of the water is impossible, and once it's in the water it sticks around for a very long time.

[1] Meeting of the FIFRA Scientific Advisory Panel on the Problem Formulation for the Environmental Fate and Ecological Risk Assessment for Atrazine. June 12-15, 2012. Document ID EPA-HQ-OPP-2012-0230-0005. Pg 7.

EPA simply cannot mitigate a pesticide that is destructive in the very low ppb concentration, persists in the environment for a decade or longer, and is used at a level of 70 million pounds per year. It can't be done. And we're genuinely perplexed by the attempt to do so.

For these reasons, and many more, we once again urge the agency to ban atrazine.

To the extent that EPA is not considering banning any uses of atrazine at this time, we offer the below comments to be constructive in the hopes of making a wholly insufficient plan a little less terrible. We also note that any effort to backtrack from the already insufficient plan, even in the face of overwhelming pressure from industry, will be strongly opposed.

Below we offer comments on EPA's current proposal.

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1) EPA's Atrazine Runoff Mitigation Plan is Ineffective and Will Not Appreciably Reduce Atrazine Concentrations in Surface Water

In EPA's Updated Mitigation Proposal for the Atrazine Interim Registration Review Decision,[2] EPA has proposed to implement four separate mitigations the agency believes will reduce atrazine runoff:[3]

[2] EPA. Updated Mitigation Proposal for the Atrazine Interim Registration Review Decision, Case Number 0062. 11/20/2024. Found here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2135. Hereafter "Updated Mitigation Proposal"
[3] Updated Mitigation Proposal at 12-13.

1) Restrict maximum annual application rates for:
   - sorghum, field corn, and sweet corn to 2.0 lbs ai/A/year or less for applications
   - sugarcane to 8.0 lbs a.i./acre in Florida and 4.0 lbs a.i./acre in Louisiana and Texas
2) Prohibit application during rain.
3) Prohibit when soils are saturated or above field capacity.
4) Users must visit a website to determine if their field falls within a Bin that requires runoff mitigation:
   - If in Bin 1, applicators must have achieved 3 points prior to making an application.
   - If in Bin 2, applicators must have achieved 6 points prior to making an application.

This is similar to, but has many key differences, from the mitigation plan EPA proposed in 2022.[4] Those key differences include:

a. The 2022 proposal prohibited atrazine application when a runoff-producing rain event was forecast in the next 48 hours, which is not included in the current proposal.
b. The 2022 proposal prohibited aerial application of all atrazine formulations, which is not included in the current proposal.
c. The 2022 proposal implemented mandatory record-keeping measures, which is not included in the current proposal.
d. The 2022 proposal included a mitigation menu that contained 12 options for runoff reduction, while the current proposal offers a mitigation menu with more than 40 options of mitigations and exemptions.

In its support for the 2022 revisions to the atrazine interim decision, the EPA concluded:

> "While the mitigation measures have varying degrees of effectiveness, EPA expects that employing mitigation measures will ***decrease atrazine concentrations to levels near or below the CE-LOC*** of 3.4 µg/L, thus lessening the risk to the aquatic ecosystem."[5]

Since EPA's current assessment of the benefits of atrazine has not changed since its 2022 conclusions (the agency provided no additional benefits analysis and stated that the most up-to-date benefits assessment was conducted in 2022[6]), we take this to indicate that the agency's expected mitigation outcome would remain the same as well. Since the expected mitigation outcome relies on the balancing of costs and benefits – and since EPA has not indicated or provided any support that the costs and benefits have changed – there would be no reason to indicate that the expected mitigation outcome has shifted significantly.

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[4] EPA. Proposed Revisions to the Atrazine Interim Registration Review Decision, Case Number 0062. June 23, 2022. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1625. Hereafter "Proposed Revisions."
[5] EPA. EFED Support Documentation for the Proposed Revisions to the Atrazine Interim Registration Review Decision Regarding Risks to Aquatic Plant Communities. June 23, 2022. Pages 9-10. Emphasis added. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1623. Hereafter "EFED Support Document."
[6] Proposed Revisions. Page 8.

Since the CE-LOC has increased from 3.4 µg/L to 9.7 µg/L, the agency's position should, therefore, be that the current runoff mitigation plan would be expected to decrease atrazine levels to near or below the current CE-LOC of 9.7 µg/L.

The need to reduce atrazine levels to near or below the CE-LOC would make sense given the enormous significance the EPA has placed on the CE-LOC value. According to EPA, "exceedances of the CE-LOC are considered far more meaningful than exceedances for any single aquatic plant species" and by protecting plant populations and not just individual plants "it is intended to also provide protection for the entire aquatic ecosystem, including fish, invertebrates, and amphibians."[7]

EPA further states that: "The mitigation focus on toxicity to aquatic plant communities is needed to ensure that atrazine concentrations in watersheds do not cause significant changes in plant community structure, function and productivity and thus put at risk the food chain with potential effects on the entire aquatic ecosystem including reduced biological diversity, reduced food items for fish, birds, and mammals, reductions in spawning and nursery habitat, increased erodibility, and reduction in overall water quality."[8]

The CE-LOC is not simply a safety threshold for a single species, it is a safety threshold for entire aquatic ecosystems throughout the U.S. Therefore, bringing waterways into compliance with this water standard is enormously important.

Despite EPA's past statements on the ecosystem-wide implications of the CE-LOC, the agency has provided no quantification of how it believes atrazine runoff will be reduced following the implementation of its current proposal. And in the 2022 proposal, the agency only indicated that atrazine levels would be reduced to levels near or below the CE-LOC without providing scientific support for how that would be achieved.

Here, we have conducted this quantification. For our analysis we sought to determine how effective EPA's current atrazine runoff reduction plan would be in practice. While some atrazine users may have implemented practices meant to reduce atrazine runoff, current atrazine use and crop production practices are wholly insufficient to reduce atrazine runoff to levels that are not highly damaging to aquatic wildlife, water quality and the broader environment. Therefore, a successful runoff mitigation plan requires significant changes in atrazine use and crop production practices because the practices currently in place are entirely inadequate by themselves.

We calculated how much atrazine runoff would be achieved with the proposed rate reduction in corn and sugarcane combined with the proposed Bin 1 and Bin 2 mitigations, based on information collected by the EPA, USDA and the pesticide industry on current atrazine use and crop production practices (Appendix A).

We found that the EPA's proposed plan to reduce atrazine runoff will only result in waterways in an estimated 123 of the 11,249 contaminated watersheds (1%) to drop below the CE-LOC (Appendix

[7] Updated Mitigation Proposal at 4.
[8] Proposed Revisions. Page 14.

A, Supplemental Files A and B). This means that 99% of the nation's lakes, rivers and streams predicted to have dangerous levels of atrazine would remain harmful to aquatic wildlife following EPA's proposed runoff reduction plan.

Waterways in each atrazine-impaired watershed would only see atrazine concentrations reduced between 2% and 6% after the EPA's proposal is implemented — not nearly enough of a reduction to meaningfully impact atrazine levels in contaminated waterways. Following implementation of the EPA's proposal, 70% of atrazine-impaired waterways would still have predicted concentrations twice as high as the CE-LOC; 30% would have predicted atrazine concentrations five times higher than the CE-LOC.

Our analysis concludes that the EPA's proposed plan to reduce atrazine runoff will be completely ineffective at protecting wildlife and will do very little to lower the levels of atrazine pollution in waterways across the country (Appendix A, Supplemental Files A and B).

2) Individual Fields Highly Vulnerable to Runoff are Not Addressed by EPA's Proposed Mitigation Plan

In addition to our main comments, the Center has submitted supplemental comments[9] to the atrazine docket containing a GIS analysis of the proximity of corn/soy rotation fields to waterways in three representative counties in Illinois, one drinking water supply lake watershed in Illinois, and along the border of every drinking water lake in Illinois.

In this relatively small footprint, 948 parcels growing corn or soybean (a common rotational partner with corn) were identified that either have a cropped area within 66 ft of rivers/streams or are cropped within 200 ft of lakes/reservoirs. These are the currently required no-spray buffers for atrazine from surface water[10] and these buffer values were used as a measure of proximity to surface water that would likely make these fields particularly vulnerable to atrazine runoff if the herbicide were used on these fields.

Of these 948 parcels where corn/soy was cropped in close proximity to surface water, 820 parcels had 1428 sites where the cropped area is <66 ft from the nexus where runoff enters streams or rivers (see supplemental comments submitted by the Center for Biological Diversity and associated excel file). The remaining 128 parcels are cropped within 200 ft of a drinking water lake shoreline

[9] Supplemental comments were submitted separately to the atrazine docket and accompanied by an excel spreadsheet entitled "parcel details and point calculations" and 950 pdf files that document characteristics of each parcel. Tracking number: m8v-skqe-835l.

[10] See current label for Acuron here: https://www3.epa.gov/pesticides/chem_search/ppls/000100-01466-20211110.pdf; and current label for AAtrex nine-o here: https://www3.epa.gov/pesticides/chem_search/ppls/000100-00585-20211110.pdf.

Given the high use of atrazine on corn in Illinois (estimated at 90%[11]), the noted erosion adjacent to many of these fields, evidence of considerable channel runoff within many of these fields, and/or the presence of culverts/spillways that bypass filter strips in many of these fields, it is likely that many of these fields are a considerable source of atrazine in nearby surface water.

Below are a few examples of what real Illinois corn fields and runoff scenarios look like in practice:

Parcel 1: A spillway in Champaign County directly adjacent to a cropped field. All of the runoff from this field is clearly going directly to this point where there is no buffer and dumps directly into the water, as evidenced by the crop residue float lines highlighted in red.

[11] Weed Science Society of America. Draft Endangered Species Act Biological Evaluations: Atrazine, Simazine, and Propazine Registration Review. See intra letter written by Aaron Hager in the Department of Crop Sciences University of Illinois. Available here: https://wssa.net/wp-content/uploads/WSSA-comments-on-Triazine-BEs_Final.pdf.

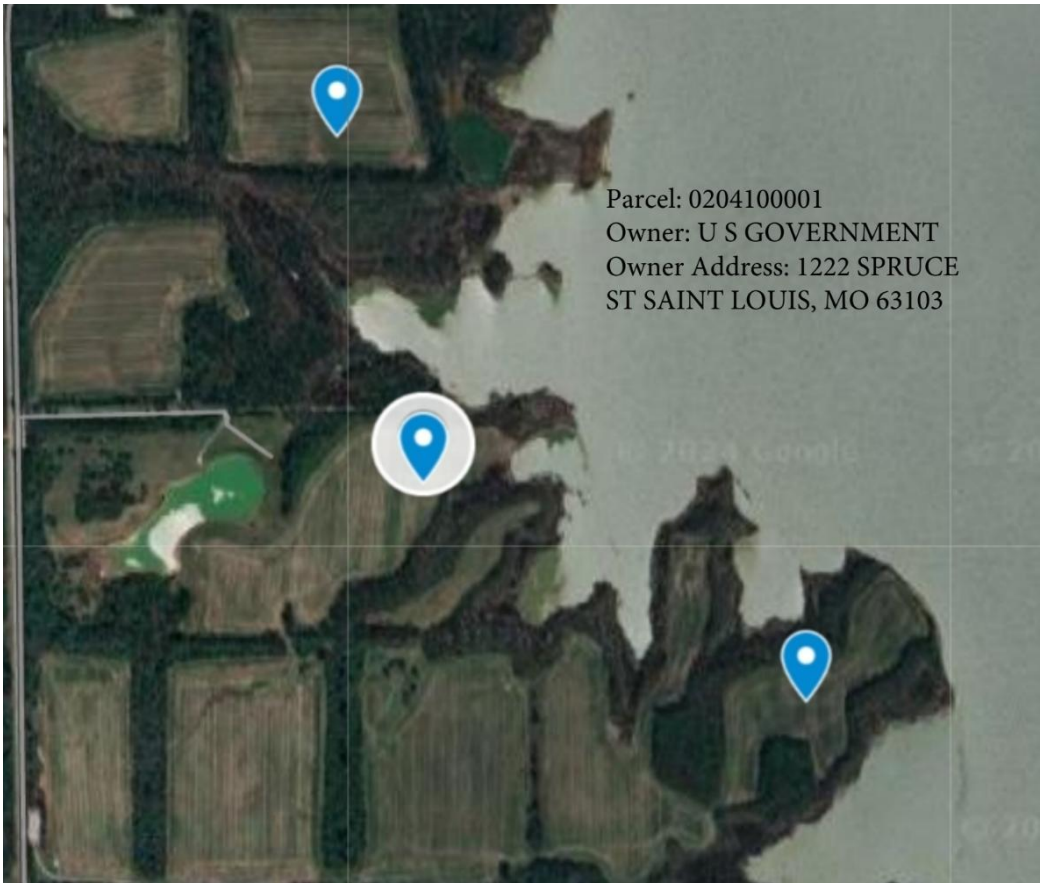
Parcel 2: A channel has been formed on this field in Piatt County where all of the runoff is directed into the nearby waterway. Despite there being a non-cropped buffer along the waterway, a culvert directs the water from the beginning edge of the buffer directly into the waterway, bypassing the buffer.

Parcel 3: A culvert in the middle of a cropped field in Piatt County directs runoff directly into a nearby waterway, bypassing a modest non-cropped buffer.

Parcel 4: A culvert at the edge of a field in Champaign County collects runoff and dumps directly into a nearby waterway, bypassing a non-cropped buffer.

Parcel 5: Channel flow from a corn/soy field in the Lake Springfield watershed dumps directly into a nearby spillway, with the resulting erosion essentially bypassing a modest non-cropped buffer.

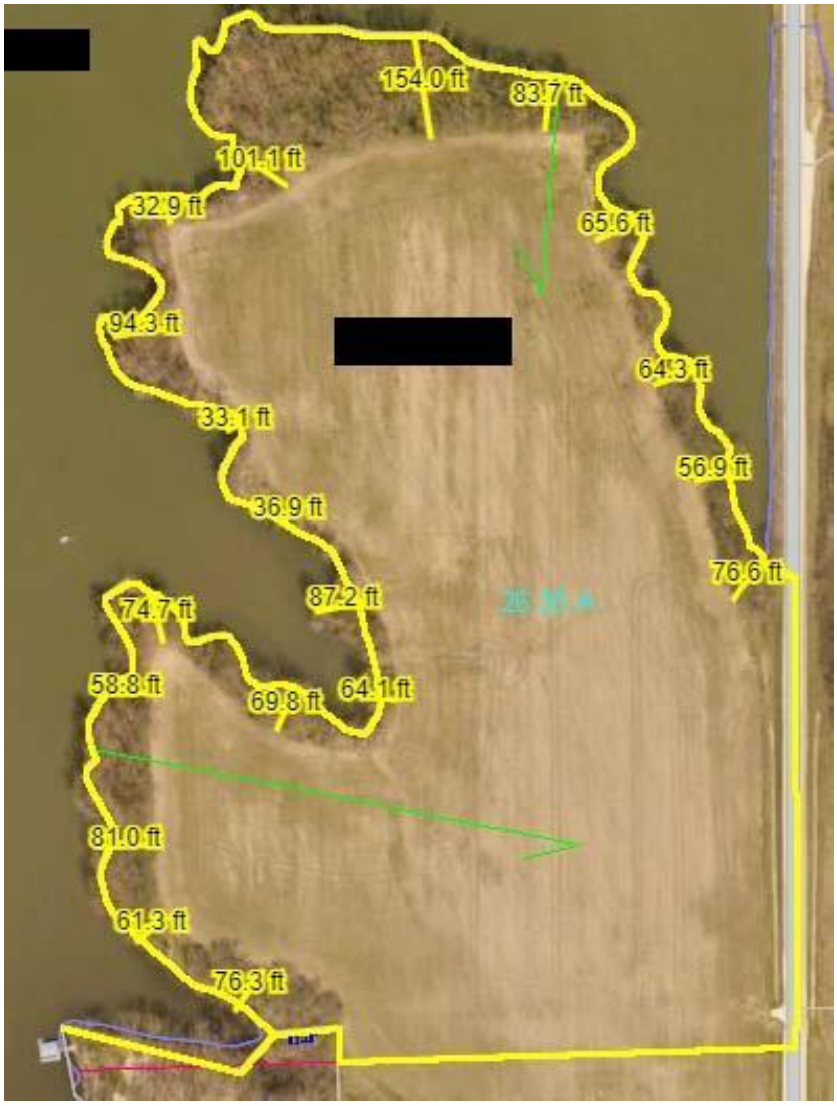
Parcel 6: A culvert at the edge of a corn/soy field in the Lake Springfield watershed has runoff leaving the field in channel flow, bypassing the buffered area and dumping directly into a nearby waterway.



Parcel 7: Federal government-owned land with corn/soy cropped as close as 70ft from Rend Lake, a lake used for drinking water.

Parcel 8: Corn/soy field cropped within less than 100 ft of Lake Mattoon, a drinking water lake in Illinois.

Parcel 9: A corn/soy field on a peninsula on Lake Mattoon, a drinking water lake in Illinois. The peninsula is only 300 ft across, leaving only a modest non-cropped buffer between the crop and water edge.



Parcel 10: A corn/soy field on East Fork Lake, a drinking water lake in Illinois. There is less than a 200 ft buffer between the crop and drinking water along the entire bank of the lake.

Parcel 11: Significant erosion at the edge of a corn/soy field in the Lake Springfield watershed has runoff leaving the field in channel flow, eroding a tight channel through the buffered area and dumping directly into a nearby waterway

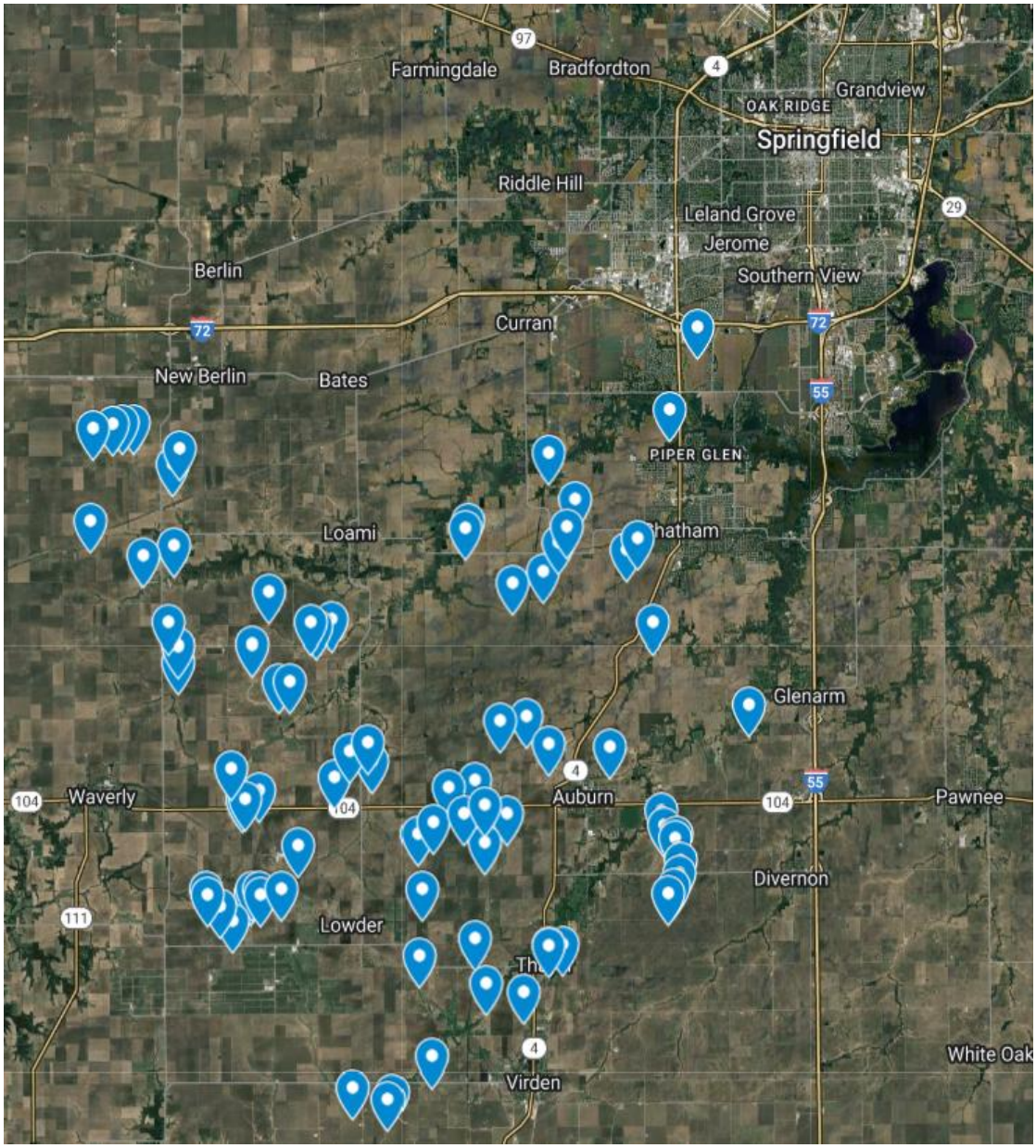
Parcel 12: High velocity runoff at the edge of a corn/soy field in the Lake Springfield watershed. This field has runoff leaving in channel flow at 2 sites (circled), appearing to run at relatively high velocity and pushing through the buffered area directly into a nearby waterway.

Parcel 13: A channel has formed on the edge of a cropped field in Piatt County where runoff from the field is directed into a spillway that bypasses the existing buffer strip and dumps directly into a nearby waterway.

Parcel 14: A relatively high velocity channel flow directs runoff to the edge of a field in Champaign County where it dumps directly into a nearby waterway.

Parcel 15: A channel has formed on the edge of a cropped field in McLean County where runoff from the field is directed into an eroded ditch that has gouged a channel through the existing buffer strip and dumps directly into a nearby waterway.

Map of parcels that have corn/soy cropped within 200 ft of Lake Mattoon, a drinking water lake in Illinois. Each blue marker is a field that is cropped within 200 ft of the Lake (27 in total).



Map of 83 parcels that have corn/soy cropped within 66 ft of a river or stream in the watershed of Lake Springfield, a reservoir that supplies water to 150,000 people in Illinois (the large body of water south of Springfield on the map). Each blue marker is a field that is cropped within 66 ft of a stream or river that flows into Lake Springfield.

The parcel pictures above represent just 15 of the 948 parcels that were identified as the most runoff-vulnerable fields in these Illinois counties. 948 PDF files containing pictures of each parcel were submitted to EPA with our supplemental comments.

Despite the vulnerability of these fields to atrazine runoff, 99.9% of them (947 out of 948) are eligible for at least 6 points from EPA's runoff mitigation menu *without requiring any changes in pesticide use or crop production* (see supplemental comments submitted by the Center for Biological Diversity and associated excel file). This means that for all but one of these highly

vulnerable runoff fields, EPA's proposed mitigation plan *would require no further mitigation* – even in watersheds where atrazine levels are >4 times higher than the CE-LOC (45.4 ppb). Every single one of the 15 parcels that are pictured above would not have to change anything under EPA's proposed mitigation plan.

Even more astounding, 98% of these runoff-vulnerable fields can attain 9 or more points just based on current crop production, land characteristics and pesticide use practices (see supplemental comments submitted by the Center for Biological Diversity and associated excel file). This means that 98% of these runoff-vulnerable parcels could remove a mitigation – like remove a 60 ft filter strip, stop cover cropping, or start irrigating their crops – and *still* be compliant with EPA's proposed runoff mitigation point system.

The fact that EPA's proposed runoff mitigation plan states that it "is expected to reduce potential risks of concern to aquatic plant communities in vulnerable watersheds"[12], yet requires no further mitigation in 99.9% of the most vulnerable parcels to runoff that have been identified in 3 different Illinois counties indicates that this plan is hollow.

Therefore, we conclude that 1) fields vulnerable to runoff are common in impacted watersheds in the assessed area in Illinois, and 2) EPA's proposed runoff mitigation plan would have little to no impact on CE-LOC exceedances in these Illinois regions.

In Section 1 and Appendix A we showed that EPA's proposed runoff mitigation plan will not appreciably bring down atrazine levels in impacted watersheds at the national, aggregated level. In this Section and in supplemental comments, we've presented evidence, at the granular, field-level, that this proposed mitigation plan will not appreciably reduce runoff within a few highly impacted watersheds.

3) EPA's Current Version of the Mitigation Menu has Not Been Vetted, and Input from All Stakeholders has Not Been Incorporated

As mentioned in its Updated Proposal, EPA's proposed mitigation menu to reduce atrazine runoff is the same mitigation menu that the agency has developed as part of its Herbicide Strategy to increase the efficiency of the Agency's ESA obligations.[13]

The Center for Biological Diversity has been one of the primary stakeholders involved in the development of EPA's Herbicide Strategy and all ongoing efforts to aid the agency in its ESA obligations. We appreciate the effort and the progress the agency has made on the Herbicide

[12] Updated Mitigation Proposal at 18.
[13] Updated Mitigation Proposal at 8-9.

Strategy. We commented extensively on the draft Herbicide Strategy, including the original mitigation menu, when the agency solicited comments in July of 2023.

When the agency released its draft Herbicide Strategy for public comment in 2023, the proposed mitigation menu was very different than what it is currently. Following public comments, the agency decided to update its mitigation menu in October of 2024.[14] The updates were aimed at providing flexibility for pesticide users and reducing the "burden" on pesticide users by "revisiting" how the agency calculated efficacy points associated with each mitigation/exemption option in the menu.[15] These changes followed extensive outreach by EPA to stakeholders representing agricultural interests at industry- and USDA-hosted workshops.[16]

In the initial draft Herbicide Strategy that the agency solicited comments on, the original mitigation menu looked very different and made very different assumptions about the efficacy of different mitigation options.[17] For instance, many new mitigation options were added in the updated menu, and many of the original options achieved a much greater number of points in the new menu (assumed to have greater efficacy than originally identified).[18] The new mitigation menu is significantly and objectively more permissive and less protective than the original mitigation menu that was released for public comment.

We are not aware of any change in this new menu that provided an additional level of protection for wildlife or water resources. The changes were overwhelmingly one-sided. It is clear the EPA's intention with this mitigation menu update was to reduce opposition from pesticide users. We highlight this fact because, as this mitigation menu gets used in additional contexts outside of the ESA (as it is here), how it was developed becomes much more important.

We strongly oppose any use of this updated runoff mitigation menu in mitigation proposals in any context, ESA or FIFRA. The updated mitigation menu has changed *significantly* from its original form that EPA solicited public comment on. The EPA has sought extensive input since then from pesticide-industry and pesticide-user interests. At the Pesticide Program Dialogue Committee (PPDC) meeting[19] on November 14, 2024, EPA indicated that it was not intending on soliciting public comment on its updated runoff mitigation menu, despite its significant changes, and that

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[14] https://www.epa.gov/pesticides/epa-updates-mitigation-menu-website-options-protect-nontarget-species-pesticide-runoff

[15] EPA. Update on Draft Herbicide Strategy (April 2024). Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1131.

[16] EPA. Herbicide Strategy to Reduce Exposure of Federally Listed Endangered and Threatened Species and Designated Critical Habitats from the Use of Conventional Agricultural Herbicides. August 2024. Page 15. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1137. Hereafter "Herbicide Strategy."

[17] EPA. Draft Technical Support for Runoff, Erosion, and Spray Drift Mitigation Practices to Protect Non-Target Plants and Wildlife. June 2023. Page 42-44. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-0007.

[18] EPA. Application of EPA's Runoff and Erosion and Spray Drift Mitigations Through Scenarios that Represent Crop Production Systems in Support of Endangered Species Strategies. August 2024 Page 67. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1139.

[19] https://www.epa.gov/pesticide-advisory-committees-and-regulatory-partners/pesticide-program-dialogue-committee-ppdc

stakeholders could comment on the new mitigation menu during each individual pesticide registration comment period. To put it mildly, that is a problem for most stakeholders that aren't the pesticide industry. Many stakeholders don't have the resources or staff to comment at that level.

The EPA has not solicited feedback from any stakeholder that does not promote the use of pesticides on this significantly-changed mitigation menu. We believe EPA has disenfranchised an entire swath of stakeholders with an interest in protecting species and the environment from commenting on this completely ineffective runoff mitigation menu.

While we recognize that we have the ability to comment on this mitigation menu now as part of this comment period, we note that there are many other problems with EPA's atrazine proposal that will divide our time significantly. We have written what we can in the time provided with a focus on the current atrazine proposal, but this is not even close to a comprehensive detail of our concerns due to the hindrances outlined above.

4) EPA's Current Iteration of the Runoff Mitigation Menu is Poorly Suited for Atrazine Mitigation

a. Estimated Runoff Reduction for Relief Points is Specific to Modelling Done Under the ESA and is Not Transferrable to the Current Atrazine Analysis

In calculating Estimated Environmental Concentrations (EECs) under the ESA, EPA uses the Pesticide in Water Calculator (PWC). This exposure exercise models the runoff that happens at a typical farm pond. The model does not reflect an actual place that exits, rather it uses certain assumptions to measure estimated runoff from a crop field with a specific set of characteristics. EPA generally believes that the PWC, as it is used for ESA purposes, represents a conservative estimate of runoff. The agency uses the purported conservatism in its PWC modelling to justify multiple mitigation relief options in the runoff mitigation menu: Runoff Vulnerability, Field Slope and Soil Type.[20]

Below we discuss how the use of the WARP-MP model in EPA's atrazine proposal precludes any justification whatsoever used in developing runoff mitigation relief in EPA's runoff mitigation menu. The WARP-MP model used in EPA's atrazine assessment literally uses modelling variables that are more spatially explicit and accurate than the PWC modelling EPA used to initially develop the mitigation relief options. Therefore, the mitigation relief in the runoff mitigation menu has already been accounted for in EPA's WARP-MP modelling runs and incorporated into the resulting output. This means that these mitigation relief options will erroneously exempt most corn and sugarcane acreage from having to implement any runoff mitigation under EPA's proposed plan.

[20] First three options in mitigation menu. https://www.epa.gov/pesticides/mitigation-menu.

i. Runoff Vulnerability

EPA defined its runoff vulnerability zones by using the PWC.[21] In developing runoff vulnerability zones, EPA adapted the PWC to develop about 3 million scenarios that "account for geographic variability in weather and soils."[22] It then compared all those scenarios that represent areas around the country to the nationwide maximum value that it identified in its 3 million-scenario run.[23] While the pesticide vulnerability modelling had high resolution (it modelled runoff every 17 square miles), EPA reduced the resolution to the county level for ease of communicating to the public.[24]

Despite the relatively high resolution EPA achieved in its runoff vulnerability exercise, the PWC does not account for the volume of pesticide use in any given area and does not account for the watershed area to receiving waterbody ratio, which is directly proportional to pesticide concentration in water.[25] The PWC is also not informed by pesticide-specific monitoring studies that may have taken place throughout the country.

EPA's vulnerability rankings were developed by comparing county-specific modelling information from the PWC to the maximum value representing the most runoff-prone area in the country. Based on these ratios, EPA determined that 6 points would be given to counties with a two order of magnitude difference in the values, 3 points would be given to counties with a one order of magnitude difference in the values, and 2 points would be given to counties with a 1/2 order of magnitude difference in the values.[26] These 2, 3 and 6 point counties correspond to "medium," "low," and "very low" runoff vulnerability counties in EPA's mitigation menu[27]

This exercise was conducted because EPA believes that its PWC model output for its ESA analyses may overestimate runoff in certain counties with lower runoff vulnerability.

Therefore, the justification for EPA's runoff vulnerability relief points is reliant on EPA utilizing a conservative nationwide maximum value for estimating runoff in any given geographic area. Otherwise, its assessment of purported overestimation is irrelevant and incorrect. If a PWC-estimated environmental concentration does not use the most conservative possible scenarios to model runoff, then any overestimation that may be occurring will necessarily be less than what EPA currently estimates.

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[21] EPA. Ecological Mitigation Support Document to Support Endangered Species Strategies. Version 1.0. July 2024. Page 147. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1133. (Hereafter "Ecological Mitigation Support Document").
[22] Ecological Mitigation Support Document. Page 148.
[23] Ecological Mitigation Support Document. Page 95.
[24] Ecological Mitigation Support Document. Page 96.
[25] Ecological Mitigation Support Document. Pages 95 and 147.
[26] Ecological Mitigation Support Document. Page 97.
[27] https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#pesticide-runoff

As a perfect example of how runoff vulnerability assumptions can be completely irrelevant under a different analysis, EPA's modelling of atrazine has taken a *very* different approach than what the agency does under the ESA. EPA estimated atrazine concentrations using a model developed by the USGS called Watershed Regression for Pesticides for Multiple Pesticides model (WARP-MP).[28] WARP-MP is uniquely suited for this analysis, as it was calibrated using data on atrazine specifically. EPA's atrazine modelling represents one of the most comprehensive, accurate water modelling datasets ever compiled for a pesticide.

This model relies on five explanatory variables in estimating atrazine levels across the country: 1) the annual pesticide usage intensity, 2) the % agricultural area with a soil restrictive layer on the top 25 cm of soil, 3) total precipitation during May and June, 4) the rainfall erosivity factor (basically how fast raindrops fall and erode land), and 5) streamflow contributed by rainfall on saturated soil.[29] *Together, these explanatory variables alone account for 81% of the variability in atrazine surface water levels.*[30]

The PWC is more crude and less accurate than the WARP-MP for atrazine. Unlike the PWC, there is very little conservatism built into the WARP modelling that EPA conducted. Short of conducting daily monitoring of atrazine concentrations at 100,000 different locations throughout the country, EPA's modelling represents the most accurate estimations of national atrazine water concentration ever conducted.

Therefore, EPA's analysis of runoff vulnerability zones has zero relevance to its atrazine proposal. In fact, the WARP-MP modelling EPA conducted for atrazine is *more spatially explicit and accurate* than the PWC runs it did for modelling runoff vulnerability. The WARP-MP accounts for local conditions at the HUC12 level,[31] which is sub-county. Since runoff vulnerability for ESA purposes is described at the county level, WARP-MP has higher spatial resolution and accounts for local conditions with a higher accuracy. Not only that, but WARP-MP accounts for more variables on local conditions than any modelling done by PWC. Whereas PWC only accounts for the crop that is grown, the soil characteristics, and weather characteristics of the region being modelled, WARP-MP accounts for all those variables and 1) the atrazine use intensity in the area, 2) how hard rain falls in an area and the resulting erosion (also called the "rainfall erosivity factor"), and 3) the percent of streamflow caused by runoff (also called the "Dunne overland flow").[32]

EPA recognizes the limitations with its runoff vulnerability analysis that was conducted using the PWC, stating: "Note that the quantification of vulnerability is a hypothetical assessment: it does not consider whether a pesticide is actually used in the area and does not consider local hydrological

[28] EFED Support Document. Page 4.
[29] EFED Support Document. Pages 4 and 13.
[30] EFED Support Document. Page 4.
[31] EPA. Refined Ecological Risk Assessment for Atrazine. April 12, 2016. Page 92. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-0315. (Hereafter "Risk Assessment")
[32] EFED Support Document. Page 13.

characteristics, such as drainage areas or actual waterbody types, or the impact of local management practices" and "The watershed area to receiving waterbody volume, which varies across the landscape, is another important factor related to vulnerability that is not considered in this analysis."[33]

WARP-MP provides an objectively more accurate estimate of sub-county runoff based on local conditions than the analysis EPA used to create its runoff vulnerability zones for the runoff mitigation menu.

This means that the potential overestimation that comes from not accounting for local conditions – that EPA uses to justify giving points for runoff vulnerability – is simply not relevant in the context of this atrazine analysis. No conservative modelling estimates were used here – geographic estimates of runoff were simply calculated based on local conditions known in those areas. The runoff vulnerability has *already been accounted for* in EPA's WARP-MP modelling of water concentrations at a sub-county level. The WARP-MP model accounted for this by predicting lower atrazine concentrations in areas that have lower runoff vulnerability.

There is no significant overestimation occurring here. And any overestimation that does occur would not be expected to partition among lower runoff vulnerability counties. Local conditions, such as rainfall levels, soil type, rainfall speed and overland flow have already been accounted for in EPA's modeling estimates. Of the 82,921 watersheds in the continental U.S., 485 had atrazine levels estimated using solely monitoring data.[34] For the remining watersheds, EPA uses the upper 95% prediction interval in its WARP-MP model to estimate atrazine watershed levels because the median prediction from WARP-MP would erroneously mis-categorize 41% of available monitored sites as not exceeding the CE-LOC when they actually have.[35]

This means that the WARP-MP model output tracks very well with monitoring data. Since, in many cases, the median WARP-MP values would underestimate actual concentrations, EPA must use the upper 95% prediction intervals. Any potential overestimation coming from using 95th percentile prediction values would be miniscule compared to the orders of magnitude of difference EPA was predicting with PWC. Furthermore, any potential overestimation in atrazine levels would not be spatially-specific since local conditions have already been accounted for in the WARP-MP output. EPA's runoff vulnerability map by county[36] is simply irrelevant in this context.

This is important because our analysis found that all Florida sugarcane acreage in a watershed with CE-LOC exceedances would get 3 points for being in a county with a "low" runoff vulnerability score and all Texas sugarcane acreage in a watershed with CE-LOC exceedances would get 2 points

[33] Ecological Mitigation Support Document. Page 147.
[34] Updated Mitigation Proposal. Page 34.
[35] Updated Mitigation Proposal at 34.
[36] EPA. Proposed Mitigation Points by County. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2138.

for being in a county with a "medium" runoff vulnerability score (Appendix A, Section 3.b.*i*). We were unable to calculate how much corn acreage would receive points by county because we did not have county-scale watershed information for corn-growing states. But just by comparing EPA's map of CE-LOC exceedances[37] with EPA's runoff vulnerability map,[38] we estimate that at least half of all corn acreage in areas with CE-LOC exceedances would receive at least 2 points for being in a "low" runoff vulnerability county. An analysis conducted by BASF and Compliance Services International indicates that roughly 70-75% of corn acreage would receive at least two points based on reduced runoff potential.[39]

This means that all TX and FL sugarcane acreage and 50-75% of corn acreage nationally would be exempt from having to implement any mitigation in Bin 1 watersheds (adding 2 points for runoff vulnerability to 1 point for mitigation tracking would equal 3 points). Since this runoff exemption is based on an analysis that has no relevance to the EPA's atrazine plan, tens of millions of acres will be exempt from mitigation erroneously.

ii. Field Slope

Much like with Runoff Vulnerability, Field Slope is already accounted for in EPA's WARP-MP modelling at the sub-county level and cannot be used as a mitigation relief option. EPA's original justification for adding a field slope relief option in the runoff mitigation menu is because the agency believed the PWC model to use "higher than average erosion" estimates.[40] EPA believed this justified giving points to acreage with low slope because "actual fields with slopes that are lower than these PWC scenario values should produce less erosion."[41]

However, here we have the atrazine modelling analysis conducted with WARP-MP. Like with runoff vulnerability, WARP-MP accounts for field slope at a sub-county resolution (HUC12 resolution) by utilizing the RFACTOR explanatory variable, which incorporates data from the Universal Soil Loss Equation.[42] EPA states that the Universal Soil Loss Equation "is the standard for erosion modeling and accounts for slope."[43]

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[37] EPA. Updated High Resolution Map (Without Roads) of HUC 12 Watersheds that Exceed the Updated CE-LOC for Atrazine. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2137.
[38] Linked in EPA's runoff mitigation menu here: https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#pesticide-runoff
[39] Campana, D and Hassinger, C. Quantifying field characteristic exemptions and runoff mitigation points from EPA's ESA Strategy Documents. Presentation at the American Chemical Society 2024 Fall Meeting. August 18, 2024. Page 20. Available here: https://complianceservices.com/wp-content/uploads/Quantifying-the-Potential-Agricultural-Area-Affected-by-EPAs-Draft-Herbicide-Strategy_18Aug24.pdf. Document also submitted to the docket. (Hereafter "BASF ACS presentation").
[40] Ecological Mitigation Support Document Page 55.
[41] Ecological Mitigation Support Document Page 55.
[42] EFED Support Document. Page 13.
[43] Ecological Mitigation Support Document Page 55.

Therefore, WARP-MP accounted for geographic variations in slope in its model already. So, there is no uncertainty around utilizing conservative estimates of slope as was EPA's original justification for giving credit to flat acreage in its runoff mitigation menu. With EPA's atrazine assessment, the slope variable is incorporated into EPA's modelled estimates such that lower-slope land with lower erosivity will lead to lower modelled estimates than higher-slope land.

Low slope land is common in corn growing areas, and one estimate indicates that about 60% of corn-growing acreage would qualify for this exemption and get two points[44] (together with the 1 point for mitigation tracking, that would exempt those acres from having to implement any mitigations in Bin 1 watersheds). Since the justification for this runoff exemption is based on an analysis that has no relevance to the EPA's atrazine plan, tens of millions of acres will be exempt from mitigation erroneously.

iii. Soil Type

As with runoff vulnerability and field slope, the justification EPA provides for giving mitigation relief credits to acreage with sandy soil is irrelevant for atrazine. EPA states that since its risk assessments are typically driven by modelling higher-runoff scenarios, that the agency may over-estimate runoff coming from fields with sandy soils.[45]

Once again, this justification is not relevant in the case of atrazine. EPA did not model atrazine runoff using the PWC with a field scenario containing runoff prone soils. EPA used the WARP-MP model, which modelled runoff concentrations with nationwide soil data.[46] The WARP-MP model uses the SRL25 explanatory variable that has a 1 km^2 resolution and was mapped with soil parameters from the Soil Survey Geographical (SSURGO) database and mapped agricultural land from the National Land Cover Database 2001 (NLCD 2001), version 2.[47] The SRL25 "was a highly significant and important variable in the Corn Belt" and "is likely a better indicator of watershed vulnerability for pesticide transport to streams than the K-factor."[48] Notably, the PWC that EPA used to justify soil relief in its runoff mitigation menu uses the K-factor instead of SRL25.[49]

Therefore, the WARP-MP model is a *better* predictor of local soil conditions in the corn belt than the PWC. EPA did not use a conservative soil estimate to model atrazine runoff; it used the most spatially-specific data available on soil type across the U.S.

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[44] BASF ACS presentation. Page 14.
[45] Ecological Mitigation Support Document Pages 56-57.
[46] EFED Support Document. Pages 4 and 13.
[47] USGS. Estimates of the Soil Restrictive Layer in the Upper 25,35,45, and 55 centimeters of agricultural land in the conterminous United States. Sept. 1, 2012. Available here: https://www.sciencebase.gov/catalog/item/6314057ad34e36012efa2cb0.
[48] Stone, W. W., Crawford, C. G., & Gilliom, R. J. (2013). Watershed regressions for pesticides (WARP) models for predicting stream concentrations of multiple pesticides. Journal of Environmental Quality, 42(6), 1838-1851. doi:10.2134/jeq2013.05.0179.
[49] EPA. Estimating Field and Watershed Parameters Used in USEPA's Office of Pesticide Programs Aquatic Exposure Models. 09/01/2020. Page 11. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2020-0279-0016.

Therefore, the soil-type relief option has already been accounted for in EPA's modelling by predicting lower atrazine concentrations in areas with sandy soils. There is no relief to give via points because the relief was already accounted for when EPA decided which watersheds were above the CE-LOC.

While this exemption is not as common in corn-growing areas, 5-10% of corn acreage is estimated to qualify for this exemption and get two points[50] (together with the 1 point for mitigation tracking, that would exempt those acres from having to implement any mitigations in Bin 1 watersheds). Since this runoff exemption is based on an analysis that has no relevance to the EPA's atrazine plan, millions of acres will be exempt from mitigation erroneously.

iv. Conclusions

It's clear that EPA has not considered how using this runoff mitigation menu for non-ESA purposes would impact its justification for developing "relief points" in the runoff mitigation menu. But clearly, there is a problem here. There is simply no justification whatsoever for including relief points in EPA's atrazine runoff mitigation menu. The "relief" has already been included in the modelling analysis. A lot of acreage around the country has already received that mitigation relief due to EPA's modelling not finding that they exceed the CE-LOC due to low runoff vulnerability, sandy soils and low slope. EPA cannot double count these field characteristics, because doing so would erroneously exempt acreage from implementing mitigation that EPA has determined is necessary to prevent unreasonable adverse effects to the environment.

One study indicates that 90% of all corn acreage in the U.S. that is not exempted from having to achieve mitigation points would receive at least 2 points for these three characteristics alone (runoff vulnerability, field slope, and soil type).[51] Together with the 1 point for mitigation tracking, this would exempt 90% of all corn acreage (and potential atrazine use sites) from having to implement any mitigation or change in practice whatsoever in Bin 1 watersheds. And over 30% would achieve 5 points and (together with the mitigation tracking point) would be exempt from having to implement any mitigation or change in practice whatsoever in Bin 2 watersheds.[52] These points are awarded for field characteristics that have already been accounted for in EPA's WARP modelling of atrazine levels across the country.

Under no circumstances can EPA exempt acreage or give relief for runoff vulnerability, field slope or soil type under this proposal – it is simply not fit for purpose. Any attempt to do so will result in failure to ensure that no unreasonable adverse effects are occurring under FIFRA and will be unlawful.

[50] BASF ACS presentation. Pages 15 and 20.
[51] BASF ACS presentation. Page 21.
[52] BASF ACS presentation. Page 21.

b. Runoff Reduction Assumptions for Tillage and Perennial Cropping in Mitigation Menu are Not Relevant to Atrazine

EPA's runoff mitigation menu – and, thus, EPA's atrazine runoff mitigation proposal – awards 2-3 points for the conservation tillage techniques of reduced tillage and no-till/perennial cropping, respectively.[53] The number of points associated with each category was determined by the efficacy rating given to each practice, which EPA determined was "medium" and "high" efficacy, respectively.[54] Despite the enormous variability in pesticide runoff reduction from fields practicing conservation tillage in published studies, EPA concluded that the variable efficacy for reduced tillage averaged out to be "medium" efficacy.[55] The agency cited one study to indicate that no-till was 27% more effective than reduced tillage at runoff reduction to justify its "high" efficacy raking.[56]

The problem with using a mitigation technique that produces highly variable runoff reduction outcomes is that efficacy can vary wildly depending on the chemical properties of each individual pesticide. Unfortunately, atrazine happens to be one of the many pesticides that aren't significantly impacted by conservation tillage techniques. Conservation tillage is generally considered to be decent at reducing erosion (assuming there is plant matter left on the surface), but it is not a dependable technique to reduce liquid pesticide runoff.

Atrazine is persistent and highly soluble and mobile in water with a low K_{oc}.[57] Roughly 99.8% of atrazine is estimated to partition with the liquid runoff fraction, and sediment-bound atrazine is essentially non-existent.[58] That one quality significantly impacts the ability of conservation tillage or perennial cropping to reduce atrazine runoff. This is demonstrated time and time again in the published literature.

An EPA-commissioned study in Ohio followed three consecutive years of corn and soybean fields and found no significant changes in atrazine runoff loss when comparing fields that have not been tilled for over 10 years and fields that were fall-plowed.[59] A follow-up to that field study similarly found that tillage had no significant effect on atrazine runoff.[60] A USDA study of corn-growing fields in Indiana found that maximum atrazine runoff from no-till fields was nearly four times

[53] https://www.epa.gov/pesticides/mitigation-menu.
[54] Ecological Mitigation Support Document Page 58.
[55] Ecological Mitigation Support Document Page 58.
[56] Ecological Mitigation Support Document Pages 58-59.
[57] Risk Assessment page 23.
[58] Basta N.T., Huhnke J.H., Stiegler J.H. (1997) Atrazine runoff from conservation tillage systems: a simulated rainfall study, J. Soil Water Conserv. 52, 44–48.
[59] Logan, TJ, Eckert, DJ, Harrison, B, Beak, D, and Adewumni, J. Effects of no-till and fall plowing on pesticide movement in runoff and tile drainage. December 1989. Available here.
[60] Logan, T., Eckert, D., & Beak, D. (1994). Tillage, crop and climatic effects of runoff and tile drainage losses of nitrate and four herbicides. Soil and Tillage Research, 30(1), 75-103. doi:10.1016/0167-1987(94)90151-1.

higher than from conventionally tilled fields.[61] Modelling of multiple runoff management practices found that reduced tillage practices generally had the lowest efficacy in reducing atrazine runoff, leading the authors to conclude that reduced tilling was "not highly effective in reducing atrazine losses compared with other remedial measures."[62] A four year study on corn fields in Ontario found that average atrazine runoff from no-till and ridge-till fields was 30-80% *greater* than from conventionally tilled fields.[63] A six-year USDA study in Iowa found that observed and model-simulated atrazine runoff was *twice as high* in no-till fields compared to tilled fields.[64]

In fact, atrazine is the most widely-studied pesticide with regards to understanding runoff effects from conventional tillage and no-till.[65] A meta-analysis of 21 different studies analyzing 41 separate measurements of atrazine runoff found *consistently greater concentrations* of atrazine runoff from no-till fields compared to tilled fields.[66] The authors attribute this finding to the chemical properties of atrazine – having a high water solubility and low affinity for soil. Similar lack of effect of no-till on pesticide runoff was identified for chemicals with similar chemical properties.

But EPA already knows this because the agency did a literature review for its 2022 proposed runoff mitigations.[67] Of the nine studies the agency analyzed, not a single one consistently found that reduced- or no-till reduced atrazine runoff at all. And many found the opposite effect.

Therefore, the mitigating effect of tillage on atrazine runoff is nonexistent – and many studies find consistently *increased* atrazine runoff in no-till compared to tilled fields. Awarding any points to pesticide users for implementing conservation tillage techniques is out of line with the available research and will not achieve the necessary runoff reductions EPA has determined are needed to meet its FIFRA obligations. We strongly oppose any assumption that conservation tillage practices or no-till will have any mitigating effect on atrazine runoff because the available research indicates that, at best, it will have no measurable effect and, at worst, will result in greater runoff into waterways.

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[61] Warnemuende, E. A., Patterson, J. P., Smith, D. R., & Huang, C. (2007). Effects of tilling no-till soil on losses of atrazine and glyphosate to runoff water under variable intensity simulated rainfall. Soil and Tillage Research, 95(1-2), 19-26. doi:10.1016/j.still.2006.09.001.

[62] Harman, W. L., Wang, E., & Williams, J. R. (2004). Reducing atrazine losses. Journal of Environmental Quality, 33(1), 7-12. doi:10.2134/jeq2004.7000.

[63] Gaynor, J. D., MacTavish, D. C., & Findlay, W. I. (1995). Atrazine and Metolachlor loss in surface and subsurface runoff from three tillage treatments in corn. Journal of Environmental Quality, 24(2), 246-256. doi:10.2134/jeq1995.00472425002400020006x.

[64] Malone, R., Nolan, B., Ma, L., Kanwar, R., Pederson, C., & Heilman, P. (2014). Effects of tillage and application rate on atrazine transport to subsurface drainage: Evaluation of RZWQM using a six-year field study. Agricultural Water Management, 132, 10-22. doi:10.1016/j.agwat.2013.09.009.

[65] Elias, D., Wang, L., & Jacinthe, P. (2018). A meta-analysis of pesticide loss in runoff under conventional tillage and no-till management. Environmental Monitoring and Assessment, 190(2). doi:10.1007/s10661-017-6441-1. *See Table 1.*

[66] Elias et al. 2018. See Table 1 and Figure 1.

[67] EFED Support Document. Appendix B.

5) EPA's Current Iteration of the Runoff Mitigation Menu is Under-Protective for ESA Purposes

As mentioned in Section 3, EPA's runoff mitigation menu was developed for the Agency's work on the ESA. Following one public comment period and additional extensive outreach to the pesticide industry and pesticide users, EPA significantly revised its runoff mitigation menu in October of 2024. The revisions resulted in a menu that was flawed, but decent becoming a menu that is so full of holes we refer to it internally as the Swiss cheese mitigation menu.

Under the current runoff mitigation menu, the vast majority of pesticide users would be exempt from having to implement any change in practice whatsoever. This is evident from EPA's final scenarios document, where 11 out of 13 crop production scenarios EPA modelled would get at least 9 points without having to do a single thing. This compares with 4 out of 13 crop production scenarios that would achieve at least 9 points under EPA's initial menu proposal in 2023.[68] 9 points is the highest level of mitigation that would ever be required under EPA's mitigation menu.

To put it bluntly, this is a paper-pushing exercise – a way for EPA and pesticide users to feel better about themselves while achieving absolutely nothing. Here we outline some of the major issues with the new runoff mitigation as it relates to EPA's atrazine mitigation proposal. This is not an exhaustive list.

a. Significantly Over-Counting Runoff Mitigation Relief

Our previous section discusses how EPA's justification for having mitigation relief points in the runoff mitigation menu is irrelevant in the context of modelling water concentrations with the WARP-MP model.

This section discusses how using the PWC, which EPA uses in its endangered species assessments, already accounts for multiple menu options on the front end, while still giving points to pesticide users on the back end. What we mean by this is that many of the field characteristics that give pesticide users points under the mitigation menu, such as weather patterns, soil type and slope, are *already included* in the agency's PWC modelling and accounted for prior to awarding points.

In addition to double counting runoff relief *within* different mitigation categories, as is done by accounting for field characteristics during modelling combined with offering relief points for those same field characteristics, EPA also double counts relief points *between* different mitigation options. For instance, the points received for runoff vulnerability already incorporate relief for field

[68] EPA. Application of EPA's Runoff and Erosion and Spray Drift Mitigations Through Scenarios that Represent Crop Production Systems in Support of Endangered Species Strategies. August 2024 Page 67. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1139.

slope and soil type, yet pesticide users can receive additional points for those characteristics in the mitigation menu. This essentially double counts that mitigation relief.

Below we describe how, combined, these faulty assumptions can essentially *triple count* certain field characteristics and give pesticide users mitigation relief many times over for one runoff reduction characteristic.

i. Double Counting Relief Points Within Different Mitigation Categories

Runoff Vulnerability

EPA defined its runoff vulnerability zones by using the PWC.[69] In developing runoff vulnerability zones, EPA adapted the PWC to develop about 3 million scenarios that "account for geographic variability in weather and soils."[70] It then compared all those scenarios that represent areas around the country to the nationwide maximum value that it identified in its 3 million-scenario run.[71] While the pesticide vulnerability modelling had high resolution (it modelled runoff every 17 square miles), EPA reduced the resolution to the county level for ease of communicating to the public.[72]

Therefore, EPA's vulnerability rankings were developed by comparing county-specific modelling information from the PWC to the *maximum value* representing the most runoff-prone area in the country. Based on these ratios, EPA determined that 6 points would be given to counties with a two order of magnitude difference in the values, 3 points would be given to counties with a one order of magnitude difference in the values, and 2 points would be given to counties with a 1/2 order of magnitude difference in the values.[73] These 2, 3 and 6 point counties correspond to "medium," "low," and "very low" runoff vulnerability counties in EPA's mitigation menu[74]

This exercise was conducted because EPA believes that the PWC model output for its ESA analyses may overestimate runoff in certain counties with lower runoff vulnerability.

However, the observed differences the EPA calculated between the absolute nationwide maximum runoff scenario and the 3 million scenarios throughout the country in its runoff vulnerability exercise are dependent on EPA using the nationwide maximum runoff value in its ESA assessments (because that is the basis for reference). But this is simply not the case. In the agency's ESA analyses, the EPA models scenarios by hydrologic unit code 2 (HUC2) region using scenarios that exist throughout the country.[75] That equals 18 regions throughout the continental U.S. Weather data

[69] Ecological Mitigation Support Document. Page 147.
[70] Ecological Mitigation Support Document. Page 148.
[71] Ecological Mitigation Support Document. Page 95.
[72] Ecological Mitigation Support Document. Page 96.
[73] Ecological Mitigation Support Document. Page 97.
[74] https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#pesticide-runoff
[75] EPA. Final National Level Listed Species Biological Evaluation for Atrazine. November 2021. ATTACHMENT 3-1: Background Document: Aquatic Exposure Estimation for Endangered Species (DOCX). Pages 6-7. Available here:

from 242 meteorological stations across the country were used to estimate rainfall patterns throughout 25 regions[76] (18 HUC2s + 7 HUC2s were given two scenarios).[77] HUC2 regions have very different precipitation values.[78] EPA states that "The scenario with the highest runoff curve number was identified ***per HUC2 region-crop group combination***, as it represented the highest runoff potential."[79]

EPA even moves further away from conservatism in its ESA assessments by conducting a "probabilistic" approach for species that includes capturing and characterizing the "variability in the most influential input parameters used in EPA's models."[80] This assessment provides ranges of potential environmental aquatic concentrations to use in modelling. These ranges of potential exposure concentrations were generated by using a wider range of modelled rainfall data within each HUC2 region and different hydrologic soil groups. [81] This information was used in EPA's analysis to determine whether species were likely to be adversely affected (LAA) by the action.

Therefore, it's clear that EPA did not use the most runoff-prone nationwide modelling values in its ESA assessment. In fact, it used geographical- and weather-specific modelling parameters in 25 different regions across the U.S. So, while one of those regions may correspond to the national maximum runoff value, the other 24 do not. The regions in the West are be modelled with much lower runoff vulnerability already incorporated into the PWC model due to lower average rainfall.

EPA recognized this in its draft technical support document for the herbicide strategy. The agency's original runoff vulnerability category was for agricultural acres west of I-35,[82] which was subsequently changed to the current option of runoff vulnerability by county. However, the agency considered the efficacy of this category "low" because "much of the mitigating benefit of these regions is already included in the modeling of the EECs."[83] For low efficacy runoff mitigations the agency was proposing to award 1 point.[84]

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https://www.epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-atrazine. Hereafter "Atrazine BE Attachment 3-1"

[76] Atrazine BE Attachment 3-1 page 11.

[77] EPA. Final National Level Listed Species Biological Evaluation for Atrazine. November 2021. APPENDIX 1-3. Atrazine Scenario Development (DOCX). Pages 1-2. Available here: https://www.epa.gov/endangered-species/final-national-level-listed-species-biological-evaluation-atrazine. Hereafter "Atrazine BE Appendix 1-3"

[78] Atrazine BE Attachment 3-1 page 15.

[79] Atrazine BE Attachment 3-1 page 11. Emphasis added.

[80] Atrazine BE Attachment 3-1 page 22.

[81] Atrazine BE Attachment 3-1 page 22-23.

[82] EPA. Draft Technical Support for Runoff, Erosion, and Spray Drift Mitigation Practices to Protect Non-Target Plants and Wildlife. June 2023. Page 42. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-0007. Hereafter "Draft Technical Support."

[83] Draft Technical Support. Page 52.

[84] EPA. 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. July 2023. Page 21. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-0009. Hereafter "Draft Herbicide Strategy."

Subsequently, in its final technical support document for the herbicide strategy, EPA made significant changes without justification. In the final technical support document, EPA no longer acknowledges that regional runoff mitigation is accounted for in its EEC modelling[85] and gives no indication or discussion of why the agency changed its mind. The agency also finds that the efficacy of regional differences in runoff was now considered extremely high, with 2-6 points awarded depending on the county, instead of the original 1 point for western states.[86] The agency estimates that 81% of all cultivated agricultural acres and 95% of specialty crop acreage will achieve at least 2 points from the runoff vulnerability mitigation relief option alone.[87]

The agency is aware that its PWC already accounts for different rainfall levels in different regions, but it pretends like it doesn't matter. The agency conducts its PWC analysis at multiple regional levels which account for geographic differences in rainfall, soil type and slope. The resolution is not particularly high – it's at the HUC2 level – but it's much more spatially explicit than simply taking the highest possible nationwide modelling value (as is assumed in the runoff vulnerability analysis). EPA must account for this. EPA's PWC model has already accounted for HUC2 regions with less rainfall (mainly western states) in developing nationwide modelling estimates. The relief is built into the model, yet EPA is essentially doubling the relief on the back end via awarding points in its mitigation menu.

Furthermore, EPA is even utilizing *more spatially-representative data* in its probabilistic approach using the MAGTool.[88] This accounts for an even wider range of local weather and soil data than is included in the PWC runs for its ESA analysis. So, the agency is accounting for geographic differences in runoff (at the HUC2 level) and is also accounting for non-conservative estimates within those regions via its "probabilistic" approach to make LAA or not likely to adversely affect (NLAA) calls. Therefore, the assumption used to justify runoff vulnerability scores, which is based on the difference between the nationwide maximum compared to local county estimates, is not relevant to the analysis that is taking place under the ESA. In developing runoff vulnerability scores, the agency assumes that the ESA analysis is going to be the most conservative analysis possible. But that is not the case, and this undercuts the agency's ultimate justification.

Soil Type

In its current runoff mitigation menu, EPA gives pesticide users 2 points for using pesticides in areas with predominantly sandy soils (Hydrologic group A and B soils).[89] EPA has justified giving these 2 mitigation relief points because the agency believes that "risk assessments are typically

[85] Ecological Mitigation Support Document. Pages 94-97.
[86] Ecological Mitigation Support Document. Pages 96-97.
[87] Ecological Mitigation Support Document. Page 156.
[88] Atrazine BE Attachment 3-1 page 22.
[89] https://www.epa.gov/pesticides/mitigation-menu. Third option down in Table 1.

driven by modeling the higher runoff scenarios (with C and D soils), which would overestimate runoff for actual fields with A and B soils."[90]

Therefore, EPA believes that since it generally analyzes risk assuming fields have Group C or D soils, that pesticide users who apply pesticides in sandier soils should get 2 points. In its technical support for its draft herbicide strategy, EPA gave this relief characteristic "low efficacy" (1 point) because "Although there are multiple lines of evidence to support that runoff and erosion are reduced in these soil types due to reduced water moving off the field, for the most part these qualities are already considered in the modeled EECs."[91] Upon finalization of the herbicide strategy, EPA makes no mention of soil type being accounted for in modelling exposures and changed its efficacy classification to "moderate" (2 points).[92]

As with runoff vulnerability, EPA's PWC model does account for regional differences in soil type by modelling at the HUC2 level.[93] So some of the geographic variability in soil sand content has already been accounted for in EPA's modelling. This is consistent with past EPA statements.[94]

In addition to EPA's PWC accounting for regional differences in soil sand content, EPA also does a probabilistic modelling exercise in its ESA analyses that specifically accounts for different soil types. For instance, in its weight of evidence analysis using the MAGTool, EPA states: "The analysis looked at hydrologic soil groups which would reduce the runoff from a use site, resulting in lower EECs. Again, PRZM5/VVWM modeling was done using the original aquatic runs done for the BEs, but were conducted using modified ESA scenarios ***designed to represent different hydrologic soil groups***."[95]

EPA's weight of evidence analysis for atrazine resulted in some species having their calls changed from LAA to NLAA.[96] Therefore, hydrologic soil group has already been accounted for in EPA's ESA analysis two times over. The first step utilized regional soil data in the PWC at the HUC2 level, then the second step specifically modelled runoff assuming group A and B soils in refining the agency's affect calls. Soil data has *already been incorporated* into the assessment via fewer LAA calls and that is the "relief." Yet, EPA wants to incorporate soil type a *third time* by giving pesticide users points for something that has already been accounted for twice over.

Furthermore, EPA gives no consideration to the increased potential for groundwater contamination when applying pesticides in sandy soils. Groundwater can transfer to surface water through subsurface transfer, and EPA noted this uncertainty in its draft technical support for its draft

[90] Ecological Mitigation Support Document. Pages 56-57.
[91] Draft Technical Support pages 42 and 52.
[92] Ecological Mitigation Support Document. Pages 56-57.
[93] Atrazine BE Attachment 3-1 page 6.
[94] Draft Technical Support pages 42 and 52.
[95] Atrazine BE Attachment 3-1 page 23. Emphasis added.
[96] Atrazine BE Appendix 4-1.

herbicide strategy[97] but does not acknowledge it in the final herbicide strategy. For herbicides like atrazine that are major groundwater contaminants,[98] this runoff relief option could effectively incentivize the use of atrazine in areas that are more prone to groundwater contamination.

Slope

In its current runoff mitigation menu, EPA gives pesticide users 2 points for using pesticides in areas with a field slope ≤3%.[99] EPA has justified giving these 2 mitigation relief points because the agency believes that "higher-sloped scenarios (which include slopes up to 48%) likely drive risk assessments, especially for low mobility (high K_{oc}) chemicals"[100]

First, atrazine is a high mobility chemical (low K_{oc}), which means it generally partitions into runoff and not into soil-associated erosion. While slope is very impactful on reducing erosion, it is far less impactful on runoff.[101] Therefore, giving the same number of points to pesticide users who use a high K_{oc} pesticide vs a low K_{oc} pesticide is fraught with potential inaccuracies.

Second, EPA knows that slope is explicitly accounted for in its risk assessment. EPA states: "Slope is already a consideration in the calculations of EECs, as the PWC model incorporates a variant of the Universal Soil Loss Equation (Wischmeier and Smith, 1978), which is the standard for erosion modeling and ***explicitly accounts for slope***."[102] EPA also acknowledges that of the modelled scenarios the agency uses as PWC inputs for runoff estimation, 70% have slopes less than 3% grade.[103] Therefore, low slope is very well-represented in the agency's estimated concentrations from runoff-prone fields. It is also quite telling that low-slope land is over-represented in the agency's most conservative estimates of runoff. EPA downplayed the impact of slope in developing the agency's runoff mitigation menu in the draft technical support for its draft herbicide strategy and initially gave it a "low efficacy" rating (1 point).[104] Yet, upon finalization EPA recategorized it as "medium efficacy" (2 points) and changed the confidence level with which it communicated risk estimates. EPA goes from saying higher sloped land "could" drive risk assessments, to now saying it "likely" drives risk assessments.[105] Yet there are no data or any evidence given to back up this assertion.

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[97] Draft Technical Support page 42.
[98] Gilliom, R. J., Barbash, J. E., Crawford, C. G., Hamilton, P. A., Martin, J. D., Nakagaki, N., … Wolock, D. M. (2006). Pesticides in the nation's streams and ground water, 1992–2001. Circular. doi:10.3133/cir1291.
[99] https://www.epa.gov/pesticides/mitigation-menu. Second option down in Table 1.
[100] Ecological Mitigation Support Document. Page 56.
[101] Draft Technical Support page 51.
[102] Draft Technical Support page 51. Emphasis added.
[103] Ecological Mitigation Support Document. Pages 55-56.
[104] Draft Technical Support pages 51-52.
[105] Compare Draft Technical Support pages 51-52 to Ecological Mitigation Support Document. Pages 55-56.

We feel that EPA is on very shaky ground here with regards to the overt and unsupported changes to the herbicide strategy, particularly with how predominant low slope land is in the modelled PWC estimates and the differences in efficacy based on K_{oc}.

EPA already accounts for slopes of multiple different gradients in the PWC and the scenarios are heavily weighted towards low-slope land. There are very little data to indicate that runoff relief based on slope is not already built into the modelling process EPA uses to assess risk. The agency cannot account for a field characteristic with a mitigating effect and then offer credit for that same mitigating effect. That is double-counting, and it biases towards mitigation menu items not resulting in the intended reduction in runoff.

ii. Double Counting Relief Points Between Different Mitigation Categories

Runoff Vulnerability and Soil Type

EPA defined its runoff vulnerability zones by using the PWC.[106] In developing runoff vulnerability zones, EPA adapted the PWC to develop about 3 million scenarios that "account for geographic variability in weather ***and soils***."[107] It then compared all those scenarios that represent areas around the country to the nationwide maximum value that it identified in its 3 million-scenario run.[108] Therefore, EPA's vulnerability rankings were developed by comparing county-specific modelling information from the PWC to the maximum value representing the most runoff-prone area in the country. Based on these ratios, EPA determined that 6 points would be given to counties with a two order of magnitude difference in the values, 3 points would be given to counties with a one order of magnitude difference in the values, and 2 points would be given to counties with a 1/2 order of magnitude difference in the values.[109] These 2, 3 and 6 point counties correspond to "medium," "low," and "very low" runoff vulnerability counties in EPA's mitigation menu[110]

EPA states that in developing its 3 million scenarios used in its runoff vulnerability calculations: "These scenarios comprise 54 years of weather data, ***soil and slope characteristics***, 16 different crop categories. The scale of this modeling simulation was conducted at a much finer resolution than that of EPA's standard aquatic modeling for regulatory actions (i.e. 2-digit HUC resolution)."[111] These scenarios were developed every 17 square miles using data from the USDA Soil Survey Geographic (SSURGO) database.[112]

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[106] Ecological Mitigation Support Document. Page 147.
[107] Ecological Mitigation Support Document. Page 148. Emphasis Added.
[108] Ecological Mitigation Support Document. Page 95.
[109] Ecological Mitigation Support Document. Page 97.
[110] https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#pesticide-runoff
[111] Ecological Mitigation Support Document. Page 95. Emphasis Added.
[112] Ecological Mitigation Support Document. Page 148-149.

Therefore, soil data at very high resolution was already incorporated into EPA's runoff vulnerability scores. To underscore the importance of soil data in the resulting runoff vulnerability scores, the agency even determined that some areas that should be more prone to runoff (given rainfall totals in the area) were actually found to have lower runoff vulnerability because of soils, specifically: "A deeper look was taken into HUC3S and HUC5 where pesticide runoff vulnerability was lower than expected. It was determined that these areas have higher amounts of soil hydrologic groups A and B. Therefore, precipitation events are more likely to cause more infiltration (and therefore less runoff) in these areas."[113]

What this means is that the "relief" for soil type is already accounted for in EPA's runoff vulnerability scores. The agency has essentially provided two options for relief in the runoff mitigation menu for the same field characteristic. Sandy soils in any given geographic region are incorporated into runoff vulnerability calculations via estimating lower runoff vulnerability (and more points) in areas that have sandy soils. The relief is already built into that metric. But then EPA offers a separate option for points based on soil type that can be combined with runoff vulnerability points to essentially get twice the relief for one field characteristic.

Runoff Vulnerability and Slope

Runoff vulnerability scores come from modeling runs EPA conducts in the PWC. EPA states: "Slope is already a consideration in the calculations of EECs, as the PWC model incorporates a variant of the Universal Soil Loss Equation (Wischmeier and Smith, 1978), which is the standard for erosion modeling and explicitly accounts for slope."[114] However, while the typical PWC modelling for ESA purposes accounts for slope at the HUC2 level, EPA's runoff vulnerability scores were generated utilizing more than 3 million scenarios at a much higher resolution (every 17 square miles).[115] Therefore, the runoff vulnerability scores account for slope on a more precise scale.

Areas with higher erosion vulnerability (higher slope) will get a higher runoff vulnerability classification (fewer points) than areas with lower slope. Slope is already built into the runoff vulnerability scores. Yet the mitigation menu allows pesticide users to attain additional points for using pesticides on low slope land (<3% grade). There are no restrictions on combining runoff vulnerability and low slope mitigation relief, therefore, pesticide users can get relief twice over for the same field characteristic.

[113] Ecological Mitigation Support Document. Page 150.
[114] Draft Technical Support page 51.
[115] Ecological Mitigation Support Document. Page 149.

iii. Consequences of Over-Counting Relief Points

In Section 5 we have highlighted how certain field characteristics are double counted multiple times for runoff relief.

In Subsection 5.a.i, we have highlighted how EPA's modelling of surface water contamination for ESA purposes already accounts for geographic differences in rainfall, soil type and slope. These are the variables that pesticide users then get relief for on the back end in EPA's runoff mitigation menu. So the runoff relief is essentially double-counted: 1) there is lower estimated surface water contamination in areas with sandy soils, less rainfall, and flatter terrain, while at the same time 2) pesticide users can exempt themselves from any additional mitigation by getting points for those same field characteristics in the runoff mitigation menu. While the geographic differences of those variables are less precise in EPA's PWC modelling (on a HUC2-level instead of a county- or individual-field level), they are accounted for to some extent. This is something EPA was fully up front about in its draft herbicide strategy – which appeared to just vanish upon finalization without any justification whatsoever. This is especially egregious in EPA's process of developing runoff vulnerability scores, which identify county-level runoff vulnerability by comparing to nationwide maximum values. This comparison has no relevance to EPA's ESA work because the agency does not use nationwide maximum values in its modelling estimates – it uses weather- and soil-specific values at each HUC2 level.

In Subsection 5.a.ii, we have highlighted how EPA's development of runoff vulnerability scores by county already incorporates geographically-precise soil and slope characteristics. Unlike PWC modelling at the HUC2 level, this process has a much higher level of precision – accounting for soil and slope differences every 17 square miles. So the runoff relief – AGAIN – is essentially double-counted: 1) EPA accounts for precise soil-type and slope characteristics in its county-level runoff vulnerability designations, while at the same time 2) pesticide users can easily combine runoff vulnerability points with other mitigation relief options that give them points for the same soil and slope characteristics used to determine runoff vulnerability points.

EPA's runoff mitigation menu works by assuming that certain mitigations and field/weather characteristics can reduce runoff by a certain amount. Pesticide users get a certain number of points that is proportional to the expected runoff reduction. However, when the agency accounts for certain field characteristics in its modelling and gives pesticide users points for those same characteristics, or if EPA allows pesticide users to get multiple points for a single field characteristic, the actual runoff reduction does not match the expected runoff reduction. There are multiple layers of double-counting going on here – to the point where there is an enormous disconnect between the efficacy EPA attributes to certain field characteristics and the actual runoff reduction that is achieved.

We believe this is an enormous oversight that can be attributed to an agency under pressure to appease pesticide users with a watered-down runoff mitigation menu that is packed full of

exemptions and loopholes to the point where it is no longer a functioning plan. When basically every single pesticide user gets exempted from having to change their crop production or pesticide-use practices, it's a good indication that this is not a serious or effective mitigation plan.

b. Faulty Assumptions in Proposed Tillage Practice/Perennial Cropping Efficacy

We fully support no-till farming when it is done sustainably and in a beneficial manner, and we recognize the important role the practice can play in reducing erosion and soil runoff. However, we equally believe it is important to not peddle false solutions. While reduced tillage has environmental benefits, reducing pesticide runoff in the liquid fraction is not one of them. The scientific literature on the impacts of reduced tillage on pesticide runoff is so highly variable to the point that it's impossible to make any sense of it. And to make sweeping assumptions of its efficacy on reducing pesticide runoff, as the EPA does in the mitigation menu, is downright absurd.

With reduced tillage, more than just about any other mitigation technique, the chemical properties of the pesticide matter. For a pesticide with a very high K_{oc} that tends to bind organic matter, reduced tillage may be somewhat effective at reducing sediment-bound runoff. But for pesticides that readily dissolve in water and do not bind sediment, the data indicate that reduced tillage does not consistently work at reducing runoff – and in many cases can increase pesticide runoff.

A USDA-funded study found that not only did no-till practices not reduce surface water contamination, but it actually increased leaching of a pollutant into groundwater (presumably through increased occurrence of macropores).[116] This led the researchers to conclude that no-till should be combined with things like cover cropping, intercropping or rotations with perennial crops to realize any significant water-quality benefits. A meta-analysis of 34 studies that compared pesticide runoff from no-till and conventional tillage found that "Overall, the concentration and the load of pesticides were greater in runoff from [no-till] fields, especially pesticides with high solubility and low affinity for solids."[117] The study concluded that, while the positive impacts of no-till on soil erosion were well-documented, there is no significant positive impact on liquid pesticide runoff. A synthesis of multiple meta-analyses on the impact of different crop management practices found clear benefits for maintaining a continuous living cover on the soil, while the benefits of reduced tillage were highly variable and beneficial effects were often inconclusive.[118]

Yet EPA has decided to assign a "medium" efficacy rating for reduced tillage techniques and a "high" rating for no-till and perennial cropping, assigning each practice 2 and 3 points,

[116] Daryanto, S., Wang, L., & Jacinthe, P. (2017). Impacts of no-tillage management on nitrate loss from corn, soybean and wheat cultivation: A meta-analysis. Scientific Reports, 7(1). doi:10.1038/s41598-017-12383-7.
[117] Elias, D., Wang, L., & Jacinthe, P. (2018). A meta-analysis of pesticide loss in runoff under conventional tillage and no-till management. Environmental Monitoring and Assessment, 190(2). doi:10.1007/s10661-017-6441-1.
[118] Blanchy, G., Bragato, G., Di Bene, C., Jarvis, N., Larsbo, M., Meurer, K., & Garré, S. (2023). Soil and crop management practices and the water regulation functions of soils: A qualitative synthesis of meta-analyses relevant to European agriculture. SOIL, 9(1), 1-20. doi:10.5194/soil-9-1-2023.

respectively.[119] This decision stemmed from EPA's heavy reliance on a study by Alix et al., which found that the percent reduction in pesticide runoff from reduced tillage was 50 to 75%.[120] The agency built upon this reduction by citing a single study to indicate that no-till provided 27% higher efficacy than reduced tillage.[121] Below we address serious concerns with EPA's interpretation of these studies:

i. Alix et al., 2017[122]

The Alix et al., 2017 study provides the basis for EPA's estimation that reduced tillage can reduce pesticide runoff by 50-75%.[123] EPA claims to have reviewed additional literature on reduced tillage by citing to six other studies, but ultimately uses the estimate from Alix et al. in assigning efficacy (and points) to this practice. [124] This makes the Alix et al. study by far the most impactful in EPA's assessment.

Unfortunately, the Alix et al., 2017 workshop report is not even close to robust enough to support such an impactful conclusion. This report cites *only eight* studies to support its conclusion that reduced tillage and no-till reduce pesticide runoff by 50-75%.[125] By just about any scientific standard, this is laughably insufficient. We estimate that there are currently at least 100 studies in the scientific literature that measure pesticide runoff following implementation of reduced- or no-till. There are way more than eight studies that measure *just atrazine runoff alone*, much less other pesticides (See Section 4b). A 2018 meta-analysis found 87 studies analyzing pesticide runoff following no-till or reduced-till.[126] Analyzing less than 1/10th of the available studies on a particular subject to develop ranges of efficacy is just terrible science. And for EPA to prop this study up as some kind of blueprint for how the agency analyzes runoff reduction from different mitigation techniques is absolutely in violation if its duties to utilize the best available science under the ESA and FIFRA.

We note that this workshop was sponsored by just about every pesticide company that exists and many of the coauthors on this workshop report were formerly or currently employed by the pesticide industry, which has a vested interest in biasing results towards the heightened efficacy of these mitigation practices. This necessitates a greater level of scrutiny on EPA's part, which the agency clearly has not conducted here.

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[119] Ecological Mitigation Support Document. Page 58 and https://www.epa.gov/pesticides/mitigation-menu.
[120] Ecological Mitigation Support Document. Pages 13 and 58.
[121] Ecological Mitigation Support Document. Page 58.
[122] Alix, A., Brown, C., Capri, E., Goerlitz, G., Golla, B., Knauer, K., et al. 2017. Mitigating the Risks of Plant Protection Products in the Environment: MAgPIE. Available here: https://abe.ufl.edu/faculty/carpena/files/pdf/software/vfsmod/magpie2013.pdf. (Hereafter Alix et al. 2017)
[122] Ecological Mitigation Support Document. Page 58., 2017)
[123] Ecological Mitigation Support Document. Page 58.
[124] Ecological Mitigation Support Document. Page 58.
[125] Alix et al. 2017. Table A2.2
[126] Elias et al. 2018. Page 3.

Importantly, the eight studies this workshop report analyzed[127] *do not even support its stated conclusions*.

1) The Maetens, 2012[128] study, which the report says assigns "runoff reduction effectiveness of 25 to 70% to no-till, and 5 to 30% to reduced tillage"[129] makes no such finding. The only information the authors publish that could be used to identify a range of runoff reduction is in the box and whisker plots in Figure 7. The box plot ranges from a 60% reduction to a 5% increase in runoff for no-till and a 35% reduction to a 10% increase in runoff for reduced till. The efficacy of reduced tillage in reducing pesticide runoff had a median of an 8% reduction and a mean of a 38% *increase* in runoff compared to conventional practices.[130] No tillage had a 13% median reduction and a 25% mean reduction. Of the 14 soil and water conservation techniques the authors analyzed, reduced tillage was the worst at reducing pesticide runoff and no-till was the 4th worst.[131] The take-away conclusion from this study is that reduced tillage provides no significant efficacy in reducing runoff and no-till provides some modest reduction.

2) Alletto et al., 2010[132] is by far the most comprehensive study cited by the Alix et al. report, compiling dozens of studies and presenting runoff reductions and increases by pesticide active ingredient. Alix et al. correctly state that there is a wide efficacy range in the available data on pesticide losses from no-till, reduced tillage and conventional till, however the authors strangely conclude that reduced tillage is more efficient at reducing runoff than leaching.[133] This is an odd takeaway from a study when the stated objective of Alix et al. is to analyze how efficiently reduced tillage reduces runoff compared with conventional tillage, not leaching. The Alletto et al. study makes no conclusion as to the efficacy of reduced tillage with regards to pesticide runoff, but the study does conclude that pesticide runoff in reduced tillage is heavily dependent on other variables such as "intensity of rainfall, its arrival time after treatment, the interval between two rainfall events – and pesticide properties – e.g. water solubility, retention, half-life and formulation."[134] Therefore, there is really no efficacy range that can be gleaned from this study. Rather, it highlights that the enormous variability in efficacy is dependent upon multiple variables, some of which cannot be controlled in the field.

[127] Alix et al. 2017. Table A2.2
[128] Maetens W., Poesen, J., Vanmaercke, M. 2012. How effective are soil conservation techniques in reducing plot runoff and soil loss in Europe and the Mediterranean?. Earth Sci. Rev. 115, 21-36.
[129] Alix et al. 2017. Page 371.
[130] Maetens et al., 2012. Table 5.
[131] Maetens et al., 2012. Figure 5.
[132] Alletto, L., Coquet, Y., Benoit, P., Heddadj, D., Barriuso, E. 2010. Tillage management effects on pesticide fate in soils. A review. Agron. Sustain. Dev. 30, 367-400.
[133] Alix et al. 2017. Pages 370-371.
[134] Alletto et al., 2010. Page 28.

3) Soane et al., 2012[135] is a sprawling review on the barriers to adoption of reduced- and no-till across Europe. It's inclusion in the Alix et al. review is puzzling because the 22-page review dedicates less than one page to the issue of pesticide runoff. There are no empirical results provided or reproduced from the literature. In fact, pesticide runoff is not even mentioned in the one-page summary of the study's conclusions. This review is simply irrelevant to the issue of pesticide runoff. The Alix et al. report concludes that this review cites one study from France indicating runoff reduction of 40%.[136] We were unable to verify this claim because the study was only available in French. The Soane et al. study made no mention of the 40% runoff reduction value cited in the Alix et al. report and came to no conclusions about pesticide runoff following different tillage practices.[137] We conclude that this study provides no evidence to support Alix et al.'s conclusions. If the French study purportedly showing 40% runoff reduction was so impactful, it should have been cited directly. Not indirectly via an unrelated review article.

4) The Alix et al. report cites two studies from Germany, which were not available in the English language. Therefore, we were unable to review these studies. The report concluded that the LfL 2013 study found that erosion mitigation was best at ≥30% surface cover and the UBA 2004 study found that mulch and direct seeding led to a 71 to 90% and 100% reduction of transport of selected herbicides in corn.[138] We were unable to confirm the veracity of these claims.

5) Deasy et al., 2010[139] does not even measure pesticide runoff. Alix et al. state that the study found "Minimum tillage led to reduction of water losses (4 to 81%) and sediment losses (37 to 98%) from fields"[140] But reduction in water losses does not necessarily mean reduction in pesticide runoff. Highly soluble pesticides could be present at higher concentrations in a smaller volume of water. The Deasy et al. study even states directly that tillage practices have "not been tested for their effectiveness on dissolved organic carbon or pesticide losses."[141] Therefore, we fail to see the utility of this study, particularly since there are nearly 100 other studies that specifically collect empirical measurements of pesticide runoff.[142] The conclusion from Alix et al. is not aligned with the stated goal of measuring the efficacy of reduced- and no-till practices on pesticide runoff.

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[135] BD Soane, BC Ball, J Arvidsson, G Basch, F Moreno and J Roger- Estrade, 2012. No-till in northern, western and south-western Europe. A review of the problems and opportunities for crop production and the environment. Soil Tillage Res. 118, 66-87.
[136] Alix et al. 2017. Pages 370.
[137] Soane et al. 2012. Page 12.
[138] Alix et al. 2017. Pages 370.
[139] Deasy, C. Quinton, J.N., Silgram, M., Bailey, A.P., Jackson, B. and Stevens, C.J. 2010. Contributing understanding of mitigation option for phosphorus and sediment to a review of the efficacy of contemporary agricultural stewardship measures. Agricultural Systems 103, 105-109.
[140] Alix et al. 2017. Pages 370.
[141] Deasy at al., 2010. Page 4.
[142] Elias, D., Wang, L., & Jacinthe, P. (2018). A meta-analysis of pesticide loss in runoff under conventional tillage and no-till management. Environmental Monitoring and Assessment, 190(2). doi:10.1007/s10661-017-6441-1.

6) Miao et al., 2004[143] measured the effects of minimum tillage on herbicide runoff in Italy. Alix et al. correctly conclude that the study generally found significant effects on pesticide runoff reduction in a reduced-till environment compared to a conventionally-tilled environment. However, the Miao study did not only compare reduced tillage to conventional tillage; it compared reduced tillage *in conjunction with* a continuous cover crop compared to conventional tillage with no cover crop. It is highly misleading of Alix et al. to use this study to support the efficacy of reduced tillage because it adds cover-cropping, a practice known to increase the efficacy of reduced tillage practices at reducing pesticide runoff. We have no qualms with the use of this study to support an effectiveness rating for reduced tillage *combined* with cover-cropping, however, in this context it is being used solely to support the practice of reduced tillage alone. Alix et al.'s conclusions are not correct.

7) Fawcett et al. 1994[144] reviewed the literature from 1967-1991 on tillage impacts on pesticide runoff. The review finds, as Alix et al. accurately describes, that average reduction in herbicide losses was 70% for no-till, 69% for chisel ploughing, and 42% for ridge till. Given the age of many studies reviewed here, we question why more recent reviews were not included. For instance, many of the pesticides analyzed in this review haven't been used in the U.S. for over 50 years: cyanazine, alachlor, fonofos, secbumeton. Needless to say, the results are not as relevant to modern day pesticide use as just about every other study on tillage we're aware of. But we do concede that the review typically finds runoff reduction benefits from reduced tillage.

To sum up, the Alix et al. 2017 report reviewed eight studies on how tillage practices impact pesticide runoff. Two of those studies were in German and we were unable to review them due to language barriers. The Alletto et al., 2010[145] and Soane et al., 2012[146] come to no conclusions and make no definitive statements about the efficacy of reduced tillage on pesticide runoff in water. The Deasy et al., 2010[147] study does not measure pesticide runoff, only water runoff. The Miao et al., 2004[148] study only analyzes the efficacy of pesticide runoff following reduced tillage *in combination* with a year-round cover crop.

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[143] Z Miao, A Vicari, E Capri, F Ventura, L Padovani and M Trevisan 2004. Modeling the effects of tillage management practices on herbicide runoff in northern Italy. J Environmental Quality. 33: 1720-1732.
[144] RS Fawcett, BR Christensen and DP Tierney 1994. The impact of conservation tillage on pesticide runoff into surface water: a review and analysis. J. Soil Water Conserv. 49: 126-135
[145] Alletto, L., Coquet, Y., Benoit, P., Heddadj, D., Barriuso, E. 2010. Tillage management effects on pesticide fate in soils. A review. Agron. Sustain. Dev. 30, 367-400.
[146] BD Soane, BC Ball, J Arvidsson, G Basch, F Moreno and J Roger- Estrade, 2012. No-till in northern, western and south-western Europe. A review of the problems and opportunities for crop production and the environment. Soil Tillage Res. 118, 66-87.
[147] Deasy, C. Quinton, J.N., Silgram, M., Bailey, A.P., Jackson, B. and Stevens, C.J. 2010. Contributing understanding of mitigation option for phosphorus and sediment to a review of the efficacy of contemporary agricultural stewardship measures. Agricultural Systems 103, 105-109.
[148] Z Miao, A Vicari, E Capri, F Ventura, L Padovani and M Trevisan 2004. Modeling the effects of tillage management practices on herbicide runoff in northern Italy. J Environmental Quality. 33: 1720-1732.

That leaves two studies that we were able to review that Alix et al. cited to support their findings. The Maetens, 2012[149] study found the efficacy of reduced tillage in reducing pesticide runoff had a weighted mean of a 38% *increase* in runoff compared to conventional practices. The Fawcett et al. 1994[150] review found average reduction in herbicide losses were 69% for chisel ploughing, and 42% for ridge till. That would give an efficacy range of -38% to 69% with a median of 15.5% reduction in pesticide runoff with reduced tilling. That would give reduced tilling a "low" efficacy rating worth 1 point.

However, in reality it is silly to use a % reduction value that has so little supporting scientific evidence. The Alix et al. report is not fit for purpose – it is simply a terrible review of a handful of studies seemingly picked at random. Any continued attempt to utilize this study and its questionable outcomes will not comply with EPA's requirement to use the best available science for its ESA obligations.

In addition to opposing the use of Alix et al.'s "average" efficacy ratings, we also wish to highlight a major flaw in the "range" EPA has identified in the literature on the efficacy of reduced tillage. Based on its literature review of how reduced tillage impacts pesticide runoff, EPA identified a range of 0-100% pesticide reduction reported in the literature.[151] On its face, EPA's range looked as if it supported the ultimate decision to identify 50-75% pesticide reduction as the ultimate efficacy of reduced tillage because 50 is between 0 and 100.

However, EPA's range values are not accurate. In EPA's literature review, the agency even noted that pesticide runoff impacts are highly variable in the literature, with studies finding no significant effects, significant pesticide runoff reductions, and significant pesticide runoff *increases*.[152] Similarly, in our literature review of atrazine runoff, we found a similar wide range of findings, mostly leaning towards runoff increases (Section 4b). Notably, many studies found that reduced- and no-till increased atrazine runoff considerably. In just one example, a four-year study on corn fields in Ontario found that average atrazine runoff from no-till and ridge-till fields was 30-80% *greater* than from conventionally tilled fields.[153]

Therefore, the high-end of EPA's range is correct at 100%, but its low-end range must go into negative numbers because many studies have found reduced- or no-till to *increase* pesticide runoff. The bottom of EPA's range cannot be zero if the problem gets worse. Just given the study cited in

[149] Maetens W., Poesen, J., Vanmaercke, M. 2012. How effective are soil conservation techniques in reducing plot runoff and soil loss in Europe and the Mediterranean?. Earth Sci. Rev. 115, 21-36.
[150] RS Fawcett, BR Christensen and DP Tierney 1994. The impact of conservation tillage on pesticide runoff into surface water: a review and analysis. J. Soil Water Conserv. 49: 126-135
[151] Ecological Mitigation Support Document. Page 58.
[152] Ecological Mitigation Support Document. Page 58.
[153] Gaynor, J. D., MacTavish, D. C., & Findlay, W. I. (1995). Atrazine and Metolachlor loss in surface and subsurface runoff from three tillage treatments in corn. Journal of Environmental Quality, 24(2), 246-256. doi:10.2134/jeq1995.00472425002400020006x.

the preceding paragraph, the range should be -80% to 100%. This error must be rectified, as it is currently misleading to the public to indicate that the worst outcome following no-till is that no runoff reduction is realized. In fact, pesticide runoff can get even worse – and that must be accounted for in developing estimated efficacy in the runoff mitigation menu.

ii. Sun et al., 2015[154]

EPA cites the Sun et al. study as evidence that no-till and perennial cropping are 27% more effective at reducing runoff compared to reduced tillage.[155] While the 27% figure is not entirely accurate (that is the percent reduction compared to moldboard plow. Compared to reduced tillage, it is roughly a 21% reduction[156]), EPA is technically correct. However, the Sun et al. 2015 meta-analysis only analyzed *water runoff* from tilled and non-tilled fields.[157] There was no assessment whatsoever of pesticide runoff. While water runoff and pesticide runoff may have some correlation, they are not proxies for one another. Just because less water runs off the field, does not necessarily mean less pesticides run off the field. Without measuring the pesticide concentration in the water runoff, one cannot conclude that less pesticide runoff is present.

This is especially egregious considering there is a meta-analysis published *prior* to EPA's Herbicide Strategy that actually analyzes pesticide runoff from tilled and no-till fields.[158] This is by far a more relevant meta-analysis of the known literature than Sun et al. 2015, yet EPA makes no mention of it and does not even cite the study.

EPA has taken a single meta-analysis from the literature that has questionable relevance to the task at hand and made sweeping assumptions about the efficacy of no-till and perennial cropping. A finding that is opposite that of a more relevant and recent meta-analysis, which found that no-till has zero measurable effect on pesticide runoff compared to tilled fields. Even assuming that water runoff is a better proxy for pesticide runoff than pesticide runoff itself, the Sun et al. 2015 meta-analysis makes many qualifications to its findings that EPA does not even discuss.

For instance, the Sun et al. study found *no significant difference* between no-till and reduced till/conventional till for studies that analyzed natural rainfall, studies on land that had a slope of <5% grade or >10% grade, studies that lasted more than 4 years, and in soils with a high clay content.[159] Having significant runoff reductions only occur in studies looking at simulated rainfall is questionable enough, but it's very possible that there is significantly more land in the U.S. that falls in the low/high slope, high clay soil category than the medium slope low clay soil category.

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[154] Sun, Y., Zeng, Y., Shi, Q., Pan, X., & Huang, S. 2015. No-tillage controls on runoff: A meta-analysis. Soil and Tillage Research, 153, 1-6.
[155] Ecological Mitigation Support Document. Page 59.
[156] Sun et al, 2015. Figure 2.
[157] Sun et al, 2015. Methods section.
[158] Elias et al. 2018.
[159] Sun et al, 2015. Figures 3 – 6.

Furthermore, multiple studies, including the Sun et al. meta-analysis, have found that any runoff reductions from no-till are erased over time.[160] This is concerning because perennial-cropped land is basically in perpetual no-till and likely won't provide any pesticide runoff reduction benefits whatsoever. Yet perennial-cropped land is considered by EPA to have "high" efficacy in reducing pesticide runoff and receives 3 points[161] for a practice that the available scientific evidence has deemed ineffective.

We also want to highlight that this study also finds *no significant difference* between water runoff from reduced tillage fields compared to conventional tillage. It is incredibly sketchy and misleading to use this study to support the finding that no-till is more effective at reducing runoff than reduced tillage, without even mentioning that the study also *directly contradicts* EPA's previous findings that reduced tillage reduces runoff compared to conventionally tilled fields. It appears that EPA is just cherry-picking the findings it wants to use and disregarding the rest.

To conclude, EPA's conclusions regarding the purported efficacy of pesticide runoff reductions from reduced tillage and no-till 1) are not based on the best available science, 2) rely on faulty interpretations of scientific studies, and 3) significantly inflate the purported runoff benefits from reduced- and no-till.

EPA must revisit its efficacy calculations for reduced tillage and no-till/perennial cropping. Based on the scientific literature, there is no demonstratable reduction in runoff from reduced or no-till fields. Furthermore, there is no solid evidence that no-till/perennial cropping is any more effective than reduced-till at reducing pesticide runoff.

Given the demonstrated benefits at reducing erosion and soil loss, we believe a case could be made to award 1-2 points for reduced tillage, no-till and perennial cropping for pesticides with a K_{oc} >1000 L/kg. However, for mobile pesticides that partition with the liquid fraction of runoff, there is absolutely no evidence that tillage practices alone have any measurable impact.

Alternatively, the scientific evidence indicates that no-till *combined* with other soil health practices, like cover cropping or mulching, can together somewhat reduce liquid pesticide runoff. This would require a change to the mitigation menu where points could only be acquired from the *combination* of practices for pesticides with a K_{oc} <1000 L/kg.

c. Faulty Assumptions in Proposed Irrigation Practice Efficacy

Pesticide runoff is typically associated with precipitation. However, irrigation can directly lead to runoff if a field is overwatered, or indirectly lead to runoff by decreasing the time it takes for soil to

[160] Maetens et al., 2012 and Sun et al., 2015.
[161] Ecological Mitigation Support Document. Page 58 and https://www.epa.gov/pesticides/mitigation-menu.

become saturated following a precipitation event. Despite the potential for irrigation to lead to runoff, it is often considered a relatively minor contributor to surface water runoff compared to precipitation. There are many reasons for this, most notably that 1) in the past few decades, programs across the country have been implemented to help make agriculture more water-conscious, 2) irrigation is controllable, while precipitation is not, and 3) the scarcity of water resources across much of the country have limited the availability of water for agricultural purposes.

We believe EPA has significantly overestimated the efficacy of practicing certain irrigation techniques on surface water runoff. To be clear, we fully support giving credit for the use of certain irrigation practices. The general environmental benefits of reducing irrigation are substantial, and these practices should be incentivized at some level. However, it's important not to overestimate a certain practice's contribution to runoff – and that is exactly what is happening here. EPA acknowledges this in the draft Herbicide Strategy, but ultimately ignores it in the final.

In the draft Herbicide Strategy, EPA fully acknowledges that this mitigation is "not specifically aimed at pesticide runoff reduction."[162] EPA proposed to give irrigation practices a "low efficacy" score, which is consistent with general knowledge about the relative lack of contribution to runoff compared to precipitation, and the lack of available studies on this subject.[163] EPA also proposed to prohibit points for this option if irrigation would otherwise not be utilized on the field.[164] This makes sense, as there is no mitigating effect if a field was never irrigated to begin with.

Yet, inexplicably in the final Herbicide Strategy, EPA decided to change the efficacy rating of this practice to be "medium efficacy" or "high efficacy" depending on the practice being implemented.[165] Far from being aimed at *changing* irrigation practices, as it was in the draft, the final sought to give pesticide users who have never irrigated their land the maximum 3 points (which would exempt them from any runoff mitigation for most pesticide uses).

In its support document, EPA characterizes a "medium efficacy" practice as reducing runoff by 30-60% and a "high efficacy" practice as reducing runoff by >60%.[166] Yet the agency provides no evidence that reducing irrigation runoff would achieve that level of runoff reduction – there is not a single study cited. Furthermore, if a field has never been irrigated, how would EPA assume that any runoff reduction has taken place?

EPA's own analysis provides the best evidence that there is absolutely no way changing irrigation practices can provide that amount of runoff reduction efficacy.[167] EPA simulated how avoiding pesticide application within 48 hours after irrigation or precipitation would impact runoff. Since

[162] Draft Technical Support pages 60-61.
[163] Draft Technical Support pages 60-61.
[164] Draft Technical Support page 43.
[165] Ecological Mitigation Support Document. Page 50.
[166] Ecological Mitigation Support Document. Page 47.
[167] Ecological Mitigation Support Document. Appendix E.

runoff is expected to be greatest immediately following pesticide application, this analysis is likely to capture high end estimates of runoff and runoff reduction. EPA found that runoff reduction was highly dependent on the chemical properties of the pesticide – with lower-mobility/higher-half-life pesticides realizing very little runoff reduction by not irrigating 48 hours post-application compared to irrigating immediately after application.[168] Even for higher-mobility/lower-half-life pesticides that did see runoff reductions, the reduction realized was lower than 30% for every single scenario modelled. That puts reduced irrigation firmly in the "low efficacy" category for some pesticides and the "zero efficacy" category for others.

Assume for instance that 25% of runoff from a field is attributable to irrigation and 75% is attributable to precipitation. Each field will differ in practice, but we feel that this is a very conservative estimate for most crop fields in the U.S. Even if a pesticide user goes from using flood irrigation to not irrigating at all (the two extremes), the absolute maximum runoff reduction achievable is 25%. This is because this menu option does absolutely nothing to reduce runoff from precipitation. So there is a low ceiling built into this menu option that must be acknowledged. EPA cannot hold other menu options to a certain standard (% reduction) while ignoring that same standard in awarding points for irrigation practices.

The thing about irrigation is there *has to be a change in practice* in order to achieve runoff reduction. EPA has not provided any evidence that runoff reduction would be achieved, how much reduction would be achieved, or how giving points for already implemented practices would achieve any runoff reduction at all. For all other mitigation practices EPA attempts to identify a "% reduction" value – some sort of indication that implementing the practice would reduce runoff. But for irrigation, there is nothing. It's almost as if EPA is in on some confidential information that the rest of us don't know.

All of this is made worse by the fact that lack of irrigation tends to correlate very well with *high precipitation*. Crops need water to grow and there are only two ways to water them: irrigation and precipitation. When one is lower the other tends to be higher. This is no better exemplified than with atrazine. Only about 15% of U.S. corn is irrigated,[169] and a lot of corn happens to be in areas that EPA has identified as highly vulnerable to runoff.[170] It's really a no-brainer – if it rains a lot you don't have to irrigate. Giving a lot of points (3 points is A LOT) to pesticide users who do not irrigate essentially exempts most pesticide users in highly vulnerable runoff areas from having to mitigate at all. This is problematic on so many levels.

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[168] Ecological Mitigation Support Document. Appendix E.
[169] USDA. 2017 Census of Agriculture. Table 35. Specified Crops by Acres Harvested: 2017 and 2012. Available here: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/st99_1_0035_0035.pdf
[170] Compare corn-growing map https://www.nass.usda.gov/Charts_and_Maps/Crops_County/cr-pr.php to runoff vulnerability map by county https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#pesticide-runoff.

The beauty about irrigation is that it is measurable and easily studied, unlike precipitation which is sporadic and unpredictable. Yet there is no measurement taking place, no estimation of runoff reduction. Just a blanket exemption. Irrigation is a minor contributor to runoff compared to precipitation in most of the country, yet EPA is treating it like it is a major contributor by categorizing irrigation practices as medium efficacy (30-60% reduction) and high efficacy (>60% reduction). These % runoff reductions are simply unachievable by mitigating irrigation runoff alone. You *might* be able to achieve the low end of those values (30%) by going from flood irrigation to not irrigating at all. But no pesticide user would ever do that, because it would devastate their crop.

EPA had it right in the draft herbicide strategy. This mitigation item is not aimed at reducing runoff because it does nothing about precipitation,[171] but nevertheless it is a good practice to adopt. Giving pesticide users 1 point for managing irrigation more precisely makes total sense to incentivize good practices for a minor runoff-contributing pathway. But anything more than that is egregious and completely unsupported by the available data. Furthermore, awarding pesticide users 3 points for not irrigating in areas where it rains a lot is likely to have the exact opposite effect of mitigating runoff.

6) Changes in Mitigation from 2022 Proposal are Unjustified, Unsupported and Arbitrary

EPA makes numerous changes from its 2022 proposal that are unsupported and hinder the EPA's ability to ensure no unreasonable adverse effects occur following re-registration of atrazine

a. Recordkeeping Requirements

In 2022, EPA proposed recordkeeping requirements "to ensure compliance with the additional runoff mitigation requirements being proposed, and to allow for possible future evaluation of the effectiveness of the mitigation."[172] These proposed requirements included:

- Full name and certification number of the certified applicator
- Product name and EPA registration number
- Total amount of product applied
- Application month, day and year with start and finish times
- Crop receiving the application
- Location of the application (address, crossroads, or GPS coordinates)

[171] Draft Technical Support pages 60-61.
[172] Proposed Revisions. Page 10.

- Size of area treated
- Application Timing: whether the applicator applied the product preemergence or post emergence
- Tank Mix Products: a list of all products (pesticides, adjuvants, and other products) that the applicator tank mixed with the atrazine product for each application including the EPA registration numbers in the case of any pesticides
- Conservation practice(s) that were chosen from the proposed picklist for implementation prior to atrazine applications (if applicable)

According to EPA these recordkeeping requirements were proposed to 1) ensure compliance with a complicated set of mitigation measures, 2) allow for possible future evaluation of the effectiveness of the mitigation, and 3) ensure that, together with mitigation measures, overall atrazine exposure to aquatic plant communities and potential risk to other non-target species is reduced.[173]

Yet in response to comments from pesticide-user stakeholders, EPA has now proposed to reverse its decision to require recordkeeping – instead opting to make it a voluntary option in the mitigation menu worth 1 point.[174]

EPA has provided no evidence to indicate that a voluntary recordkeeping option would 1) ensure compliance, 2) allow for future efficacy evaluation of mitigations, or 3) ensure that atrazine exposure and risk to wildlife are reduced. In fact, making a recordkeeping requirement *voluntary* would objectively impair EPA's ability to achieve its previously-stated goals. It's unclear how many people would opt to include this mitigation. As evidenced by our analysis in Appendix A, most growers would get 3 points, and many would even get 6 points, without even needing to use the mitigation tracking option. For instance, 85% of corn acres are not irrigated (Appendix A, Section 3.a.ii). That would give 85% of corn growers 3 points without having to include any recordkeeping at all. Even assuming 50% of atrazine users chose to implement the mitigation tracking option, how would EPA achieve its stated goals of ensuring compliance, mitigation efficacy, or risk reduction with only 50% coverage? There is no explanation from EPA how it intends to ensure that no unreasonable adverse effects are occurring without a requirement that all users implement this simple recordkeeping requirement.

Furthermore, the mitigation tracking option that EPA points to as a viable alternative to the previously proposed recordkeeping requirement is woefully lacking in any detail at all. In the mitigation menu, the requirements EPA has put in place for the mitigation tracking option are as follows: "EPA is assigning one point for any grower/applicator who tracks their mitigations on paper or in electronic format."[175]

[173] Proposed Revisions. Page 10.
[174] Updated Mitigation Proposal. Page 41.
[175] https://www.epa.gov/pesticides/mitigation-menu-measure-descriptions#tracking

Far from the reasonable level of detail previously proposed, a pesticide user could simply write on a napkin "did not irrigate" and file it away. That would meet their requirements under the mitigation tracking option. The pesticide user does not even need to record what pesticide was used, the date or even what crop they sprayed.

Even assuming that, magically, 100% of atrazine users implemented this practice, the recordkeeping requirements are utterly worthless. EPA previously stated that recordkeeping is needed to 1) ensure compliance with a complicated set of mitigation measures, 2) allow for possible future evaluation of the effectiveness of the mitigation, and 3) ensure that, together with mitigation measures, overall atrazine exposure to aquatic plant communities and potential risk to other non-target species is reduced.[176]

EPA cannot possibly meet those goals with a voluntary action that does not provide the level of detail needed to even demonstrate that atrazine was even used. And the risk-benefit balancing could not have changed, because the purported benefits have not changed since 2022 when this requirement was first proposed (the agency provided no additional benefits analysis and stated that the most up-to-date benefits assessment was conducted in 2022[177]).

Therefore, EPA's current proposal to make recordkeeping voluntary and provide no useable information cannot meet the agency's previously stated goals of ensuring compliance, mitigation efficacy and risk reduction.

b. Aerial Application Prohibition

In 2022, EPA proposed to prohibit all aerial applications of atrazine.[178] This proposed prohibition included all liquid formulations of atrazine that the 2020 interim decision had omitted from its prohibition on aerial application of non-liquid atrazine formulations.

EPA's 2022 prohibition on all aerial applications of atrazine was proposed to "reduce the potential for atrazine runoff while also reducing risk to non-target species from spray drift"[179] The EPA went on to state that "Although prohibiting aerial applications may not significantly reduce the concentration of atrazine in runoff, prohibiting aerial applications will limit environmental loading from spray drift."[180]

EPA had clearly meant the proposed aerial application prohibition to not only reduce runoff via reduced environmental loading, but also reduce harm to wildlife from spray drift. This harm from spray drift the agency found was occurring in 2022 was occurring even with the previous spray drift mitigation put in place in the 2020 interim decision.

[176] Proposed Revisions. Page 10.
[177] Proposed Revisions. Page 8.
[178] Proposed Revisions. Page 18.
[179] Proposed Revisions. Page 14.
[180] EFED Support Document. Page 9.

However, in deciding not to pursue a prohibition on aerial applications, EPA has indicated that "additional modeling with the Pesticide Water Calculator indicates that aerial applications, given drift buffers already required on atrazine labels, do not lead to higher aquatic exposure relative to ground applications."[181] We fail to see how this justification possibly supports EPA's decision to allow the dumping of atrazine from airplanes. EPA was clear that the agency believed aerial applications were leading to worrisome environmental loading and leading to unacceptable risk to wildlife. If EPA's modelling found that aerial applications were no worse to aquatic species than ground applications, then the logical conclusion is that ground applications are leading to worrisome exposures as well, not that aerial applications are somehow magically safe.

This can't be due to a shift in the cost-benefit balancing, because the purported benefits have not changed (the agency provided no additional benefits analysis and stated that the most up-to-date benefits assessment was conducted in 2022[182]). The agency's rationale for the general mitigations proposed in 2022, including the aerial prohibition, was that EPA "has determined that the proposed general mitigation requirements will not fundamentally change how atrazine is used by most growers and is expected to reduce potential risks of concern to aquatic plant communities via atrazine runoff."[183]

Without any analysis put forth by EPA, the agency has not made clear that aerial applications of liquid atrazine formulations can be made safely without FIFRA violations. The agency must explain how its "new" analysis indicates that aerial applications are not of concern instead of indicating that ground applications are also of concern. The spray drift mitigation EPA uses to justify its reversal of prohibiting aerial applications was already in place in 2022 when the agency proposed the aerial prohibition. Nothing new has happened other than pressure from stakeholders who financially benefit from dumping pesticides from airplanes.

c. Use of the 95th Percentile Instead of 90th Percentile to Delineate Additional Mitigation

In the 2022 proposed mitigation, EPA used the 90th percentile national WARP-MP predicted atrazine concentration as the threshold to delineate the most vulnerable of the vulnerable watersheds where additional mitigations would need to be implemented. EPA made this determination because "based on PWC modeling and the range of effectiveness of the various mitigation options, watersheds above the 90th percentile would likely require more mitigation to achieve atrazine concentrations near or below the CE-LOC than watersheds with concentrations already below the 90th percentile concentration…"[184]

[181] Updated Mitigation Proposal. Page 36.
[182] Proposed Revisions. Page 8.
[183] Proposed Revisions. Page 14.
[184] EFED Support Document. Page 6.

However, in the current mitigation proposal, EPA has decided to use the 95th percentile national WARP-MP predicted atrazine concentration as the threshold to delineate the most vulnerable watersheds, ultimately raising the threshold concentration significantly. This means that far fewer of the most contaminated waterways will be mitigated accordingly.

EPA uses a rather perplexing line of reasoning when justifying its decision to use the 95th percentile instead of the 90th percentile. The agency states in two separate passages that using the 95th percentile as the delineation between the two mitigation bins "would help to address the larger impacts identified for sorghum and sugarcane growers for whom the 2022 proposed picklist was less feasible because the 2022 proposed revisions offered few options for sorghum and sugarcane growers specifically."[185] The agency further states: "Defining the 95% percentile (45.4 µg/L) as the division between bins 1 and 2 will still provide protection for watersheds with the highest vulnerability to atrazine runoff and give growers more flexibility than the 2022 proposed picklist, with the goal of providing atrazine users additional options so that if mitigation is required, a grower can select the least burdensome runoff mitigations on an individual farm basis."[186]

So, EPA's position appears to be that by adjusting the threshold so that fewer waterways require additional mitigation, the agency will somehow give pesticide users "more flexibility" and somehow offset the "impacts" of the 2022 proposed picklist.

The problem is: this justification is not relevant. Changing how the agency defines each mitigation bin has absolutely nothing to do with giving anyone more flexibility or helping out certain pesticide users that don't have as many options in the 2022 picklist. Changing that delineation simply determines *how many* pesticide users need to achieve a set number of mitigation points, not providing flexibility or ease for those who need to attain points.

The "flexibility" and "giving pesticide users more options" issues were *already addressed* by the agency by using the updated mitigation menu instead of the 2022 proposed picklist.[187] For instance, in justifying its move to use the mitigation menu instead of the proposed 2022 picklist, EPA states: "The use of mitigation menu provides growers and/or applicators enough flexibility to choose what is technologically and economically feasible for their specific circumstances"[188] Furthermore, EPA touts that the new mitigation menu gives pesticide users 40 options to choose from compared to the 2022 proposed picklist which gave only 12 options.[189] EPA also states that "The updated mitigation proposal contains options that are feasible in sugarcane, such as vegetated ditches, low slope fields, elevated berm systems in some sugarcane-producing areas, moderate pesticide runoff vulnerability in some areas, and dryland farming (under the mitigation measure 'irrigation water management') in some areas." For sorghum, EPA states that most sorghum growers will qualify for more than

[185] Updated Mitigation Proposal. Page 17.
[186] Updated Mitigation Proposal. Page 35.
[187] Updated Mitigation Proposal. Pages 9, 14, 18, 39, 40-41.
[188] Updated Mitigation Proposal. Page 39. Emphasis added.
[189] Updated Mitigation Proposal. Page 9.

enough points with EPA's mitigation menu just based on the typical practices utilized in these fields.[190]

Therefore, flexibility and purported impacts to sorghum and sugarcane have *already been addressed* by EPA using its new mitigation menu instead of the proposed 2022 picklist. EPA's justification for using the 95th percentile delineation value for binning watersheds is not only irrelevant, but it has also already been addressed by other changes made to the proposed decision.

In 2022, EPA stated that based on the agency's modelling and estimated mitigation effectiveness, a proper threshold to delineate how much mitigation is needed in each watershed is the 90th percentile national WARP-MP predicted atrazine concentration.[191] No scientific analyses have been conducted to date to change such a conclusion, the justification for the change was not even relevant to what the change from the 90th to 95th percentile accomplished, and the justification had already been addressed by other changes. The cost-benefit calculus could not have changed because the agency provided no additional benefits analysis and stated that the most up-to-date benefits assessment was conducted in 2022.[192]

In many ways, with the current mitigation proposal essentially accomplishing nothing (as we address in Sections 1 and 2 in these comments), this really doesn't matter. Requiring 3 points or 6 points is irrelevant with a mitigation plan this weak. But assuming a mitigation plan is implemented that can accomplish significant water quality improvements, this threshold is important. We conclude that EPA cannot ensure that its decision complies with FIFRA unless it gives adequate justification and scientific analysis for its changes.

d. Prohibition on Use Within 48 Hrs of Runoff-Producing Precipitation

In 2022, EPA proposed the following mitigation: "prohibiting application of atrazine containing products during rain or when a storm event likely to produce runoff from the treated area is forecasted (by NOAA/National Weather Service, or other similar forecasting service) to occur within 48 hours following application."[193]

In the updated mitigation proposal EPA has decided to omit this prohibition from pesticide labels. The agency justifies this by saying: "EPA did not include this statement in the updated mitigation proposal for atrazine because this mitigation is most effective for pesticides that are mobile and non-persistent, as described in EPA's "Ecological Mitigation Support Document to Support Endangered Species Strategies" available in the Herbicide Strategy docket (EPA-HQ-OPP-2023-0365). Atrazine is highly mobile but is persistent, and so a 48-hour rain restriction would not be effective in reducing runoff for atrazine."[194]

[190] Updated Mitigation Proposal. Pages 40-41.
[191] EFED Support Document. Page 6.
[192] Proposed Revisions. Page 8.
[193] Proposed Revisions. Page 9.
[194] Updated Mitigation Proposal. Page 36.

While EPA's modelling shows that, for persistent chemicals, a 48-hr rain restriction does not necessarily show significant effectiveness,[195] empirical evidence indicates otherwise. EPA stated in the draft herbicide strategy that "several studies anecdotally noted that atrazine (a persistent, mobile chemical) concentrations were highest in runoff when runoff-producing rain events occurred a few days after application (Caron et al., 2012; Fawcett et al., 1994; Gaynor et al., 1995; Krutz et al., 2005)."[196] Clearly a 48 hr rain restriction can impact atrazine runoff despite its long half-life.

EPA provides no justification for its decision to reverse its prohibition on applying within 48-hr of runoff producing rain other than it wouldn't be effective according to EPA's modelling. But, as mentioned above, scientific studies show that it can be effective. And EPA has even stated that it would not be burdensome to pesticide users, as it aligns with best management practices already implemented.[197] EPA noted that a prohibition on runoff-producing rain would not prevent "activation" of atrazine or application before a small amount of rain.[198]

We note the irony here: that EPA is proposing not to implement this mitigation because atrazine is too persistent, yet EPA's entire runoff reduction plan is dependent on short term mitigations that are likely much less effective on persistent chemicals than on non-persistent chemicals. It really reflects poorly on EPA's proposed mitigation plan.

While we in no way believe this middling mitigation will turn this disastrous proposal into a successful runoff mitigation plan, it can help reduce runoff to some extent. Together with EPA's previous finding that this is an already well-established management practice by most pesticide users and it will not be particularly burdensome,[199] we urge the EPA to reinstate this requirement on labels. However, the previous language was unenforceable and subjective. We propose the following language, which EPA has already started implementing on many pesticide labels during registration review:

"Do not apply when soil in the area to be treated is saturated (i.e., if there is standing water on the field or if water can be squeezed from soil,") or if NOAA/National Weather Service predicts 50% chance or greater of 1 or more inches of rainfall to occur within 48 hours following application. Detailed National Weather Service forecasts for local weather conditions may be obtained on-line at: http://www.nws.noaa.gov, on NOAA weather radio, or by contacting your local National Weather Service Forecasting Office."

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[195] Ecological Mitigation Support Document. Appendix E.
[196] Draft Technical Support. Page 48.
[197] EPA. Assessment of the Benefits of Atrazine and the Impacts of Potential Mitigation for Field Corn, Sweet Corn, Sorghum, and Sugarcane; PC Code (080803). June 23, 2022. Page 28. Found here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1624 (Hereafter "Benefits Assessment")
[198] Proposed Revisions. Page 12.
[199] Proposed Revisions. Page 14.

7) Agency's New CE-LOC is Under-Protective and is an Insufficient Threshold to Protect Aquatic Life

To begin, we strongly oppose EPA's proposal to increase the CE-LOC from 3.4 ppb to 9.7 ppb. We believe this is highly under-protective of aquatic plant communities and wildlife populations, particularly amphibians and fish, and the EPA's current proposed CE-LOC is inconsistent with the best available science. Notably this one change resulted in 6,832 impaired watersheds throughout the country to be reclassified as being below the CE-LOC and no longer subject to any runoff mitigation (see Supplemental File A, Sheet 1). That is 8% of all the watersheds in the continental U.S. that just incorrectly got a clean bill of health.

Please see past comments that we and others have submitted to the agency on this issue if you are interested in further details of our opposition.

In responding to comments by Center for Food Safety that the agency's CE-LOC (which at the time was 3.4 ppb) was under-protective of other aquatic wildlife, EPA responded that "The 2016 PRA specified that 3.4 µg a.i./L was considered protective of sublethal effects to amphibians based on the weight of evidence, including potential impacts to reproduction. Considering the toxicity data for reproductive effects that is presented in the PRA, 3.4 µg a.i./L was considered protective of effects to fish as well."[200]

However, the proposed CE-LOC has now increased by nearly a factor of three to 9.7 ppb. The analysis that EPA conducted in the 2016 risk assessment that is taken as evidence that 3.4 ppb was protective of other aquatic wildlife[201] is no longer relevant to the current proposal. The agency cannot conclude that 3.4 ppb is protective of all aquatic wildlife, while at the same time changing that same safety threshold. The scientific analysis needed to assess whether 9.7 ppb is protective of aquatic wildlife has already been conducted by the agency in its risk assessment, and the results are conclusive – 9.7 ppb is *not protective* of fish and amphibians.

This is important because EPA has never intended the CE-LOC to simply protect just plants. The agency states that the CE-LOC: "is intended to also provide protection for the entire aquatic ecosystem, including fish, invertebrates, and amphibians."[202] Therefore, a threshold that the agency believes is protective of plants is not necessarily a protective threshold. The EPA must demonstrate that the 9.7 ppb threshold is protective of the entire aquatic ecosystem. The 2016 ecological risk assessment demonstrates otherwise.

For fish, EPA's analysis found a full ½ of chronic toxicity studies identified biochemical, cellular, physiological, behavioral, reproduction, and growth /development harms at atrazine concentrations

[200] Updated Mitigation Proposal. Page 30.
[201] Risk Assessment. Page 311.
[202] Updated Mitigation Proposal. Page 4.

less than 10 ppb.[203] Even the dose that EPA used as its chronic level of concern (LOC) for fish was 5 ppb (notably higher than 3.4 ppb but lower than the current proposed CE-LOC of 9.7 ppb).[204] EPA has provided no evidence that the currently proposed CE-LOC is protective of fish and the agency's own risk assessment indicates otherwise. Chronic toxicity thresholds for aquatic and marine fish were universally exceeded for all uses and application methods of atrazine.[205] Even when reduced application rates of 0.25 and 0.5 lb a.i./A were modeled, 100 percent of the modeled scenarios exceeded EPA's level of concern for aquatic vertebrates.[206] Even when modeling based on an application rate of 0.25 lb a.i./A – a rate so low that it would provide little utility to farmers – the EPA's levels of concern were exceeded for all aquatic organisms except freshwater invertebrates.[207]

For amphibians, nearly half of available studies on reproduction/sexual development, development/morphology, growth and mortality found toxicities below 10 ppb.[208] There is a significant overlap between estimated environmental concentrations and weight of evidence effects for amphibians. The EPA even states that "… a large portion of the reported effects for amphibian mortality, development, growth and reproduction are at or below concentrations measured in the environment as well as the estimated environmental concentrations from modeling data."[209] Mortality is even seen below levels that have been monitored in water bodies. These aren't estimates or modeled concentrations; these are real values that have been found in agricultural water bodies. Atrazine concentrations as low as 4 ppb can act additively with changes in temperature and moisture to decrease foraging efficiency, mass and time to death of salamanders.[210] Taken together we agree with the EPA that the overlap of effect concentrations and measured concentrations is "considerable."[211]

Of additional consideration is the fact that the 2012 FIFRA Scientific Advisory Panel (SAP) found that a previously proposed CELOC of 4 to 7 ppb (60-day rolling average) was not necessarily protective of aquatic life.[212] This *unanimous conclusion* was due to "compelling laboratory evidence" of low-dose toxicity of atrazine to fish and amphibians, the lack of toxicity studies that test indirect effects to herbivores, and the EPA's reluctance to analyze the toxicity of atrazine mixtures (pesticides and degradates).[213] Therefore, it is completely arbitrary that a proposed CE-LOC of 9.7 ppb is assumed to be protective of all aquatic wildlife instead of just aquatic plants. This is not supported by the risk assessment data or the opinions of the 2012 SAP (the only SAP that was

[203] Risk Assessment. Page 284.
[204] Risk Assessment. Page 162.
[205] Risk Assessment. Pages 277-279.
[206] Risk Assessment. Page 285.
[207] Risk Assessment. Pages 280-282.
[208] Risk Assessment. Page 300.
[209] Risk Assessment. Page 307.
[210] Risk Assessment. Page 181.
[211] Risk Assessment. Page 307.
[212] FIFRA Scientific Advisory Panel. (2012) SAP Minutes No. 2012-05. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding: Problem Formulation for the Reassessment of Ecological Risks from the Use of Atrazine. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2012-0230-0220. Hereafter "2012 SAP Meeting Minutes"
[213] 2012 SAP Meeting Minutes. Page 57-58.

ever asked to weigh in on this issue). Notably, the protectiveness, or lack thereof, of the proposed CE-LOC to aquatic wildlife has not been assessed by any FIFRA SAP since 2012.

If the EPA believes that the proposed CE-LOC of 9.7 ppb is protective of all aquatic wildlife, it must provide evidence to support that assertion – not just state that 3.4 ppb is protective. Right now, all of the available evidence indicates that significant harm will occur to aquatic wildlife at concentrations below 9.7 ppb and regulation based on the proposed CE-LOC is arbitrary and capricious and not compliant with FIFRA.

8) Given the Ineffectiveness of EPA's Mitigation Proposal, ESA Protections Must be Adjusted Accordingly

In Sections 1 and 2, we outlined how ineffective EPA's runoff mitigation proposal would be at reducing atrazine concentrations in waterways across the country. This is incredibly important for EPA's current FIFRA work, but perhaps even more impactful for the agency's ESA work that is currently ongoing.

EPA finalized its atrazine Biological Evaluation ("BE") in 2021.[214] In that analysis, EPA found that 1,013 species are likely to be adversely affected ("LAA") by atrazine and 328 critical habitats are LAA.[215] FWS and NMFS are currently conducting Biological Opinions for the use of atrazine in the U.S.

EPA's current ESA mitigation plan for all herbicides utilizes the Herbicide Strategy[216] as a blueprint to mitigate herbicide use in a way that avoids jeopardy and adverse modification of critical habitat for ESA-listed plants and ESA-listed animals that rely on plants. While the Herbicide Strategy may be a blueprint for an effective mitigation plan for some herbicides, it will not be for atrazine.

In the current atrazine proposal, EPA has used the Herbicide Strategy to attempt to mitigate runoff to an acceptable level. Our analysis in Appendix A has shown that this plan will fail to bring atrazine concentrations below levels known to impact plant communities in nearly all contaminated waterways. This is with 3 runoff mitigation points required in watersheds with predicted 60-day average atrazine concentrations between 9.7-45.4 ppb and 6 runoff mitigation points required in watersheds with predicted 60-day average atrazine concentrations > 45.4 ppb.

We note that even with 9 runoff mitigation points required in these waterways, which is the highest number of points the agency currently considers, there is absolutely no way to bring even half of these contaminated waterways into compliance with the proposed CE-LOC. And the CE-LOC is not

[214] Atrazine BE.
[215] Atrazine BE. Executive Summary.
[216] Herbicide Strategy

a suitable toxicity threshold to comply with the ESA, it is a FIFRA threshold meant to comply with an under-protective law. Atrazine will require a paradigm shift in how the agency mitigates runoff for endangered species. Given the persistence of atrazine and potential to accumulate in the environment from year to year, nothing less than a complete prohibition of atrazine application throughout the entire year in the habitat of aquatic species that overlap with atrazine use areas will be sufficient.

We wish to make clear that we are fully supportive of the ESA-specific mitigation that has been put in place to date for atrazine, like prohibitions in Hawaii and the U.S. territories, along U.S. roadsides and on conifers on public and private lands, including forests and Christmas tree farms. These mitigations are *important* and we commend EPA and atrazine registrants for securing these protections. However, much more needs to be done here, and the ESA-listed species that haven't received protections yet are going to be impossible to protect using only mitigations outlined in the Herbicide Strategy.

9) EPA Must Maintain and Strengthen Atrazine Monitoring Requirements

The Atrazine Ecological Exposure Monitoring Program ("AEEMP") was established in 2004 to monitor atrazine levels in highly contaminated waterways in corn and sorghum growing regions. In May of 2024, Syngenta requested that its monitoring requirements under the AEEMP be discontinued.[217] We strongly urge the agency to not scale back the AEEMP and commit to that course of action in its response to comments.

Syngenta believes that EPA's use of WARP modelling to predict atrazine concentration in most waterways should preclude further monitoring. We believe EPA's use of WARP justifies the exact opposite. We find it unbelievable that after two decades of the AEEMP, that only 185 watersheds out of 82,920 watersheds in the continental U.S. had high enough quality modelling data available for use in risk assessment.[218] And only an additional 300 watersheds had a sampling frequency high enough to be used with bias factors.[219]

We actually agree with Syngenta asking EPA, "What's the point of all of this?" If the monitoring requirements for AEEMP are so weak that the monitoring data aren't used in risk assessment, then why collect it at all? That is a legitimate gripe.

However, we strongly disagree with Syngenta that this justifies releasing the company from its duties under the AEEMP. EPA must require stronger and more frequent monitoring from Syngenta under AEEMP so the data can actually be useful. Sampling a site 12 times a year does not provide

[217] Syngenta. Renewed Request to Discontinue Atrazine Ecological Exposure Monitoring Program. May 22, 2024. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2132.
[218] Updated Mitigation Proposal. Page 6.
[219] Updated Mitigation Proposal. Page 6.

the type of temporal resolution that is needed to detect peak concentrations. You cannot identify an accurate 60-day average if you are not catching the peaks.

In its 2020 Interim Decision, EPA stated: "Continued water monitoring in streams and watersheds (the AEEMP) is needed to determine when and where additional stewardship is necessary to protect aquatic plant communities from potential affects, as well as to monitor the success of on-going and new stewardship programs."[220] This statement necessarily means that EPA must strengthen the AEEMP so the agency has high-quality data to assess the impacts of its mitigation plan. Our analysis shows that EPA's current mitigation plan will have no significant impact on atrazine levels in water, but to the extent that EPA strengthens this plan considerably, it will be vitally important to make sure its works. The only way to do this is through monitoring before and after mitigation adoption.

Monitoring is an essential part of determining whether a mitigation plan is working or not. A robust monitoring program is necessary to ensuring that atrazine levels decrease in these vulnerable watersheds. EPA must maintain and strengthen the AEEMP monitoring requirements to ensure it has the necessary information to measure the success of its mitigation plan.

10) The Proposed Mitigation Plan Must be Conditioned on Meeting Benchmarks on Water Quality Improvement

As with any mitigation plan, this plan's success will depend on multiple factors – like EPA's many assumptions about mitigation compliance, efficacy and adoption. The only scientific analysis analyzing EPA's currently proposed mitigation plan has found that it will fail to meaningfully reduce atrazine concentrations across the country and at the individual field level (Sections 1 and 2 of these comments). To the extent EPA significantly strengthens its mitigation plan following this comment period, it will be important to confirm that compliance and mitigation efficacy are high enough to realize reductions in atrazine. We are justifiably skeptical that any mitigation plan can work, which is why we are asking the EPA to ban atrazine.

We feel that these immense uncertainties necessitate a contingency plan. If EPA moves forward without banning atrazine, it should make its proposed mitigation plan contingent on atrazine water concentrations *actually decreasing* below the CE-LOC. EPA could tailor the AEEMP to provide that confirmation, at least for a subset of watersheds. EPA could select representative watersheds in specific states or regions that could be monitored according to best practices designed to detect peak concentrations. If water quality issues were not rectified following implementation of the mitigation plan, EPA would be required to consider geographic restrictions in use via Bulletins Live! Two. Any water quality improvements must be sustained, as demonstrated through annual water quality monitoring, through to, at least, the next registration review cycle.

[220] EPA. Atrazine Interim Registration Review Decision. Case Number 0062. September 2020. Page 36. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1605. Hereafter "Interim Decision."

Ultimately the proposed mitigation plan is intended to achieve one thing – the reduction of atrazine in waterways that is harming wildlife and water quality. Any plan that is not conditioned on an intended outcome is a waste of everyone's time – not least of all EPA's time and resources.

The proposed mitigation plan is complicated and, as our analysis shows, will likely be ineffective. If the agency still insists on moving forward with this plan or a different one, we strongly urge EPA to give it some teeth and condition any registration decision on intended outcomes.

11) EPA Should be Transparent with the Public About Syngenta's Compliance with Conditional Acuron Registration

In May of 2015, EPA conditionally registered the product Acuron, which is a product containing the active ingredients atrazine, bicyclopyrone, S-metolachlor and mesotrione.[221] EPA was seemingly aware of how crazy it was to be approving a new atrazine product in 2015 with everything we know about its toxicity and persistence. In attempting to assuage itself and the public, the agency put in place conditions on the registration of Acuron, which included milestones in atrazine reduction that needed to be achieved. This included the following:

> "Annual reports: Syngenta will provide an annual report to EPA no later than March 31 of each year following Acuron's first full launch year (the first full launch year currently is anticipated to be 2016 and, if so, the first report would be made in March of 2017). The report will include data on the total application of specific herbicide products to corn grown in the U.S. in the preceding year.
> B. 2018 Interim Milestone: In the annual report on the 2018 growing season (provided in March of 2019) Syngenta will demonstrate a 1.6-million-pound reduction of atrazine applied per year on base acres treated with the specific Syngenta products compared to the baseline (referred to as "the interim milestone"). If this interim milestone is not reached, no later than April 15, 2019, Syngenta will submit for EPA approval revisions to the label for Acuron which include a reduction or prohibition of the use of additional atrazine in tank-mixing or sequential use (or other measures agreed upon with EPA prior to that date) that would be consistent with achieving the 2020 atrazine reduction milestone. Provided that EPA approves the label revisions by May 31, 2019, this revised label must be on all Acuron product (100-1466) that Syngenta releases for shipment as of September 30, 2019. If Syngenta submits label revisions by April 15, 2019, but EPA has not approved the label revisions by May 31, EPA and Syngenta will discuss and establish a revised schedule for making the revisions.
> C. 2020 Milestone: In the annual report on the 2020 growing season (provided in March of 2021), Syngenta will demonstrate an approximately 3.6-million-pound reduction of atrazine. If the 2018 interim milestone is reached but the 2020 milestone is not reached, no later than April 15, 2021, Syngenta will submit for EPA approval revisions to the label for Acuron

[221] EPA. Acuron™ Herbicide Notice of Conditional Registration EPA Reg. 100-1466. April 24, 2015. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2014-0355-0078. Hereafter "Acuron Registration."

which include a reduction or prohibition of the use of additional atrazine in tank-mixing or sequential use (or other measures agreed upon with EPA prior to that date) that would be consistent with achieving the 2020 atrazine reduction milestone in the 2021 growing season. (Meeting the 2020 atrazine reduction milestone in either 2020 or 2021 is referred to as "the milestone"). Provided that Syngenta submits label revisions by April 15, 2021, and EPA approves the label revisions by May 31, 2021, this revised label must be on all Acuron product (100-1466) that Syngenta releases for shipment as of September 30, 2021. If Syngenta submits the label revisions by April 15, 2021, but EPA has not approved the label revisions by May 31, EPA and Syngenta will discuss and establish a revised schedule for making the revisions.

5. A. Failure to Achieve Herbicide Use Reduction: If neither the 2018 nor the 2020 reduction milestone is reached, Syngenta agrees that EPA may, at its sole discretion, issue an order cancelling the 100-1466 registration without a hearing (subject to the rights reserved in paragraph 5.B. below). If the 2018 milestone is reached, the 2020 milestone is not reached, label revisions are undertaken for the 2021 growing season as provided above, and the 2020 milestone is not reached in the 2021 growing season (as demonstrated by the annual report submitted in March 2022), then Syngenta agrees that EPA may, at its sole discretion, issue an order cancelling the 100-1466 registration without a hearing (subject to the rights reserved in paragraph 5.B. below). Before issuing any such order based on either of those two possibilities, EPA will consider the actual use reduction achieved and any other factors that may have affected the use reductions that were outside of Syngenta's control. If EPA nonetheless decides to issue a cancellation order, it will notify Syngenta in writing of its intention to cancel the registration and will specify in such notification the basis for its conclusion that Syngenta has failed to meet the 2020 milestone in the 2020 or 2021 growing season, whichever applies. If within ten (10) business days of receipt of such notification Syngenta submits to the agency a request in writing to meet with the Director of the Office of Pesticide Programs ("Office Director") before a cancellation order is issued, the agency will not issue a cancellation order before providing Syngenta an opportunity to meet with the Office Director to discuss whether cancellation is appropriate. The decision of the Office Director thereafter shall be final. Syngenta agrees to issuance of a cancellation order pursuant to this paragraph provided that it would contain provisions allowing Syngenta to sell remaining 100-1466 stocks (produced, labeled, and released for shipment as of the effective date of cancellation); allowing persons other than Syngenta to sell and distribute existing stocks; and allowing use of such existing stocks in accordance with the label on the product until exhausted.

B. Syngenta agrees that it will not challenge (or provide financial or technical assistance to anyone challenging) in any administrative forum the issuance of any cancellation order that conforms to all the terms of paragraph 5.A. of this notice. Notwithstanding the foregoing sentence, nothing in this paragraph shall limit Syngenta's right to: 1) defend against an EPA cancellation proceeding brought outside the terms of this letter; 2) support or participate in any action (in any forum) that challenges any EPA policy or practice of general applicability

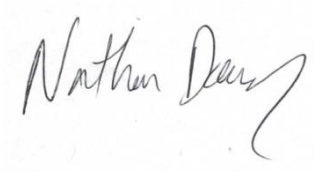
that may affect the ultimate requirements set forth in EPA's registration approval letter for 100-1466, including the support of or participation in the activities of any trade association or coalition that is involved in any such challenge; 3) defend any personal injury, toxic tort, or other such suit and raise any defense in such suit; 4) submit applications to amend any requirement or milestone in this letter; or 5) enforce rights under FIFRA or EPA's implementing regulations other than rights waived in this letter.
6. A. Sustained Achievement: The atrazine reduction addressed in this notice will be sustained. Syngenta will continue annual reporting until March 31, 2024, or until such time that the 2020 milestone has been documented in three consecutive annual reports, whichever is sooner."[222]

We have put in multiple FOIA requests for this information and have been told that it is all confidential business information ("CBI"). The first of Syngenta's annual reports was submitted to the agency in 2017. It is now 2025 and the public has received no information whatsoever on whether the terms of this registration condition have been met or whether any reductions in use have been sustained. On the other hand, publicly available data indicate that atrazine use decreased modestly from 2017 to 2018, but then rebounded back to near 2017 levels in 2019.[223] We don't currently have any information about more recent years.

EPA-required atrazine use reductions are highly relevant to this action as it is a necessary piece of information needed to critically assess how the proposed mitigation measures would work and whether the Acuron registration should be cancelled.

We urge the agency to act in a transparent manner and include an analysis of Syngenta's compliance, or lack of compliance, with Acuron's terms and conditions in its Response to Comments.

Respectfully submitted,



Nathan Donley, Ph.D.
Environmental Health Program Science Director
Center for Biological Diversity

[222] Acuron Registration. Pages 2-3.
[223] USGS. National Water-Quality Assessment (NAWQA) Project. Pesticide National Synthesis Project. Pesticide Use Maps – Atrazine. Available here: https://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=2019&map=ATRAZINE&hilo=L&disp=Atrazine.

Appendix A

1) Introduction

In EPA's Updated Mitigation Proposal for the Atrazine Interim Registration Review Decision,[224] EPA has proposed to implement four separate mitigations the agency believes will reduce atrazine runoff:[225]

1) Restrict maximum annual application rates for:
   - sorghum, field corn, and sweet corn to 2.0 lbs ai/A/year or less for applications
   - sugarcane to 8.0 lbs a.i./acre in Florida and 4.0 lbs a.i./acre in Louisiana and Texas
2) Prohibit application during rain.
3) Prohibit when soils are saturated or above field capacity.
4) Users must visit a website to determine if their field falls within a Bin that requires runoff mitigation:
   - If in Bin 1, applicators must have achieved 3 points prior to making an application.
   - If in Bin 2, applicators must have achieved 6 points prior to making an application.

For our analysis, we sought to understand how efficacious this runoff mitigation plan would be if implemented in watersheds that have predicted atrazine concentrations above the Concentration Equivalent Level of Concern (CE-LOC) of 9.7 ppb averaged over 60 days.

We have focused our analysis on mitigations #1 and #4 above. EPA has found that prohibiting applications to saturated soils or during rain align with best management practices and are already implemented by atrazine users.[226] EPA concluded that both label requirements are likely already being implemented by growers and would not impact current growing practices significantly. Therefore, we have omitted these label requirements from our analysis and concur with EPA that they will largely maintain the status quo.

Thus, our analysis focuses on runoff mitigations #1 and #4 because these are the mitigations that have the potential to reduce atrazine runoff concentrations from their current levels under already implemented practices. This is important because monitoring and modelling data have found or predicted atrazine at concentrations significantly above aquatic life thresholds,[227] and more than 1/8th of the watersheds in the contiguous U.S. currently exceed the CE-LOC.[228] We note that even with the current growing practices of most corn, sorghum and sugarcane not being irrigated or irrigated using subsurface techniques, the majority of corn, sorghum and sugarcane acres

[224] EPA. Updated Mitigation Proposal for the Atrazine Interim Registration Review Decision, Case Number 0062. 11/20/2024. Found here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2135. Hereafter "Updated Mitigation Proposal"
[225] Updated Mitigation Proposal at 12-13.
[226] Updated Mitigation Proposal at 13-14.
[227] Updated Mitigation Proposal at 7.
[228] 11,249 HUC12 watersheds above the CE-LOC divided by total HUC12 watersheds of 82,921 equals 14% total HUC12 watersheds impaired (between 1/8th and 1/7th of all HUC12's in contiguous U.S.)

implementing no tillage/reduced tillage practices, reduced atrazine application rates, and other management practices that have been put in place over the years, atrazine surface water concentrations still remain incredibly high and concerning to the EPA and the broader public. Therefore, a successful runoff mitigation plan requires significant changes in atrazine use and crop production practices because the practices currently in place are highly inadequate by themselves.

Our analysis is divided into five parts.

1) How EPA's maximum annual application rate reductions are likely to impact atrazine use in watersheds that exceed the CE-LOC
2) How EPA's requirements for Bin 1 mitigations (3 points) are likely to impact current growing practices and atrazine use in watersheds with predicted 60-day average atrazine concentrations between 9.7-45.4 ppb.
3) How EPA's requirements for Bin 2 mitigations (6 points) are likely to impact current growing practices and atrazine use in watersheds with predicted 60-day average atrazine concentrations > 45.4 ppb.
4) How the combination of EPA's proposed runoff mitigations is likely to impact atrazine levels in watersheds containing ≥ 9.7 ppb.
5) Limitations, Assumptions and Uncertainties in this analysis

For our analysis, we utilized data provided to us by EPA on predicted watershed atrazine levels in the U.S.[229] Specifically, we requested and received the predicted 60-day average atrazine concentrations for each of the 82,921 HUC12 watersheds analyzed by EPA, the crosswalk of what state(s) each HUC12 watershed is present in, and the crosswalk of the counties each HUC12 watershed is present in for Louisiana, Florida and Texas (Supplemental File A, Sheets 1-3). From these data, we identified the 11,249 HUC12 watersheds that contained 60-day average atrazine concentrations between 9.7-45.4 ppb (7,152) and above 45.4 ppb (4,097) (Supplemental File A, Sheet 4). We added state-level data to this spreadsheet to determine the relevant state(s) each HUC12 watershed is present in (Supplemental File A, Sheet 7).

2) How EPA's Maximum Annual Application Rate Reductions Are Likely to Impact Atrazine Use in Watersheds That Exceed the CE-LOC

a. Determining the Primary Contributor to Atrazine Concentrations in Each HUC12 Watershed

Due to lack of available data, we have analyzed two different atrazine uses with regards to runoff contribution: 1) corn and sorghum, and 2) sugarcane. Atrazine has a few other minor agricultural and non-agricultural uses besides these that we were unable to account for in our analysis and we did not have enough information to parse out data on sweet corn, field corn and sorghum use (so we combined these into one use layer). Corn, sorghum and sugarcane account for most atrazine use in

[229] Email communication between Center for Biological Diversity scientist Nathan Donley and EPA Chemical Review Manager Alexander Hazlehurst on 12/11/2024 and 12/16/2024.

the U.S. and are widely considered to be the greatest contributors to atrazine concentration in waterways throughout the U.S. Corn and sorghum are highly similar crops with very similar atrazine uses, field requirements and production practices, such as irrigation and tillage. And sweet corn comprises only 1% of corn grown in the U.S. Therefore, our focus on only three crops (corn, sorghum and sugarcane) will account for nearly all atrazine use in the country and our decision to combine field corn, sweet corn and sorghum into one use layer should not significantly impact our results.

To ease our analysis, we categorized each of the HUC12 watersheds that have predicted 60-day average atrazine concentrations ≥ 9.7 ppb into one of two bins: 1) primarily impacted by atrazine use on sugarcane and 2) primarily impacted by atrazine use on corn/sorghum.

To identify the HUC12 watersheds that are primarily impacted by atrazine use on sugarcane, we utilized USDA data on where sugarcane is grown in the contiguous U.S. USDA notes that most sugarcane production in the U.S. occurs in Florida, the Delta region of Louisiana, and the lower Rio Grande Valley in the southern tip of Texas.[230] Available data from USDA indicate that little to no corn is grown in Florida, but some corn is grown in Texas and Louisiana – primarily in the northern parts of the states.[231] Little to no sorghum is grown in Florida and Louisiana, however some sorghum is grown in southern Texas.[232] County maps of sugarcane production indicate that the crop is primarily grown in central Florida, the southern half of Louisiana and the southern tip of Texas.[233]

Therefore, we assumed that all of the HUC12 watersheds in Florida were primarily impacted by atrazine use on sugarcane. For Louisiana, we assumed that any HUC12 watershed in a county south of Vernon, Rapides, and Avoyelles counties was primarily impacted by atrazine use in sugarcane. The remaining Louisiana counties were assumed to be primarily impacted by atrazine use in corn/sorghum. For Texas, we assumed that all HUC12 watersheds in the counties of Hidalgo, Willacy and Cameron were primarily impacted by atrazine use in sugarcane. The remaining Texas counties were assumed to be primarily impacted by atrazine use in corn/sorghum.

We acknowledge that some watersheds may be impacted by atrazine use on both crops – for instance, the southern tip counties of Texas grow both sugarcane and sorghum – and we discuss this uncertainty in Section 6 below.

From this information we generated spreadsheets for HUC12 watersheds in corn/sorghum and sugarcane growing regions. In Supplemental File A, Sheet 8, we identified the HUC12 watersheds that contain ≥ 9.7 ppb 60-day average atrazine concentrations and exist in TX, LA, or FL. There were 1,403 HUC12 watersheds that met those parameters. The relevant county information was also

[230] USDA ERS. Sugar & Sweeteners: U.S. Sugar Production. Available here: https://www.ers.usda.gov/topics/crops/sugar-and-sweeteners/background/
[231] USDA. Corn grown for grain 2023. Harvested acres by county for selected states. Available here: https://www.nass.usda.gov/Charts_and_Maps/graphics/CR-HA-RGBChor.pdf
[232] USDA. Sorghum 2023. Planted acres by county for selected states. Available here: https://www.nass.usda.gov/Charts_and_Maps/Crops_County/as-pl.php
[233] USDA. United States Sugarcane production 2014-2018. Available here: https://ipad.fas.usda.gov/rssiws/al/crop_production_maps/US/USA_Sugarcane.png

included in this spreadsheet. From this spreadsheet we separated the TX, LA, and FL HUC12 watersheds that met the sugarcane or corn/sorghum use data layer parameters outlined above (Supplemental File A, Sheet 9 contains the TX, LA and FL HUC12 watersheds in the sugarcane use data layer and Supplemental File A, Sheet 10 contains the TX, LA and FL HUC12 watersheds in the corn/sorghum use data layer).

Supplemental File A, Sheet 9 contains the 134 HUC12 watersheds that are likely to be most greatly impacted by atrazine use in sugarcane. To attain the HUC12 watersheds most greatly impacted by atrazine use in corn/sorghum, we deleted the 134 HUC12 watersheds in Supplemental File A, Sheet 9 from Supplemental File A, Sheet 7. The resulting spreadsheet contains the 11,115 HUC12 watersheds in the corn-sorghum use data layer (Supplemental File A, Sheet 11).

Therefore, of the 11,249 HUC12 watersheds impacted by atrazine above the CE-LOC, 134 will be analyzed relevant to the proposed runoff mitigations put in place for sugarcane and 11,115 will be analyzed relevant to the proposed runoff mitigations put in place for corn and sorghum.

b. Corn and Sorghum

Supplemental File A, Sheet 11 identifies the 11,115 HUC12 watersheds that have 60-day average atrazine concentrations above the CE-LOC and are primarily impacted by atrazine use in corn and sorghum.

The following is the proposed reduction in maximum annual application rates in corn and sorghum that the agency is proposing:

- Reduction of corn and sorghum maximum annual application rates from 2.5 lbs a.i./A/year to 2 lbs a.i./A/year

To determine how EPA's proposed maximum annual rate reductions for atrazine will impact these watersheds, we gathered data on the extent and likelihood of rate reductions in the relevant watersheds. EPA has identified the percentage of field corn users who report using annual application rates higher than the proposed maximum of 2 lbs a.i./A/year.[234] EPA has estimated that 11% of atrazine users in the corn belt,[235] 9% of atrazine users in the plains states,[236] and 20% of atrazine users in the southern seaboard[237] currently apply atrazine above the proposed maximum annual application rate.[238]

We categorized each watershed in corn and sorghum-growing regions into the 1) Corn Belt, 2) Plains States and 3) Southern Seaboard (Supplemental File B, Sheets 12-14). Around 87% of HUC12 watersheds that had CE-LOC exceedances were in these three regions. For states that did

[234] EPA. Assessment of the Benefits of Atrazine and the Impacts of Potential Mitigation for Field Corn, Sweet Corn, Sorghum, and Sugarcane; PC Code (080803). June 23, 2022. Page 24; Table 6. Found here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1624 (Hereafter "Benefits Assessment")
[235] Illinois, Indiana, Iowa, Missouri, and Ohio.
[236] Colorado, Kansas, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas.
[237] Alabama, Delaware, Georgia, Maryland, North Carolina, South Carolina, and Virginia.
[238] Benefits Assessment Page 24; Table 6.

not fall into either of these three EPA-defined[239] categories, we used the national average of 10% of users applying atrazine above the proposed maximum rate of 2 lbs a.i./A/year[240] (referred to as "undefined" states, Supplemental File B, Sheet 15). For HUC12 watersheds that span multiple states, we conservatively applied the highest relevant percentage applicable to that watershed.

Since EPA has proposed a maximum annual rate reduction of 2.5 lbs a.i./A/year to 2 lbs a.i./A/year, the amount of rate reduction these growers would be required to adopt is assumed to be a 20% decrease.

In this analysis we assume that the proportion of applicators using atrazine above the proposed annual maximum application rate in a certain region remains constant in each watershed in that region. For instance, since an estimated 11% of atrazine users in the Corn Belt apply atrazine above 2 lbs a.i./A/year, we assume that 11% of atrazine users in each watershed in the corn belt states apply at that rate. In reality, this will overestimate the impact of rate reductions in some regions and underestimate it in others, as there will inevitably be some variability at the individual watershed level that is not evident in regional averages. However, without more precise pesticide use data, this approach remains the most accurate approach to estimate the impact of rate reductions on atrazine levels in relevant watersheds.

Therefore, in each HUC12 watershed in each of the four regions: 1) Plains States, 2) Corn Belt, 3) Southern Seaboard and 4) Undefined, we estimate that 9%, 11%, 20% and 10% of growers, respectively, will reduce their application rates by 20% in the relevant watersheds. This amounts to a total of 1.8%, 2.2%, 4%, and 2% reduction in atrazine runoff in each Plains States, Corn Belt, Southern Seaboard and Undefined watershed, respectively.[241]

This analysis is presented in Supplemental File B, Sheets 12-15. Supplemental File B, Sheet 16 combines all of the 11,115 HUC12 watersheds in the four regions and sorts by the newly predicted 60-day atrazine concentration based on EPA's proposed maximum annual application rate reduction. Based on these data, 119 out of 11,115 watersheds (about 1%) are estimated to no longer exceed the CE-LOC due to the proposed maximum annual application rate reduction mitigation. The waterbodies in 10,996 watersheds (about 99%) are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

c. Sugarcane

Supplemental File A, Sheet 9 identifies the 134 HUC12 watersheds that have 60-day average atrazine concentrations above the CE-LOC and are primarily impacted by atrazine use in sugarcane.

[239] Benefits Assessment Pages 6-7.
[240] Benefits Assessment Page 24; Table 6.
[241] Assuming 9%, 11%, 20% and 10% of corn/sorghum acres in each watershed achieve a 20% reduction in atrazine runoff = 0.09 * 0.2 = 0.018 (total 1.8% reduction atrazine runoff in each HUC12 watershed), = 0.11 * 0.2 = 0.022 (total 2.2% reduction atrazine runoff in each HUC12 watershed), = 0.2 * 0.2 = 0.04 (total 4% reduction atrazine runoff in each HUC12 watershed), = 0.1 * 0.2 = 0.02 (total 2% reduction atrazine runoff in each HUC12 watershed).

The following is the proposed reduction in maximum annual application rate in sugarcane that the agency is proposing:

- Reduction of sugarcane maximum annual application rates from 10 lbs a.i./A/year to 8 lbs a.i./A/year in Florida and to 4 lbs a.i./A/year in Louisiana and Texas

To determine how EPA's proposed maximum annual rate reductions for atrazine will impact these watersheds, we gathered data on the extent and likelihood of rate reductions in the relevant counties. Since data on annual application rates are not available for sugarcane,[242] we had to make some assumptions. EPA has stated that it does not anticipate that sugarcane growers will be impacted by its proposed rate reductions because it has accounted for regional differences in use, via a higher maximum annual application rate in Florida compared to Texas and Louisiana.[243] Therefore, we assume in this analysis that few growers will be impacted by EPA's proposal to reduce the annual application rate. However, it is possible that a minority of growers who currently use the maximum application rate will be impacted. We have identified what we believe to be a conservative estimate that 10% of sugarcane growers will be required to reduce their annual application rate to the new proposed maximum. This value aligns with the number of corn growers the agency believes will be impacted nationally by the proposed rate reduction in corn[244] and is consistent with EPA statements that rate reduction impacts would be low.

The amount of rate reduction this 10% of growers would be required to adopt is assumed to be a 20% decrease from 10 lbs a.i./A/year to 8 lbs a.i./A/year for Florida growers. For Louisiana and Texas, given that the typical annual application rate range is estimated to be 2-3 lbs a.i./A/year[245], we believe that very few, if any, growers in these states are applying atrazine at annual rates higher than 5 lbs a.i./A/year. EPA's position that sugarcane growers will not be impacted by its annual rate reductions[246] provides further support for this assumption. Therefore, the amount of rate reduction that 10% of TX and LA sugarcane growers would be required to adopt is assumed to be a 20% decrease from 5 lbs a.i./A/year to 4 lbs a.i./A/year.

In this analysis we assume that the proportion of applicators using atrazine above the proposed annual maximum application rate in a certain region remains constant in each watershed in that region. For instance, since an estimated 10% of atrazine users in Florida are estimated to apply atrazine above 8 lbs a.i./A/year, we assume that 10% of atrazine users in each watershed in Florida apply at that rate. In reality, this will overestimate the impact of rate reductions in some regions and underestimate it in others, as there will inevitably be some variability at the individual watershed

[242] Updated Mitigation Proposal at 13.
[243] Updated Mitigation Proposal at 13. "Based on available data, EPA does not anticipate that sugarcane growers will be impacted by the proposed rate reductions given the proposed reductions account for rates based on soil type. Sugarcane growers in Florida have organic soils that tightly absorbs atrazine and, therefore, requires higher rates for effective weed control compared to growers in Louisiana.
[244] Updated Mitigation Proposal at 13.
[245] EPA. EPA/OPP/BEAD Information & Data Inquiry on Proposed Atrazine Runoff Mitigations for Field Corn, Sorghum, Sugarcane and Sweet Corn. April 4, 2022. Page 9. Found here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1614. (Hereafter "Data Inquiry")
[246] Updated Mitigation Proposal at 13.

level that is not evident in state estimates. However, without more precise pesticide use data, this approach remains the best scientific data available to estimate the impact of rate reductions on atrazine levels in relevant watersheds.

Therefore, our analysis assumes that 10% of sugarcane growers in each relevant watershed will be required to reduce their application rates by 20% to come into compliance with EPA's proposed maximum annual rate reductions for sugarcane in FL, TX and LA. This amounts to a total of 2% reduction in atrazine runoff in each watershed.[247]

This analysis is presented in Supplemental File B, Sheet 17. This spreadsheet presents data on all of the 134 HUC12 watersheds in sugarcane growing counties and sorts by the newly predicted 60-day atrazine concentration based on EPA's proposed maximum annual application rate reduction. Based on these data, 1 out of 134 watersheds (about 1%) are estimated to no longer exceed the CE-LOC due to this specific runoff mitigation. The waterbodies in 133 watersheds are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

3) How EPA's Requirements for Bin 1 Mitigations (3 points) are Likely to Impact Current Growing Practices and Atrazine Use in Watersheds with Predicted 60-day Average Atrazine Concentrations Between 9.7-45.4 ppb

a. Corn and Sorghum

EPA is proposing to require 3 points of runoff mitigation for users who want to use atrazine in HUC12 watersheds with predicted 60-day average atrazine concentrations between 9.7-45.4 ppb (Hereafter referred to as "Bin 1 watersheds"). 7,070 of the 11,115 HUC12 watersheds primarily impacted by atrazine use in corn/sorghum are Bin 1 watersheds (Supplemental File B, Sheet 18).

Runoff mitigation points are calculated from EPA's recently updated Runoff Mitigation Menu.[248] This menu contains a mix of mitigation "relief points" – which are points given to users who do not implement any mitigation, but apply pesticides in areas or in a manner where EPA believes runoff will be reduced – and mitigation points. Importantly, for this analysis, we are not interested in how many atrazine users implement "mitigations," but how many users will be required to implement further mitigations above and beyond their current growing practices. Since EPA has predicted concerning atrazine levels in water throughout the country at present day, any mitigation in atrazine harm will necessarily need to come from measures taken above and beyond what is currently implemented.

[247] Assuming 10% of corn/sorghum acres in each watershed achieve a 20% reduction in atrazine runoff = 0.1 * 0.2 = 0.02 (total 2% reduction atrazine runoff in each HUC12 watershed)
[248] https://www.epa.gov/pesticides/mitigation-menu

i. Mitigation Relief Points

To calculate how many atrazine users will qualify for mitigation "relief points," we utilized an analysis conducted by BASF and Compliance Services International.[249]

This 2024 analysis calculated the number of acres for six crop groups (including corn) that would be "exempt" from having to implement mitigations under the current "herbicide strategy" that is being implemented under the Endangered Species Act ("ESA"), as well as for EPA's atrazine proposal. For the "non-exempt" acres of corn, this analysis calculated the mitigation relief points (which the researchers refer to as "field characteristic exemptions") that corn growers would achieve using the relief measures of "reduced runoff potential," "low slope," and "sandy soils," which correspond to the first three mitigation relief options in EPA's mitigation menu.[250] The researchers found that 90% of "non-exempt" corn acres grown in the U.S. would achieve ≥2 runoff mitigation points with these three relief options.[251]

The researchers found that 30% of corn acreage would be "exempt" from having to implement any further mitigation due to being >1,000 ft from aquatic and terrestrial wildlife habitat.[252] This exemption also exists in EPA's current atrazine proposal.[253] Therefore, for 30% of corn acres, 100% would be exempt from having to acquire mitigation points due to being <1,000 ft from aquatic or terrestrial habitat. For the remaining 70% of corn acreage that was "non-exempt," the researchers found that 10% (7% total) would attain 1 point, 39% (27.3% total) would attain 2 points, 2% (1.4% total) would attain 4 points, 36% (25.2% total) would attain 5 points, and 13% (9.1% total) would attain ≥6 points (total of 90% of the 70% of "non-exempt" corn acres receiving ≥2 points).[254]

Based on this analysis, we assumed that 30% of corn acres would be exempt from having to put in place mitigations. The remaining 70% would not be exempt from having to attain points and would immediately be eligible for the following point totals based on relief points: 7% total would attain 1 point, 27.3% would attain 2 points, 1.4% would attain 4 points, 25.2% would attain 5 points, and 9.1% would attain ≥6 points.

In addition to the three mitigation-relief options the researchers analyzed, EPA also has an additional mitigation relief option worth 1 point, which is the Mitigation Tracking option.[255] This gives the user 1 point for documenting their mitigations in paper or electronic format. Due to the relative ease of this mitigation relief option, our analysis assumes that 100% of atrazine users will choose to implement this option and receive 1 point.

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[249] Campana, D and Hassinger, C. Quantifying field characteristic exemptions and runoff mitigation points from EPA's ESA Strategy Documents. Presentation at the American Chemical Society 2024 Fall Meeting. August 18, 2024. Available here: https://complianceservices.com/wp-content/uploads/Quantifying-the-Potential-Agricultural-Area-Affected-by-EPAs-Draft-Herbicide-Strategy_18Aug24.pdf. Document also submitted to the docket. (Hereafter "BASF ACS presentation").
[250] https://www.epa.gov/pesticides/mitigation-menu
[251] BASF ACS presentation. Page 21. Red bar in graph corresponding to "corn" on the x axis.
[252] BASF ACS presentation. Page 19.
[253] Updated Mitigation Proposal at 15.
[254] BASF ACS presentation. Page 21.
[255] https://www.epa.gov/pesticides/mitigation-menu The 4th option down in Table 1.

Therefore, the 90% of "non-exempt" corn acreage that the researchers predict will qualify for ≥2 mitigation relief points based on field characteristics alone will also qualify for 1 additional relief point for mitigation tracking. This means that 93% of corn acreage (and potential atrazine use sites) will achieve ≥3 runoff mitigation relief points without having to implement any further mitigation or will be totally exempt from further mitigation (Table 1).

Table 1: Mitigation Relief Points that Will Be Achieved by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/Sorghum Acres	Mitigation "Relief" Points Achieved
7	1
27.3	3
1.4	4
25.2	5
9.1	≥6
30	exempt

*data obtained from Campana, D and Hassinger, C., 2024 and adapted to add 1 extra point for all corn acres using the mitigation tracking option

ii. Points for Irrigation Practices

The 2017 USDA Census of Agriculture indicates that 13,929,183 acres of grain and silage corn are irrigated out of a total U.S. corn acreage of 90,847,976 acres.[256] This means that 15% of corn acres grown in the U.S. are currently irrigated and 85% are not irrigated, or "rainfed." Furthermore, EPA has found that sorghum is also rarely irrigated, with ≤10% of sorghum acres in the largest sorghum producing states practicing irrigation.[257]

EPA's mitigation menu contains an in-field mitigation option of "irrigation management." Under this option, atrazine users will achieve 3 points for not irrigating their crop. Therefore, for our analysis we assumed that 85% of corn/sorghum atrazine users will receive 3 points for not irrigating their crop. This assumption does not account for regional differences in irrigation, which are known to occur.[258] This is limitation is discussed in Section 6 and we have concluded that not accounting for regional differences in irrigation will not significantly affect our findings.

[256] USDA. 2017 Census of Agriculture. Table 35. Specified Crops by Acres Harvested: 2017 and 2012. Available here: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/st99_1_0035_0035.pdf
[257] Benefits Assessment Page 30.
[258] Benefits Assessment Page 30.

Table 2: Points Achieved for Irrigation Practices by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/sorghum Acres	Mitigation Points Achieved
85	3

iii. Points for Tillage Practices

USDA has found that in 2021, 36% of corn acres in the U.S. practiced no-till and 40% practiced mulch-till, both of which are considered conservation tillage techniques.[259] USDA has also communicated to EPA that 75% of sorghum acres utilize conservation tillage, almost identical to that of corn.[260]

EPA's mitigation menu contains an in-field mitigation option of "conservation tillage." Under this option, atrazine users will achieve 3 points for using the no-till practice and 2 points for using the mulch-till practice. Therefore, our analysis assumes that 36% of corn/sorghum acres would achieve 3 points for no-till and 40% would achieve 2 points for mulch-till (76% total acres would receive 2-3 points). This assumption does not account for regional differences in adoption of conservation tillage, which can occur to some extent.[261] This limitation is discussed in Section 6 and we have concluded that not accounting for regional differences in conservation tillage will not significantly affect our findings.

Table 3: Points Achieved for Tillage Practices by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/Sorghum Acres	Mitigation Points Achieved
36	3
40	2

iv. Points for Application Rate Reduction

EPA has found that a sizeable portion of atrazine users currently apply less than maximum rates of atrazine on corn fields. Below are the annual atrazine rates used by proportion of atrazine-treated corn acreage nationally.[262]

[259] USDA. Economic Research Service. Adoption of conservation tillage has increased over the past two decades on acreage planted to major U.S. cash crops. October 25, 2022. Available here: https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=105042.
[260] Data Inquiry at Page 5.
[261] USDA. Economic Research Service. Tillage Intensity and Conservation Cropping in the United States. September 2018. Page 13. Available here: https://ers.usda.gov/sites/default/files/_laserfiche/publications/90201/EIB-197.pdf?v=77252.
[262] Benefits Assessment Page 24; Table 6.

10% of corn acreage treated with >2.0 lbs a.i./acre

18% of corn acreage treated with between 2.0 - 1.5 lbs a.i./acre

21% of corn acreage treated with between 1.5 - 1.0 lbs a.i./acre

30% of corn acreage treated with between 1.0 - 0.625 lbs a.i./acre

21% of corn acreage treated with between 0.625 - 0 lbs a.i./acre

EPA's mitigation menu contains an application parameter mitigation option of an "annual application rate reduction." Under this option, atrazine users will achieve 1 point for applying 10% to <30% less than the maximum labeled annual application rate; 2 points for applying 30% to <60% less than the maximum labeled annual application rate, and; 3 points for applying ≥60% less than the maximum labeled annual application rate.[263]

To assign a point value to the corn acreage that currently applies less than maximal annual rates of atrazine, we estimated the proportion of corn acreage that would qualify for 1, 2, or 3 points based on current atrazine application practices identified by EPA. Since EPA has proposed to reduce the maximum annual application rate for sorghum and corn to 2.0 lbs ai/A/year, that is the ceiling we have used to determine percent reduction. We have calculated the percent reduction in application rate by proportion of corn acreage identified by EPA from the values identified above.

10% of corn acreage treated with >2.0 lbs a.i./acre >>> no reduction

18% of corn acreage treated with between 2.0 - 1.5 lbs a.i./acre >>> 0%-25% reduction

21% of corn acreage treated with between 1.5 - 1.0 lbs a.i./acre >>> 25%-50% reduction

30% of corn acreage treated with between 1.0 - 0.625 lbs a.i./acre >>> 50%-68% reduction

21% of corn acreage treated with between 0.625 - 0 lbs a.i./acre >>> 68%-99% reduction

Since the percent reduction values above do not line up with the percent reduction values that determine number of points achieved (10% to <30% reduction = 1 point, 30% to <60% reduction = 2 points, ≥60% reduction = 3 points), we divided up each group based on the anticipated proportion that would fall into each of the mitigation menu's three point-bins.

For the 10% of corn acres that are sprayed with >2.0 lbs a.i./acre, we concluded that no rate reduction was taking place (0 points). For the 18% of corn acres that have a 0-25% reduction in atrazine rates, we assumed that half would achieve between 10-25% reduction (1 point) and the other half would achieve <10% reduction (0 points). For the 21% of corn acres that have a 25-50%

[263] https://www.epa.gov/pesticides/mitigation-menu

reduction in atrazine rates, we assumed that 90% would achieve between 30-50% reduction (2 points) and 10% would achieve between 25-30% reduction (1 point). For the 30% of corn acres that have a 50-68% reduction in atrazine rates, we assumed that half would achieve between 50-60% reduction (2 points) and the other half would achieve between 60-68% reduction (3 point). The remaining 21% of corn acres that have a 68%-99% reduction in atrazine rates were all assigned 3 points. These assumptions are outlined below:

10% of corn acreage treated with >2.0 lbs a.i./acre >>> 10% = 0 pt

18% of corn acreage treated with between 2.0 - 1.5 lbs a.i./acre >>> 9% = 1 pt, 9% = 0 pt

21% of corn acreage treated with between 1.5 - 1.0 lbs a.i./acre >>> 19% = 2 pt, 2% = 1 pt

30% of corn acreage treated with between 1.0 - 0.625 lbs a.i./acre >>> 15% = 3 pt, 15% = 3 pt

21% of corn acreage treated with between 0.625 - 0 lbs a.i./acre >>> 21% = 3 pt

Using the above assumptions that allowed us to convert known atrazine usage patterns to mitigation points, Table 4 identifies the point values we use in our analysis to account for points achieved through application rate reductions. Since these point values are based on national averages, it does not account for regional differences in atrazine application rates, which are known to occur.[264] This limitation is discussed in Section 6 and we have concluded that not accounting for regional differences in application rate reduction will not significantly affect our findings.

Table 4: Points Achieved Through Application Rate Reduction by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/Sorghum Acres	Mitigation Points Achieved
19	0
11	1
34	2
36	3

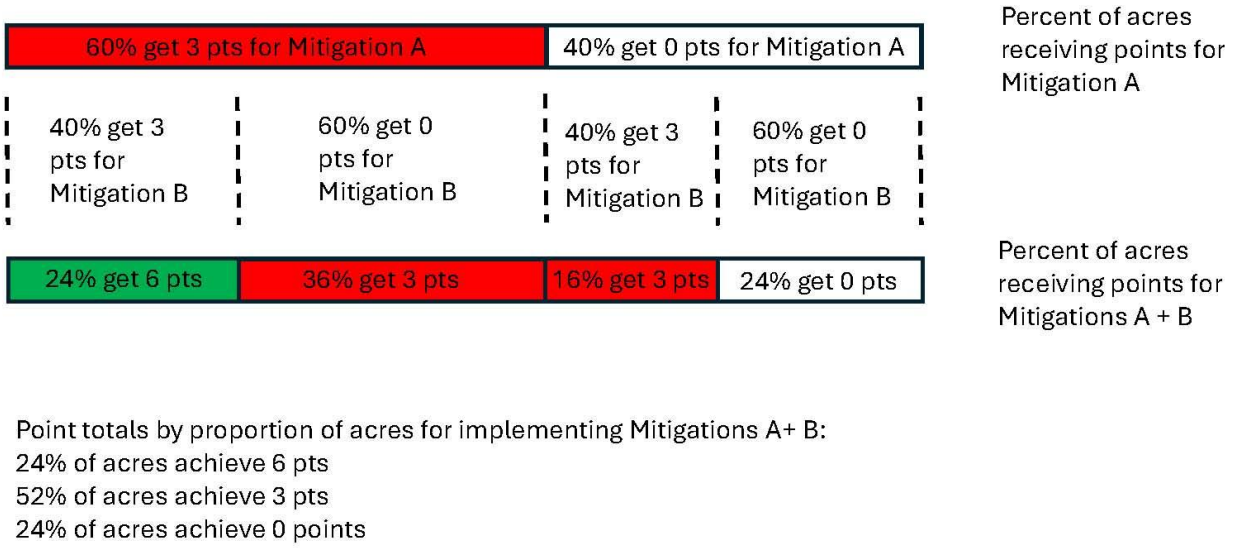
v. Percent of Corn and Sorghum Acres that Can Achieve 3 Mitigation Points Based on Current Practices

To determine how many corn and sorghum acres in the U.S. would be eligible for 3 atrazine runoff mitigation points based on current practices and field characteristics, we took a proportionality approach. For example, if Mitigation A achieves 3 points and is practiced on 60% of acres and

[264] Benefits Assessment Page 24; Table 6.

Mitigation B achieves 3 points and is practiced on 40% of acres, our analysis would assume the following: Mitigation A would result in 60% of acres receiving 3 points and 40% of acres would receive 0 points. With the introduction of Mitigation B, we would assume that 40% of acres would achieve 3 points and 60% of acres would achieve 0 points. To combine the two, we would assume that 40% of the 60% of acres implementing Mitigation A would also implement Mitigation B (and get an additional 3 points = 6 points total) and the remaining 60% of the 60% of acres implementing Mitigation A would not implement Mitigation B (and get an additional 0 points = 3 points total). This can be visualized in Figure 1.

Figure 1:



Point totals by proportion of acres for implementing Mitigations A+ B:
24% of acres achieve 6 pts
52% of acres achieve 3 pts
24% of acres achieve 0 points

This analysis assumes that the proportionality of mitigation adoption observed in the U.S. at large is maintained across adopters of other mitigations, which may or may not be the case. For instance, just because 40% of U.S. acres implement Mitigation B does not necessarily mean that 40% of acres that implement Mitigation A will also implement Mitigation B. We conclude that without available data on the proportion of acres that implement multiple practices from the mitigation menu, this is currently the most accurate way of determining the proportion of acres that will receive points under EPA's mitigation menu.

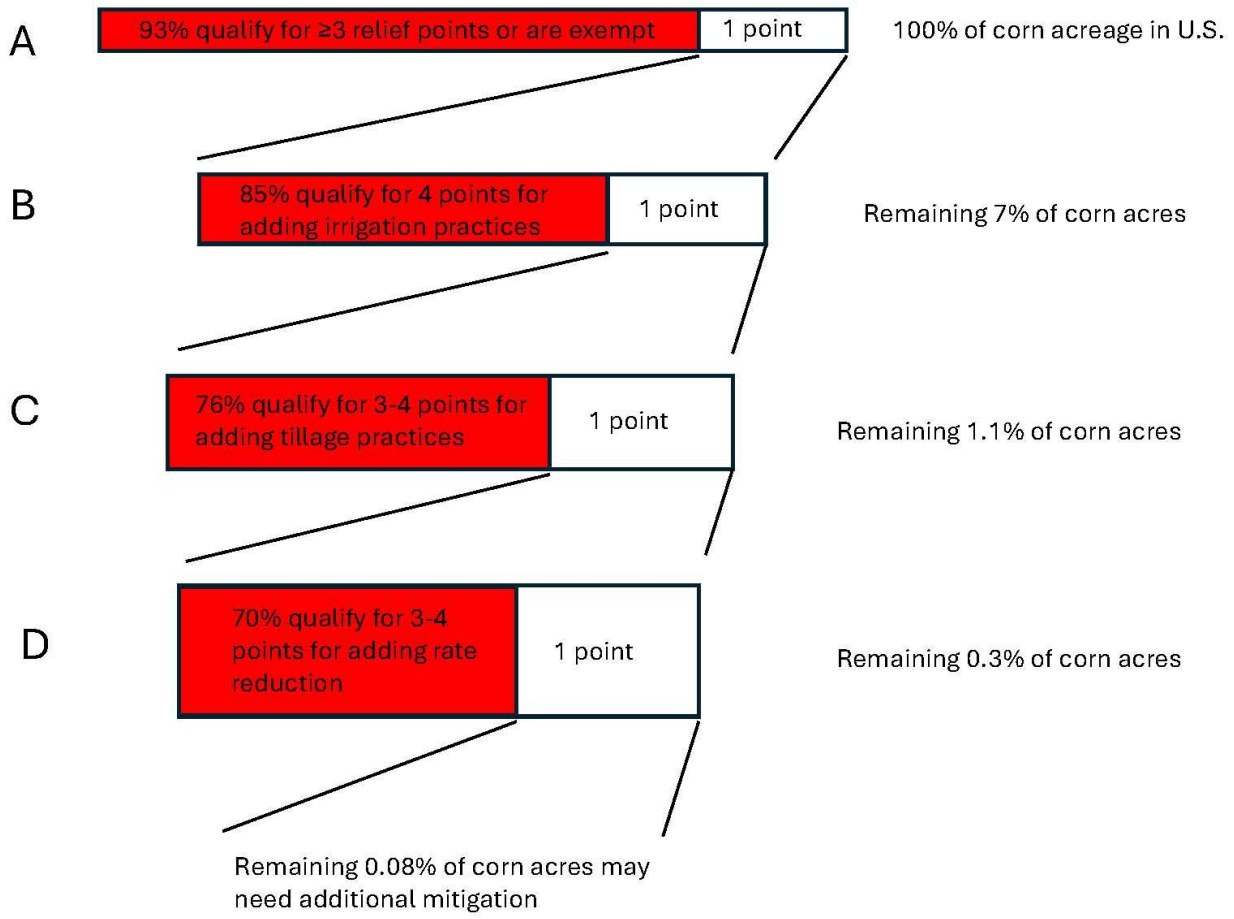
To determine the percent of corn and sorghum acres that can achieve 3 mitigation points based on current practices, we used the information on mitigation adoption outlined in Tables 1-4. This accounts for corn and sorghum acres that can achieve points for: mitigation relief, irrigation practices, tillage, application rate reduction or are exempt from runoff mitigation. Table 5 below combines the point totals from Tables 1-4.

Table 5: Points Achieved Through Mitigation Menu Practices by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/Sorghum Acres	Mitigation Points Achieved
Points for Mitigation Relief	
7	1
27.3	3
1.4	4
25.2	5
9.1	≥6
30	exempt
Points for Not Irrigating	
85	3
Points for No-Till/Mulch Till	
36	3
40	2
Points for Reducing Application Rate	
11	1
34	2
36	3

This analysis can be visualized in Figure 2. To begin, we assume that 100% of growers will adopt the mitigation tracking option to receive 1 point given that it is available to all growers and extremely easy to implement without any time or monetary investment. Next, we assume that 93% of corn and sorghum acres get ≥3 points for mitigation relief (or are exempt) and the remaining 7% will maintain 1 point for mitigation tracking (Panel A in Figure 2). Of the remaining 7% of acres that have 1 point, 85% will receive 3 points for not irrigating their crop (totaling 4 points) (Panel B in Figure 2). Of the remaining 1.1% of acres that only have 1 point, 76% will receive 2-3 points for no-till/conservation tillage (totaling 3-4 points) (Panel C in Figure 2). Of the remaining 0.3% of acres that only have 1 point, 70% will qualify for 2-3 points for application rate reduction (totaling 3-4 points) (Panel D in Figure 2). The remaining 0.08% of acres may be subject to additional mitigation under the mitigation menu.

Figure 2: Proportion of Corn and Sorghum Acres in Bin 1 Watersheds Receiving Mitigation Points Based on Current Practices



Therefore, we conclude that ≥99.92% of corn and sorghum acres in Bin 1 watersheds will achieve ≥3 runoff mitigation points without having to change growing practices or atrazine use. We note that our analysis accounted only for 7 out of 27 different practices allowed in EPA's mitigation menu and that additional acreage will likely be eligible for points based on other currently adopted practices, such as soil incorporation, mulching, grassed waterways and cover cropping. Therefore, this estimate likely significantly underestimates the total points that will be achieved using current practices.

In its support document for the runoff mitigation menu, EPA identifies the percent reduction in pesticide runoff it believes will occur following certain mitigations or field characteristics and assigns a point value.[265] In assigning point values, EPA assumes a mitigation with a low, medium, or high efficacy achieves an average of 10-30%, 30-60%, and ≥60% runoff reduction, respectively.[266]

[265] EPA. Ecological Mitigation Support Document to Support Endangered Species Strategies. Version 1.0. July 2024. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1133. (Hereafter "Ecological Mitigation Support Document").
[266] Ecological Mitigation Support Document at 47.

Low, medium, and high efficiency translates to 1, 2, and 3 points, respectively.[267] Therefore, according to EPA, 1,2 and 3 runoff mitigation points equals a 10-30%, 30-60%, and ≥60% runoff reduction, respectively.

Given that 0.08% of corn/sorghum acreage in Bin 1 watersheds may be required to achieve 2 additional runoff mitigation points, we sought to quantify how much runoff reduction would be achieved by atrazine users on corn and sorghum implementing these further mitigations. We assumed this 0.08% of acreage would need to implement at least 2 points to come into compliance with EPA's proposed Bin 1 mitigations (in addition to the 1 point for mitigation tracking). Therefore, we assumed that these 0.08% of corn/sorghum acres in Bin 1 watersheds would reduce atrazine runoff by 60%. Since 2 mitigation points would lead to anywhere from 30-60% runoff reduction by EPA's calculations, we chose the high end of 60% to maintain a conservative estimate. This amounts to a total of 0.048% reduction in atrazine runoff in each watershed.[268]

This analysis is presented in Supplemental File B, Sheet 18. This presents data on the 7,070 HUC12 watersheds in the corn/sorghum use data layer that are Bin 1 watersheds (contain 60-day average atrazine concentrations between 9.7-45.4 ppb) and sorts by the newly predicted 60-day atrazine concentration based on EPA's proposed Bin 1 runoff mitigations. Based on these data, 1 out of 7,070 watersheds (about 0.01%) are estimated to no longer exceed the CE-LOC due to this specific runoff mitigation requirement. The waterbodies in 7,069 watersheds (about 99.99%) are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

b. Sugarcane

EPA is proposing to require 3 points of runoff mitigation for users who want to use atrazine in HUC12 watersheds with predicted 60-day average atrazine concentrations between 9.7-45.4 ppb (Hereafter referred to as "Bin 1 watersheds"). 73 of the 134 HUC12 watersheds primarily impacted by atrazine use in sugarcane are Bin 1 watersheds (Supplemental File B, Sheet 19).

Runoff mitigation points are calculated from EPA's recently updated Runoff Mitigation Menu.[269] This menu contains a mix of mitigation "relief points" – which are points given to users who do not implement any mitigation but apply pesticides in areas or in a manner where EPA believes runoff will be reduced – and mitigation points. Importantly, for this analysis, we are not interested in how many atrazine users implement "mitigations," but how many users will be required to implement further mitigations above and beyond their current growing practices. Since EPA has found concerning atrazine levels in the water throughout the country at present day, any mitigation in atrazine harm will necessarily need to come from measures taken above and beyond what is currently in place.

[267] Compare Table 5-1 in EPA's Ecological Mitigation Support Document with Mitigation Menu points available here: https://www.epa.gov/pesticides/mitigation-menu.
[268] Assuming 0.08% of corn/sorghum acres in each watershed achieve a 60% reduction in atrazine runoff = 0.0008 * 0.6 = 0.00048 (total 0.048% reduction atrazine runoff in each HUC12 watershed)
[269] https://www.epa.gov/pesticides/mitigation-menu

i. Mitigation Relief Points

To calculate how many atrazine users in sugarcane will qualify for mitigation "relief points," we utilized multiple sources. The three mitigation relief options we assess in this analysis are 1) runoff vulnerability, 2) field slope parameter, and 3) mitigation tracking.[270] To assess the runoff vulnerability relief option, we utilized an EPA-curated county list that assigns points to pesticide users who apply a pesticide in specific counties with medium, low or very low runoff vulnerability scores.[271] From this county list, we assigned scores to each of the 134 HUC12 watersheds in the sugarcane use data layer based on the county/counties they are present in. If a HUC12 watershed was present in multiple counties, the lowest point value was used to maintain conservatism in our analysis. This analysis is presented in Supplemental File B, Sheet 20. For all but 4 out of the 134 watersheds, all FL counties received 3 points, all LA counties received 0 points, and all TX counties received 2 points for the runoff vulnerability relief option. To facilitate our analysis, we applied the above values for all sugarcane watersheds in each state (Table 6).

For the field slope parameter, we assumed that at least 80% of sugarcane fields in FL, TX and LA would meet EPA's definition of a low slope (≤3% grade). This is based on information provided by USDA to EPA indicating that about 80% of sugarcane fields in LA are precision graded (1-2% slopes) as well as images from Florida showing a "typical" flat sugarcane field.[272] Support for most sugarcane fields being grown on flat land is further provided by the BASF ACS presentation discussed in Section 3.a.i, which shows the vast majority of land in southern LA, central FL and the southern tip of TX being low slope.[273] We believe that 80% of sugarcane fields in FL, TX and LA being ≤3% grade is an underestimate, but one that allows us to conservatively estimate runoff reduction in EPA's proposal. Therefore, in our analysis we assume that 80% of acreage in HUC12 watersheds in the sugarcane use data layer will be awarded 2 points for being low slope (Table 6).

In addition to the runoff vulnerability and field slope relief options, EPA also has an additional mitigation relief option worth 1 point, which is the Mitigation Tracking option.[274] This gives the user 1 point for documenting their mitigations in paper or electronic format. Due to the relative ease of this mitigation relief option, our analysis assumes that 100% of atrazine users will choose to implement this option and receive 1 point.

The points achieved in sugarcane acreage for runoff mitigation relief points are presented in Table 6 below.

[270] https://www.epa.gov/pesticides/mitigation-menu
[271] EPA. Pesticide Runoff Vulnerability Mitigation Relief Points. Available here: https://www.epa.gov/system/files/documents/2024-10/county-mitigation-relief-points-runoff-vulnerability.pdf
[272] Data Inquiry pages 7, 8 and 14.
[273] BASF ACS presentation Page 14.
[274] https://www.epa.gov/pesticides/mitigation-menu The 4th option down in Table 1.

Table 6: Mitigation Relief Points that Will Be Achieved by Proportion of U.S. Sugarcane Acres

% of U.S. Sugarcane Acres	Mitigation Points Achieved
Points for Runoff Vulnerability Relief	
Louisiana	
100	0
Florida	
100	3
Texas	
100	2
Points for Low Field Slope	
80	2
Points for Mitigation Tracking	
100	1

ii. Points for Irrigation Practices

EPA's mitigation menu contains an in-field mitigation option of "irrigation management." Under this option, atrazine users will achieve 3 points for not irrigating their crop or utilizing subsurface irrigation.

The USDA has indicated to EPA that since it rains so much in the LA sugarcane-growing region, most LA sugarcane is not irrigated and the few acres that are irrigated use subsurface irrigation.[275] Furthermore, the Census of Agriculture indicates that only about 1% of LA sugarcane is irrigated.[276] Since only about 1% of LA sugarcane is irrigated and the few acres that are irrigated utilize subsurface irrigation, we have concluded that 100% of LA sugarcane growers would likely receive 3 runoff mitigation points for either not irrigating or using subsurface irrigation.

In Florida, the Census of Agriculture indicates that 99% of sugarcane acreage is irrigated.[277] However, subsurface or seepage irrigation is almost exclusively used in FL and overhead irrigation is "very limited," according to USDA.[278] The USDA did not provide EPA with irrigation practices for sugarcane in south Texas, so for this analysis we assumed that TX sugarcane irrigation practices are similar to that of central Florida. Given that irrigation is common and most irrigation is subsurface or seepage irrigation, we assumed that 90% of FL and TX sugarcane acres would receive 3 runoff mitigation points for using subsurface irrigation. We believe this is a conservative estimate to account for the few acres that use above-ground irrigation. Table 7 below shows the assumptions we make regarding irrigation practices.

[275] Data Inquiry page 13.
[276] Benefits Assessment page 30.
[277] Benefits Assessment page 30.
[278] Data Inquiry page 13.

Table 7: Points Achieved for Irrigation Practices by Proportion of U.S. Sugarcane Acres

% of U.S. Sugarcane Acres	Mitigation Points Achieved
Louisiana	
100	3
Florida and Texas	
90	3

iii. Points for Tillage Practices

EPA's mitigation menu contains an in-field mitigation option of "conservation tillage." Under this option, atrazine users will achieve 3 points for using the no-till practice, which includes perennial cropping.[279]

USDA has indicated to EPA that sugarcane is a perennial crop, which generally grows for 3-5 years, followed by one year of tillage and rotation with beans or other crops.[280] Therefore, the typical growing method for sugarcane is four years on, one year off. This means that out of every 10 years, eight will be spent growing sugarcane without tillage and two will be spent tilling and planting a rotational partner. With this typical growing schedule implemented by all sugarcane acreage in a given watershed, this means that 20% of growers will be tilling in any given year and 80% will be growing a perennial crop without tillage and able to receive 3 mitigation points.

Therefore, our analysis assumes that 80% of sugarcane acres would achieve 3 points for not tilling in any given year and 20% would receive no points due to tilling. This is outlined in Table 8 below.

Table 8: Points Achieved for No-Till/Perennial

% of U.S. Sugarcane Acres	Mitigation Points Achieved
80	3

iv. Points for Application Rate Reduction

EPA's mitigation menu contains an application parameter mitigation option of an "annual application rate reduction." Under this option, atrazine users will achieve 1 point for applying 10% to <30% less than the maximum labeled annual application rate; 2 points for applying 30% to <60% less than the maximum labeled annual application rate, and; 3 points for applying ≥60% less than the maximum labeled annual application rate.[281]

[279] https://www.epa.gov/pesticides/mitigation-menu
[280] Data Inquiry page 13.
[281] https://www.epa.gov/pesticides/mitigation-menu

To assign a point value to the sugarcane acreage that currently applies less than maximal annual rates of atrazine, we estimated the proportion of sugarcane acreage that would qualify for 1, 2, or 3 points based on current atrazine application practices identified by EPA. EPA's mitigation points awarded by % reduction are as follows: 10% to <30% reduction = 1 point, 30% to <60% reduction = 2 points, ≥60% reduction = 3 points.

Since EPA has proposed to reduce the maximum annual application rate for sugarcane to 8 lbs a.i./A/year in Florida and to 4 lbs a.i./A/year in Louisiana and Texas, that is the ceiling we have used to determine percent reduction.

The data on application rate in sugarcane is not as detailed as it is in corn. Therefore, all we have available to analyze is the average annual atrazine application rate in FL and LA and TX. EPA has cited multiple sources that identify an average annual application rate of 4.5 and 6-8 lbs a.i./A/year in Florida and 2.2 and 2-3 lbs a.i./A/year in Louisiana and Texas.[282] Given the wide range in these values, we chose a representative average value of 6 lbs a.i./A/year in Florida and 2.5 lbs a.i./A/year in Louisiana and Texas as the average annual atrazine application rate in those areas. Given these are averages, roughly 50% of atrazine-sprayed acreage would be expected to apply atrazine below those rates.

Our analysis assumes that 50% of atrazine-sprayed acres would be expected to use less than 6 lbs a.i./A/year in Florida. Since this represents a ≥25% decrease in atrazine compared to the maximum annual rate of 8 lbs a.i./A/year, we assume that 50% of Florida sugarcane acres will receive at least 1 point for using less than maximal rates (10% to <30% reduction = 1 point). We note that this is a highly conservative estimate, as most of these 50% of growers would receive more than 1 point for application rate reduction (given that all of them would have at least a 25% decrease).

Our analysis also assumes that 50% of atrazine-sprayed acres would be expected to use less than 2.5 lbs a.i./A/year in Texas and Louisiana. Since this represents a ≥37.5% decrease in atrazine compared to the maximum annual rate of 4 lbs a.i./A/year, we assume that 50% of TX and LA sugarcane acres will receive at least 2 points for using less than maximal rates (30% to <60% reduction = 2 points).

Using the above assumptions, Table 9 identifies the point values we use in our analysis to account for points achieved through application rate reductions.

[282] Benefits Assessment page 24.

Table 9: Points Achieved Through Application Rate Reduction by Proportion of U.S. Sugarcane Acres

% of U.S. Sugarcane Acres	Mitigation Points Achieved
Florida	
50	1
Louisiana and Texas	
50	2

v. Percent of Sugarcane Acres that Can Achieve 3 Mitigation Points Based on Current Practices

To determine how many sugarcane acres in Bin 1 watersheds would be eligible for 3 atrazine runoff mitigation points based on current practices and field characteristics, we used the proportionality approach outlined in Figure 1.

For this analysis, we used the information on mitigation adoption outlined in Tables 6-9. This accounts for sugarcane acres that can achieve points for: mitigation relief, irrigation practices, tillage, and application rate reduction. Table 10 below combines the point totals from Tables 6-9.

Table 10: Points Achieved Through Mitigation Menu Practices by Proportion of U.S. Sugarcane Acres

% of U.S. Sugarcane Acres	Mitigation Points Achieved
Points for Runoff Vulnerability Relief	
Louisiana	
100	0
Florida	
100	3
Texas	
100	2
Points for Low Field Slope	
80	2
Points for Mitigation Tracking	
100	1
Points for Irrigation Practices	
Louisiana	
100	3
Florida and Texas	
90	3
Points for No-Till/Perennial	
80	3
Points for Reducing Application Rate	
Florida	
50	1
Louisiana and Texas	
50	2

For the HUC12 Bin 1 watersheds primarily impacted by atrazine use in sugarcane, we conclude that none will be required to implement any further mitigation. This is because 100% of the Florida acreage that grows sugarcane will attain 3 mitigation points for residing in a "low runoff vulnerability" county (Table 6). And 100% of the Louisiana acreage that grows sugarcane will attain 3 mitigation points for either not irrigating or utilizing subsurface irrigation (Table 7). And 100% of the Texas acreage that grows sugarcane will attain 3 mitigation points for utilizing the mitigation tracking option (1 point) and residing in a "medium runoff vulnerability" county (2 points)(Table 6).

Therefore, we conclude that 100% of sugarcane acres in Bin 1 watersheds will achieve ≥3 runoff mitigation points without having to change growing practices or atrazine use. We note that our analysis accounted only for 6 out of 27 different practices allowed in EPA's mitigation menu and that additional acreage will likely be eligible for points based on other currently adopted practices,

such as soil incorporation, mulching, grassed waterways and cover cropping. Therefore, this estimate likely significantly underestimates the total points that will be achieved using current practices.

Therefore, no further mitigations are expected to be implemented in Bin 1 watersheds that are primarily impacted by atrazine use in sugarcane and no reduction in atrazine concentration in these watersheds is expected (Supplemental File B, Sheet 19).

4) How EPA's Requirements for Bin 2 Mitigations (6 points) are Likely to Impact Current Growing Practices and Atrazine Use in Watersheds with Predicted 60-day Average Atrazine Concentrations > 45.4 ppb

a. Corn and Sorghum

Predicting what proportion of corn and sorghum acreage will achieve 6 mitigation points is a bit more complex than predicting how many will achieve 3 points. This is because implementing one practice is often enough to obtain 3 points, but to get 6 points it takes a combination of at least two menu options in EPA's mitigation menu. This requires making certain assumptions about who will be combining multiple mitigation options to achieve the required number of points. For this analysis, we took the same proportionality approach outlined in Section 3.a and Figure 1.

EPA is proposing to require 6 points of runoff mitigation for users who want to use atrazine in HUC12 watersheds with predicted 60-day average atrazine concentrations > 45.4 ppb (Hereafter referred to as "Bin 2 watersheds"). 4,045 of the 11,115 HUC12 watersheds primarily impacted by atrazine use in corn/sorghum are Bin 2 watersheds (Supplemental File B, Sheet 21).

As outlined in Section 3.a, runoff mitigation points are calculated from EPA's recently updated Runoff Mitigation Menu.[283] This menu contains a mix of mitigation "relief points" – which are points given to users who do not implement any mitigation but apply pesticides in areas or in a manner where EPA believes runoff will be reduced – and mitigation points. Importantly, for this analysis, we are not interested in how many atrazine users implement "mitigations," but how many users will be required to implement further mitigations above and beyond their current growing practices. Since EPA has predicted concerning atrazine levels in the water throughout the country at present day, any mitigation in atrazine harm will necessarily need to come from measures taken above and beyond what is currently in place.

We used the information calculated in Section 3.a and summarized in Table 5 for this analysis. Table 5 is reproduced below for ease of referencing:

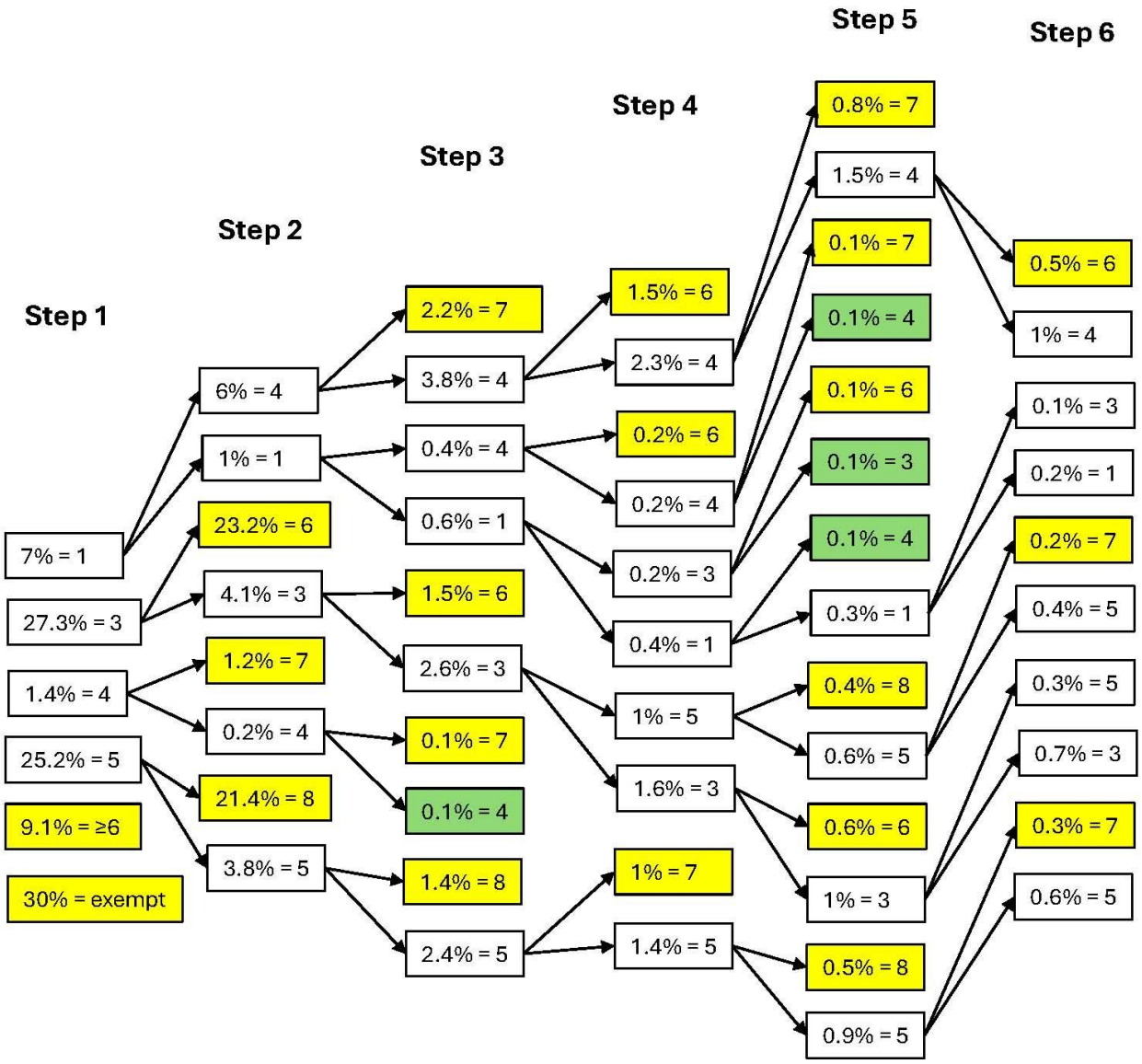
[283] https://www.epa.gov/pesticides/mitigation-menu

Table 5: Points Achieved Through Mitigation Menu Practices by Proportion of U.S. Corn/Sorghum Acres

% of U.S. Corn/Sorghum Acres	Mitigation Points Achieved
Points for Mitigation Relief	
7	1
27.3	3
1.4	4
25.2	5
9.1	≥6
30	exempt
Points for Not Irrigating	
85	3
Points for No-Till/Mulch Till	
36	3
40	2
Points for Reducing Application Rate	
11	1
34	2
36	3

In Figure 3 below, we use the proportionality approach we used in Section 3.a to determine the number of growers who would be eligible for 6 runoff points based on current practices and field characteristics.

Figure 3: Proportion of Corn and Sorghum Acres in Bin 2 Watersheds Receiving Mitigation Points Based on Current Practices. Yellow squares represent the proportion of corn/sorghum acreage that will receive at least 6 runoff mitigation points based on current practices. Green squares represent acreage percentage that is too small to be further divided up.



In Figure 3, each Step is a different mitigation option in EPA's mitigation menu. Step 1 corresponds to the "Percent of Corn Acres" and "mitigation points" for the "Points for Mitigation Relief" group in Tables 1 and 5. These are the points that will be achieved by proportion of acreage for the following mitigation relief options: "reduced runoff potential," "low slope," "mitigation tracking" and "sandy soils." 30% of corn/sorghum growers would be exempt from having to achieve any points.

Step 2 adds the additional mitigation option of using no irrigation (taken from Tables 2 and 5). This practice is currently implemented on 85% of corn acreage in the U.S. and achieves 3 additional mitigation points. So, for each of the 4 categories in Step 1 that have not achieved 6 points, 85% of the acreage in each category will also add an additional 3 points while 15% will not receive any additional points.

Step 3 adds the additional mitigation option of implementing no-till (taken from Tables 3 and 5). This practice is currently implemented on 36% of corn acreage in the U.S. and achieves 3 additional mitigation points. For each of the 5 categories in Step 2 that have not achieved 6 points, 36% will also add an additional 3 points while 64% will not receive any additional points.

Step 4 adds the additional mitigation option of implementing mulch-till (taken from Tables 3 and 5). This practice is currently implemented on 40% of corn acreage in the U.S. and achieves 2 additional mitigation points. For each of the 5 categories in Step 3 that have not achieved 6 points, 40% will also add an additional 2 points while 60% will not receive any additional points.

Step 5 adds the additional mitigation option of reducing application rate by 60-99% (taken from Tables 4 and 5). This practice is currently implemented on 36% of corn acreage in the U.S. and achieves 3 additional mitigation points. For each of the 7 categories in Step 4 that have not achieved 6 points, 36% will also add an additional 3 points while 64% will not receive any additional points.

Step 6 adds the additional mitigation option of reducing application rate by 30-60% (taken from Tables 4 and 5). This practice is currently implemented on 34% of corn acreage in the U.S. and achieves 2 additional mitigation points. For each of the 5 categories in Step 5 that have not achieved 6 points, 34% will also add an additional 2 points while 66% will not receive any additional points.

Adding up the percentage of corn/sorghum acreage in the yellow squares equals 96.3% of corn/sorghum acreage in Bin 2 watersheds that is estimated to achieve at least 6 runoff mitigation points based on current practices. We note that our analysis accounted only for 7 out of 27 different practices allowed in EPA's mitigation menu and that additional acreage will likely be eligible for points based on other currently adopted practices, such as soil incorporation, mulching, grassed waterways and cover cropping. Therefore, this estimate likely significantly underestimates the total points that will be achieved using current practices.

The remaining 3.7% of corn/sorghum acreage in Bin 2 watersheds (represented by all the green squares and the remaining white squares in Step 6) may be required to implement additional mitigations based on EPA's current proposal. 3.5% of the 3.7% of acreage that has not received 6 mitigation points have already achieved ≥3 mitigation points (Figure 3, Step 6), therefore the majority of remaining acreage will only need an additional 1-3 points to achieve the required 6 points for runoff mitigation. As discussed in Section 3.a, EPA estimates that 1-3 mitigation points will reduce runoff anywhere from 10% to >60%. We chose the high-end value of 60% atrazine runoff reduction as an estimate for atrazine reduction in the remaining 3.7% of acreage to maintain a conservative estimate of runoff reduction.

Therefore, we assumed that 3.7% of corn/sorghum acreage in Bin 2 watersheds would need to reduce atrazine runoff concentrations by 60% to come into compliance with EPA's proposed Bin 2 mitigations. This amounts to a total of 2.22% reduction in atrazine runoff in each watershed.[284]

This analysis is presented in Supplemental File B, Sheet 21. This presents data on all of the 4,045 HUC12 watersheds in the corn/sorghum use data layer that are Bin 2 watersheds (contain 60-day average atrazine concentrations >45.4 ppb) and sorts by the newly predicted 60-day atrazine concentration based on EPA's proposed Bin 2 runoff mitigations. Based on these data, 127 out of 4,045 watersheds (about 3%) are estimated to no longer exceed the 95th percentile of the CE-LOC due to this specific runoff mitigation requirement. However, 100% of the waterbodies in these watersheds are still predicted to contain atrazine at levels at least 4.5x higher than the CE-LOC. While atrazine levels in these watersheds may be minimally reduced, they still present a clear and present danger to aquatic plant communities and the wildlife that depend on them.

b. Sugarcane

Predicting what proportion of sugarcane acreage will achieve 6 mitigation points is a bit more complex than predicting how many will achieve 3 points. This is because implementing one practice is often enough to obtain 3 points, but to get 6 points it takes a combination of at least two menu options in EPA's mitigation menu. This requires making certain assumptions about who will be combining multiple mitigation options to achieve the required number of points. For this analysis, we took the same proportionality approach outlined in Section 3.a and Figure 1.

EPA is proposing to require 6 points of runoff mitigation for users who want to use atrazine in HUC12 watersheds with predicted 60-day average atrazine concentrations > 45.4 ppb (Hereafter referred to as "Bin 2 watersheds"). 61 of the 134 HUC12 watersheds primarily impacted by atrazine use in sugarcane are Bin 2 watersheds (Supplemental File B, Sheet 22).

As in Section 3, runoff mitigation points are calculated from EPA's recently updated Runoff Mitigation Menu.[285] This menu contains a mix of mitigation "relief points" – which are points given to users who do not implement any mitigation but apply pesticides in areas or in a manner where EPA believes runoff will be reduced – and mitigation points. Importantly, for this analysis, we are not interested in how many atrazine users implement "mitigations," but how many users will be required to implement further mitigations above and beyond their current growing practices. Since EPA has found concerning atrazine levels in the water throughout the country at present day, any mitigation in atrazine harm will necessarily need to come from measures taken above and beyond what is currently in place.

We used the information calculated in Section 3.b and summarized in Table 10 for this analysis. Table 10 is reproduced below for ease of referencing:

[284] Assuming 3.7% of corn/sorghum acres in each watershed achieve a 60% reduction in atrazine runoff = 0.037 * 0.6 = 0.0222 (total 2.22% reduction atrazine runoff in each HUC12 watershed)
[285] https://www.epa.gov/pesticides/mitigation-menu

Table 10: Points Achieved Through Mitigation Menu Practices by Proportion of U.S. Sugarcane Acres

% of U.S. Sugarcane Acres	Mitigation Points Achieved
Points for Runoff Vulnerability Relief	
Louisiana	
100	0
Florida	
100	3
Texas	
100	2
Points for Low Field Slope	
80	2
Points for Mitigation Tracking	
100	1
Points for Irrigation Practices	
Louisiana	
100	3
Florida and Texas	
90	3
Points for No-Till/Perennial	
80	3
Points for Reducing Application Rate	
Florida	
50	1
Louisiana and Texas	
50	2

In Figures 4-6 below, we use the proportionality approach we used in Section 3 to determine the number of Florida, Texas and Louisiana sugarcane growers who would be eligible for 6 runoff points based on current practices and field characteristics.

Figure 4: Proportion of Florida Sugarcane Acres in Bin 2 Watersheds Receiving Mitigation Points Based on Current Practices

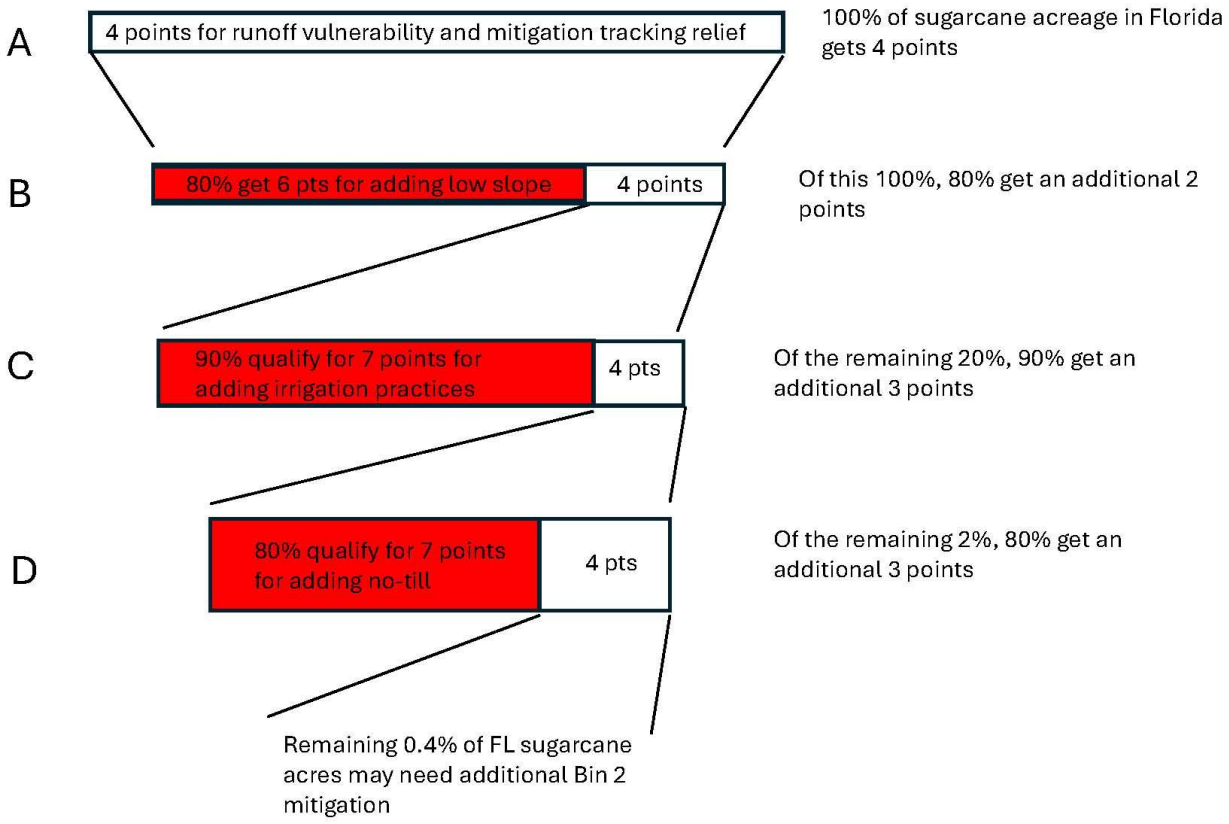


Figure 4 shows the percentage of sugarcane acres in Bin 2 watersheds in Florida estimated to receive at least 6 mitigation points based on current practices. To begin, we assume that 100% of FL sugarcane growers will adopt the mitigation tracking option to receive 1 point and will also receive 3 points for growing in a "low runoff vulnerability" county (4 points total) (Panel A in Figure 4). Next, we assume that 80% of FL sugarcane acres get an additional 2 points for growing on a low slope field (6 points total)(Panel B in Figure 4). Of the remaining 20% of acres that have 4 points, 90% will receive 3 additional points for not irrigating their crop or using subsurface irrigation (totaling 7 points) (Panel C in Figure 4). Of the remaining 2% of acres that only have 4 points, 80% will receive 3 points for not tilling (totaling 7 points) (Panel D in Figure 4). The remaining 0.4% of FL sugarcane acres in Bin 2 watersheds may be subject to additional mitigation under the EPA's runoff mitigation proposal.

Figure 5: Proportion of Texas Sugarcane Acres in Bin 2 Watersheds Receiving Mitigation Points Based on Current Practices

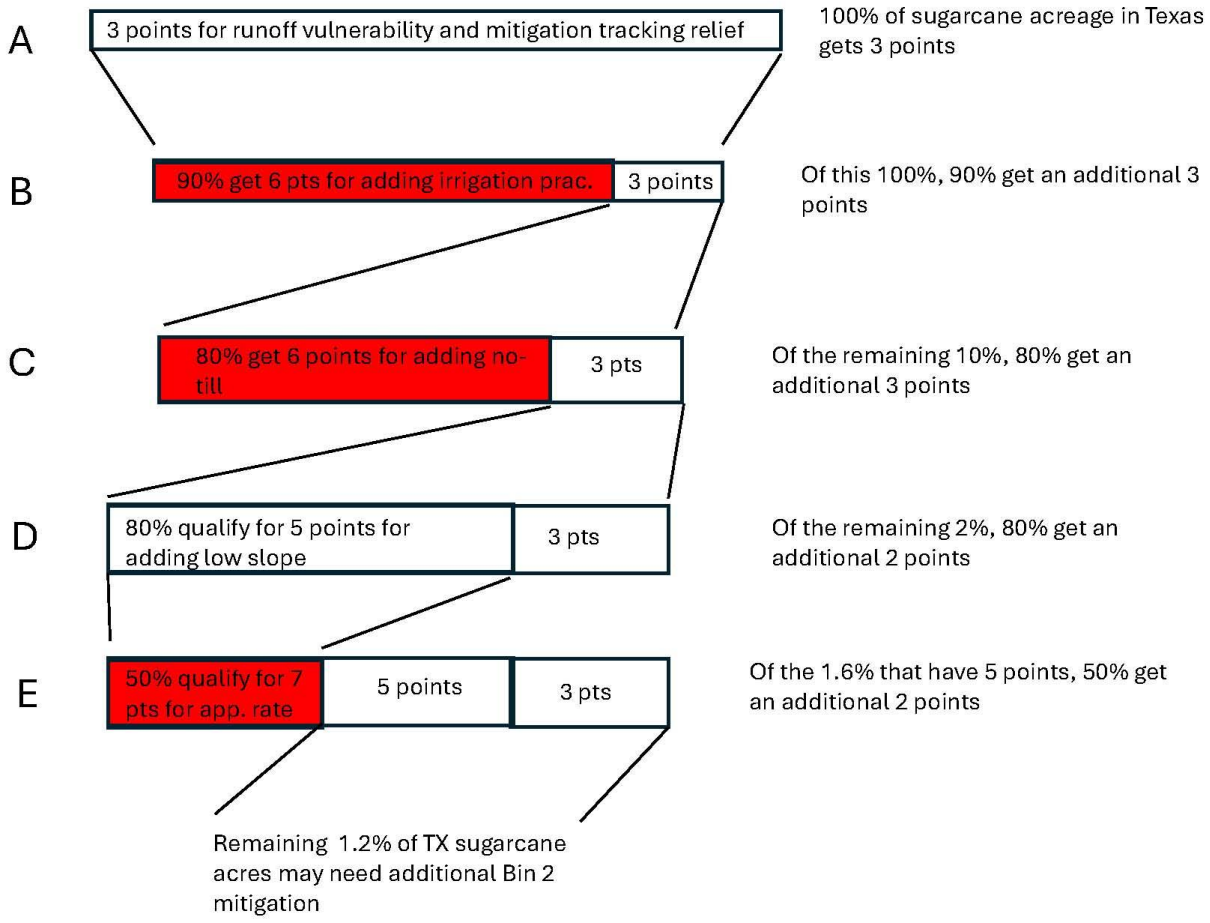


Figure 5 shows the percentage of sugarcane acres in Bin 2 watersheds in Texas estimated to receive at least 6 mitigation points based on current practices. To begin, we assume that 100% of TX sugarcane growers will adopt the mitigation tracking option to receive 1 point and will also receive 2 points for growing in a "low runoff vulnerability" county (3 points total) (Panel A in Figure 5). Next, we assume that 90% of TX sugarcane acres get an additional 3 points for not irrigating their crop or using subsurface irrigation (6 points total)(Panel B in Figure 5). Of the remaining 10% of acres that only have 3 points, 80% will receive 3 points for not tilling (totaling 6 points) (Panel C in Figure 5). Of the remaining 2% of acres that only have 3 points, 80% will receive 2 points for growing on a low slope field (5 points total)(Panel D in Figure 5). Of the remaining 1.6% of acres that have 5 points, 50% will receive 2 points for having a reduced application rate (7 points total)(Panel E in Figure 5). The remaining 1.2% of TX sugarcane acres in Bin 2 watersheds may be subject to additional mitigation under the EPA's runoff mitigation proposal.

Figure 6: Proportion of Louisiana Sugarcane Acres in Bin 2 Watersheds Receiving Mitigation Points Based on Current Practices

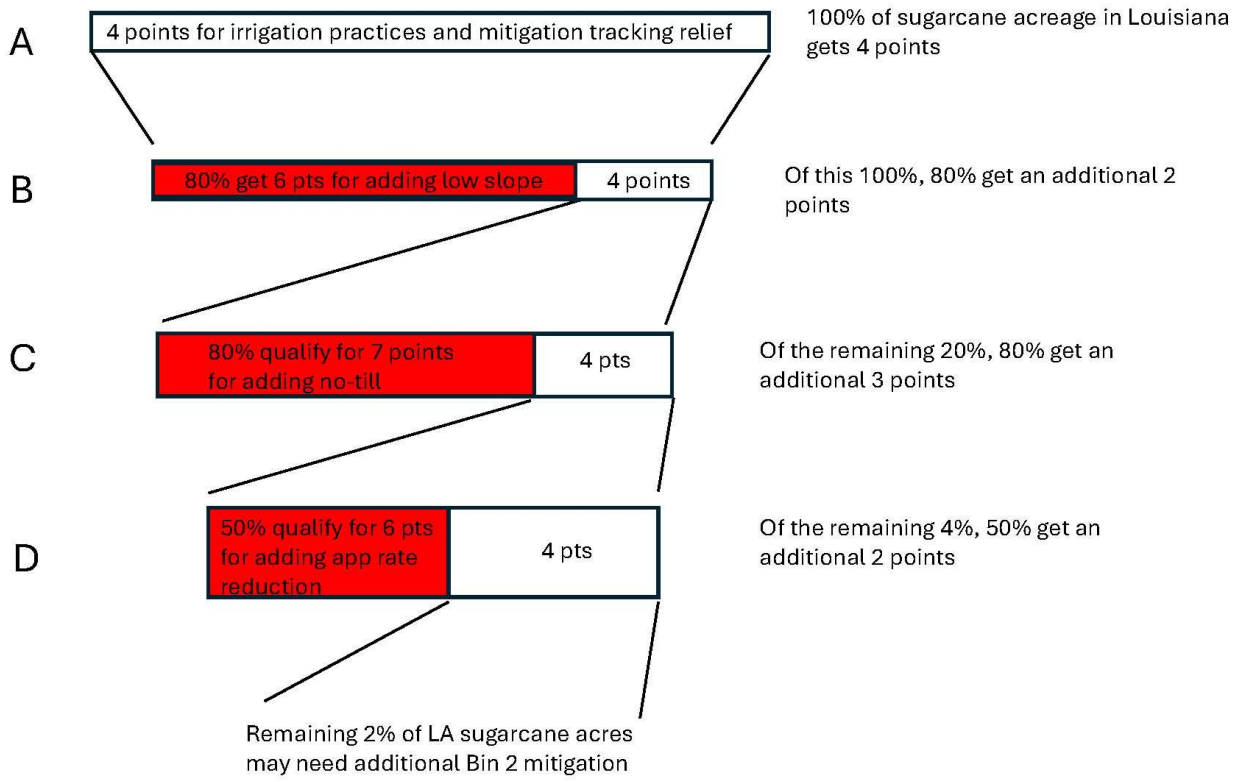


Figure 6 shows the percentage of sugarcane acres in Bin 2 watersheds in Louisiana estimated to receive at least 6 mitigation points based on current practices. To begin, we assume that 100% of LA sugarcane growers will adopt the mitigation tracking option to receive 1 point and will also receive 3 points for irrigation practices (4 points total) (Panel A in Figure 6). Next, we assume that 80% of LA sugarcane acres get an additional 2 points for growing on a low slope field (6 points total)(Panel B in Figure 6). Of the remaining 20% of acres that have 4 points, 80% will receive 3 additional points for not tilling (totaling 7 points) (Panel C in Figure 6). Of the remaining 4% of acres that only have 4 points, 50% will receive 2 additional points for applying atrazine at a reduced rate (totaling 6 points) (Panel D in Figure 6). The remaining 2% of LA sugarcane acres in Bin 2 watersheds may be subject to additional mitigation under the EPA's runoff mitigation proposal.

Therefore, 0.4% of FL sugarcane acres, 1.2% of TX sugarcane acres, and 2% of LA sugarcane acres in Bin 2 watersheds may be required to implement additional mitigations based on EPA's current proposal. We note that our analysis accounted only for 6 out of 27 different practices allowed in EPA's mitigation menu and that additional acreage will likely be eligible for points based on other currently adopted practices, such as soil incorporation, mulching, grassed waterways and cover

cropping. Therefore, this estimate likely significantly underestimates the total points that will be achieved using current practices.

All of the remaining acreage that has not received 6 mitigation points has already achieved ≥3 mitigation points (Figures 4-6), therefore the remaining acreage will only need an additional 2-3 points to achieve the required 6 points for runoff mitigation. As discussed in Section 3.a, EPA estimates that 1-3 mitigation points will reduce runoff anywhere from 30% to >60%. We chose the high-end value of 60% atrazine runoff reduction as an estimate for atrazine reduction in the remaining acreage to maintain a conservative estimate of runoff reduction.

Therefore, we assumed that 0.4% of FL sugarcane acreage, 1.2% of TX sugarcane acreage and 2% of LA sugarcane acreage in Bin 2 watersheds would need to reduce atrazine runoff concentrations by 60% to come into compliance with EPA's proposed Bin 2 mitigations. This amounts to a total of 0.24% reduction in atrazine runoff in FL Bin 2 watersheds, 0.72% reduction in atrazine runoff in TX Bin 2 watersheds, and a 1.2% reduction in atrazine runoff in each LA Bin 2 watershed.[286]

This analysis is presented in Supplemental File B, Sheet 22. This presents data on all of the 61 HUC12 watersheds in the sugarcane use data layer that are Bin 2 watersheds (contain 60-day average atrazine concentrations >45.4 ppb) and sorts by the newly predicted 60-day atrazine concentration based on EPA's proposed Bin 2 runoff mitigations. Based on these data, 1 out of 61 watersheds (about 1.5%) are estimated to no longer exceed the 95th percentile of the CE-LOC due to this specific runoff mitigation requirement. However, 100% of the waterbodies in these watersheds are still predicted to contain atrazine at levels at least 4.5x higher than the CE-LOC. While atrazine levels in these watersheds may be minimally reduced, they still present a clear and present danger to aquatic plant communities and the wildlife that depend on them.

5) How the combination of EPA's proposed runoff mitigations is likely to impact atrazine levels in watersheds containing ≥ 9.7 ppb

Based on our analyses in Section 2, we found that EPA's proposed maximum annual application rate reductions would result in 120 out of 11,249 CE-LOC-exceeded watersheds (about 1%) to no longer exceed the CE-LOC (119 in corn/sorghum growing regions and 1 in sugarcane growing regions). The waterbodies in 11,129 watersheds (about 99%) in all growing regions are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

Based on our analyses in Section 3, we found that EPA's proposed Bin 1 mitigations would result in 1 out of 7,143 CE-LOC-exceeded Bin 1 watersheds (about 0.01%) to no longer exceed the CE-LOC (1 in corn/sorghum growing regions and 0 in sugarcane growing regions). The waterbodies in 7,142

[286] Assuming 0.4% of sugarcane acres in each FL watershed achieves a 60% reduction in atrazine runoff = 0.004 * 0.6 = 0.0024 (total 0.24% reduction atrazine runoff in each FL HUC12 watershed). Assuming 1.2% of sugarcane acres in each TX watershed achieves a 60% reduction in atrazine runoff = 0.012 * 0.6 = 0.0072 (total 0.72% reduction atrazine runoff in each TX HUC12 watershed). Assuming 2% of sugarcane acres in each LA watershed achieve a 60% reduction in atrazine runoff = 0.02 * 0.6 = 0.012 (total 1.2% reduction atrazine runoff in each LA HUC12 watershed).

watersheds (about 99.99%) in all growing regions are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

Based on our analyses in Section 4, we found that EPA's proposed Bin 2 mitigations would result in 0 out of 4,106 CE-LOC-exceeded Bin 2 watersheds (0%) to no longer exceed the CE-LOC. The waterbodies in all 4,106 watersheds (100%) in all growing regions are predicted to remain harmful to aquatic plant communities and the wildlife that depend on them.

It's important to assess how the combination of proposed mitigations would impact atrazine levels in these impaired waters. To do this, we combined the percent reductions estimated for rate reductions and for Bin 1/Bin 2 mitigations for all 11,249 HUC12 waterbodies that are impaired for atrazine.

This analysis is outlined in Supplemental File B, Sheet 23 and Sheet 24 for the 7,070 Bin 1 watersheds and 4,045 Bin 2 watersheds in corn/sorghum growing regions, respectively. This analysis is outlined in Supplemental File B, Sheet 25 and Sheet 26 for the 73 Bin 1 watersheds and 61 Bin 2 watersheds in sugarcane growing regions, respectively.

Supplemental File B, Sheet 27 combines Sheets 23-26 to compile the estimated atrazine reduction in all 11,249 impaired HUC 12 watersheds. Importantly, this includes the predicted impact of all of EPA's proposed runoff mitigations combined.

This analysis shows that EPA's proposed runoff mitigation plan will only result in 123 out of 11,249 HUC 12 watersheds (1%) to drop below the CE-LOC. 246 watersheds out of 4106 (6%) would drop below the 95th percentile of the CE-LOC, but all of those would still remain well above the CE-LOC. All Bin 2 watersheds would remain more than 4x higher than the current CE-LOC. Each atrazine-impaired HUC 12 watershed would only see predicted atrazine concentrations reduced by roughly 2-6% (Supplemental File B, Sheet 27).

We conclude that EPA's proposed runoff mitigation plan will be highly ineffective at protecting wildlife and will have very little impact on atrazine water levels throughout the country.

6) Limitations, Assumptions and Uncertainties in This Analysis

a. Watershed Impacts by Use

In Section 2.a, we divide up atrazine-impacted HUC12 watersheds based on whether they are primarily impacted by atrazine use in sugarcane or corn and sorghum. There are likely some watersheds that are impacted by both. For instance, the southern tip counties of Texas grow both sorghum and sugarcane, which both likely lead to atrazine contamination in nearby watersheds. Furthermore, atrazine use in upstream watersheds on corn or sorghum could also result in downstream contamination of a watershed where sugarcane is primarily grown. Therefore, some watersheds will likely have atrazine coming from multiple sources and our analysis did not parse that out.

However, we don't believe this will significantly impact our analysis. This is mainly due to the similarities of estimated atrazine reductions between the use data layers. For instance, both the corn/sorghum and sugarcane use data layer assumes similar amounts of atrazine reduction in watersheds due to EPA's proposed application rate reduction (2% in sugarcane vs 1.8-4% in corn/sorghum – Section 2). And we also find that most atrazine users will be exempt from having to implement mitigations from EPA's mitigation menu (100% of sugarcane growers in Bin 1 watersheds compared to 99.92% of corn/sorghum growers in Bin 1 watersheds, and 98%-99.6% for sugarcane growers in Bin 2 watersheds compared to 96.3% of corn/sorghum growers in Bin 2 watersheds – Sections 3-4).

Therefore, we conclude that there is very little difference in estimated atrazine reduction between sugarcane-growing watersheds and corn/sorghum-growing watersheds. We conclude that any misclassifications in atrazine-contributing uses in any given watershed will not significantly affect our analysis or conclusions.

b. Corn, Sorghum and Sugarcane Growers Vs. Atrazine Users

In Sections 3-4 our analysis assumes that the proportion of corn, sorghum and sugarcane growers that implement a certain practice from the mitigation menu will be divided up evenly between all growers in that watershed. However, not all corn, sorghum and sugarcane growers use atrazine. It is possible that a particular mitigation adoption could be predominantly adopted by atrazine-users or non-users. For instance, if 60% of corn growers implement a certain mitigation practice but most of those that implement that practice do not use atrazine, then our analysis would not be correct and we would overestimate the adoption of mitigation amongst atrazine users. Vis versa, the opposite could also be true and we would underestimate adoption of mitigation amongst atrazine users.

For our analysis of mitigation adoption from EPA's mitigation menu, we analyze 1) mitigation relief, 2) irrigation practices, 3) application rate reductions, and 4) tilling practices. In terms of mitigation relief (field slope, runoff vulnerability zones, soil type and mitigation tracking), we know of no resource indicating that atrazine use in corn, sorghum or sugarcane is more or less likely to occur in fields of a certain slope, runoff vulnerability county or soil type. Similarly, mitigation tracking and irrigation practices would also not be expected to be more or less likely to track with atrazine use than any other variable of crop production. Application rate reductions are only relevant to atrazine users, and therefore, not of concern. Furthermore, growers who are exempt from having to implement Bin 1 and Bin 2 mitigation only have in common that they are >1,000 ft from non-managed areas or water – also not expected to track significantly with atrazine use.

However, it is possible that tilling practices may bias with atrazine use. This is because tilling is sometimes used in lieu of herbicide application, and not tilling tends to promote herbicide use to kill weeds. Therefore, the adoption of no-till would be more likely to bias towards herbicide users than non-users because herbicides are an alternative weed control practice. Since our analysis (and EPA's mitigation menu) gives points to growers for not tilling or growing a perennial crop, we assume that our analysis would tend to bias towards *underestimating* mitigation adoption amongst atrazine users because atrazine users would conceptually be more likely to not till than corn-growers in general.

Therefore, we would expect our assumption that 36% of corn growers practice no-till to actually be higher amongst corn growers who use atrazine. This biases towards conservatism in our assessment.

c. Uncertainties in Mitigation Relief Options for Corn

While we were able to roughly calculate how many mitigation relief points would be achieved for sugarcane acreage in Section 3.b using our own analysis, mitigation relief for corn acreage in Section 3.a was estimated using an analysis conducted by a pesticide registrant and a consulting company.[287] This analysis has not been published and was presented at the American Chemical Society's 2024 Fall Meeting. We cannot independently verify the results in this presentation, and they have not been peer-reviewed or published, which we recognize as a deficiency in our analysis.

However, conceptually, the results appear to highly align with how EPA has been presenting the potential impact (or lack thereof) of mitigation relief points. EPA has stated in agency documents that at least 80% of all cultivated land in the U.S. would achieve points for just the "runoff vulnerability" relief option alone,[288] which is one of five possible relief options.[289] EPA has also produced "scenarios" on how the agency believes mitigation point requirements would impact growers with certain field specifications. Of the three scenarios that concerned corn and sorghum (non-irrigated corn on flat land in IN, non-irrigated corn on sloped land in IA, and non-irrigated low-rainfall sorghum in the Western US), EPA concluded that all of those acres would achieve anywhere from 2-5 mitigation relief points automatically and would ultimately achieve 9-10 mitigation points total with current practices.[290]

So, while we can't independently confirm the accuracy of the BASF study, the results are aligned with how EPA has been communicating the lack of industry impact from the agency's mitigation menu. Therefore, we have used this study as the best scientific data available because the results are highly consistent with how the agency has been communicating about the mitigation menu to stakeholders. If the EPA is skeptical of the results from this study, we encourage the agency to do an independent analysis itself.

d. Impacts of Regional Differences in Irrigation

In Section 3.a, we assume that 85% of growers in each corn/sorghum watershed will achieve 3 mitigation points for not irrigating their crop (Table 2). This assumption is based on the national

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[287] [287] Campana, D and Hassinger, C. Quantifying field characteristic exemptions and runoff mitigation points from EPA's ESA Strategy Documents. Presentation at the American Chemical Society 2024 Fall Meeting. August 18, 2024. Available here: https://complianceservices.com/wp-content/uploads/Quantifying-the-Potential-Agricultural-Area-Affected-by-EPAs-Draft-Herbicide-Strategy_18Aug24.pdf. Document also submitted to the docket. (Hereafter "BASF ACS presentation").

[288] EPA. Herbicide Strategy to Reduce Exposure of Federally Listed Endangered and Threatened Species and Designated Critical Habitats from the Use of Conventional Agricultural Herbicides. August 2024. Page 51. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1137. And Farrugia, F. EPA'S ECOLOGICAL MITIGATION MEASURES. MAY 09, 2024. Presentation to Stakeholders. Page 5. Available here: https://www.epa.gov/system/files/documents/2024-08/mitigation-workshop-meeting_05092024.pdf.

[289] https://www.epa.gov/pesticides/mitigation-menu. First 5 options in mitigation menu.

[290] EPA. Application of EPA's Runoff and Erosion and Spray Drift Mitigations Through Scenarios that Represent Crop Production Systems in Support of Endangered Species Strategies. August 2024. Pages 14-16. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1139.

average of 85% of corn growers (and a similar number of sorghum growers) that do not irrigate. In reality, there are some regional differences in corn irrigation that are not accounted for in our analysis.[291] For instance, the 85% national statistic will likely overestimate points given for states like NE and CO (which have over 50% of fields irrigated) and underestimate points given for states like IN, MN, IL, IA, OH (where less than 10% of fields are irrigated). We note that NE is the only state EPA identifies as having a significantly higher irrigation rate that also contains a significant number of watersheds with CE-LOC exceedances.

Irrigation in Nebraska is regional, with the Eastern part of the state receiving much more rain that the Central and Western parts of the state, resulting in Eastern NE having lower irrigation rates than the rest of the state.[292] Eastern NE is also the part of the state where most of the CE-LOC exceedances are.[293] This makes sense, as the more rainfall in a region, the more likely there is to be runoff and resulting water contamination. Therefore, the Eastern part of the state relevant to our analysis is less likely to be irrigated than Nebraska as a whole. So, our lack of a regional analysis for states like Nebraska is less impactful than state-specific data would indicate.

Even assuming that all NE watersheds had a 50% irrigation rate, it would still not impact our analysis significantly. Subbing in a value of 50% for the analysis in Figure 2 (panel B), would lead to an overall percentage of acres that need more mitigation of 99.75% compared to the 99.92% percent we originally found. Assuming a 60% decrease in atrazine levels from acres needing further mitigation, that would translate to a 0.15% decrease in atrazine levels in NE Bin 1 watersheds compared to a 0.048% decrease nationally. The difference is so miniscule as to have little impact on our analysis.

Therefore, we conclude that not accounting for regional differences in irrigation will not significantly affect our findings.

e. Impacts of Regional Differences in Tilling

In Section 3.a, we assume that 76% of growers in each corn/sorghum watershed will achieve 3 mitigation points for not tilling or 2 points for mulch tilling (Table 3). This assumption is based on the national average of 76% of corn growers (and a similar number of sorghum growers) that practice one of those two tilling techniques. In reality, there are some regional differences in corn tillage that are not accounted for in our analysis. For instance, the Northern Crescent and Northern Great Plains are known to have lower adoptions of no-till and mulch-till than the rest of the country.[294] However, since those regions of the country have far fewer watersheds with CE-LOC

[291] Benefits Assessment Page 30.
[292] Nebraska Corn Board. What's the Difference Between Dry Land Corn and Irrigated Corn? Available here: https://nebraskacorn.gov/cornstalk/whats-the-difference-between-dry-land-corn-and-irrigated-corn/.
[293] EPA. Updated High Resolution Map (Without Roads) of HUC 12 Watersheds that Exceed the Updated CE-LOC for Atrazine. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-2137.
[294] USDA. Economic Research Service. Tillage Intensity and Conservation Cropping in the United States. September 2018. Page 13. Available here: https://ers.usda.gov/sites/default/files/_laserfiche/publications/90201/EIB-197.pdf?v=77252.

exceedances than the rest of the Midwest and South, any overestimating of tillage adoption would be reduced considerably.

But even if we assumed that only 45% of growers practice no-till or mulch-till (which is the lowest regional adoption rate in the U.S.[295]) instead of the 76% we assume in our analysis, it would still not impact our results significantly. Subbing in a value of 45% for the analysis in Figure 2 (panel C), would lead to an overall percentage of acres that need more mitigation of 99.83% compared to the 99.92% percent we originally found. Assuming a 60% decrease in atrazine levels from acres needing further mitigation, that would translate to a 0.1% decrease in atrazine levels in Bin 1 watersheds in areas with lower no-till adoption compared to a 0.048% decrease nationally. The difference is so miniscule as to have little impact on our analysis.

Therefore, we conclude that not accounting for regional differences in no-till or mulch-till will not significantly affect our findings.

f. Impacts of Regional Differences in Application Rate

In Section 3.a, we assume that a certain percentage of growers in each corn/sorghum watershed will achieve 0-3 mitigation points for using a reduced application rate (Table 4). This assumption is based on EPA-compiled data on the proportion of corn growers that currently use atrazine at specific rates.[296] In Section 2.b, we were able to incorporate regional differences in atrazine use rates into our analysis of how maximal rate reductions would impact atrazine levels in HUC 12 watersheds. However, for our analyses in Sections 3 and 4, it was too complex to incorporate regional data. Therefore, there are some regional differences in atrazine application rates that are not accounted for in our Bin 1 and Bin 2 analyses. For instance, EPA found that 45% of atrazine users in the Plains states applied greater than 1 lbs a.i./A/year atrazine on corn, while 80% of corn growers in the Southern Seaboard applied above that rate.[297]

But even if we assumed that 0% of growers would achieve 2-3 points for rate reduction (which is way overly-conservative) instead of the 70% we assume in our analysis, it still would not impact our results significantly. Subbing in a value of 0% for the analysis in Figure 2 (panel D), would lead to an overall percentage of acres that need more mitigation of 99.75% compared to the 99.92% percent we originally found. Assuming a 60% decrease in atrazine levels from acres needing further mitigation, that would translate to a 0.15% decrease in atrazine levels in Bin 1 watersheds compared to the original 0.048% decrease nationally. The difference is so miniscule as to have little impact on our analysis.

Therefore, we conclude that not accounting for regional differences in no-till or mulch-till will not significantly affect our findings.

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[295] USDA. Economic Research Service. Tillage Intensity and Conservation Cropping in the United States. September 2018. Page 13. Available here: https://ers.usda.gov/sites/default/files/_laserfiche/publications/90201/EIB-197.pdf?v=77252.

[296] Benefits Assessment Page 24; Table 6.

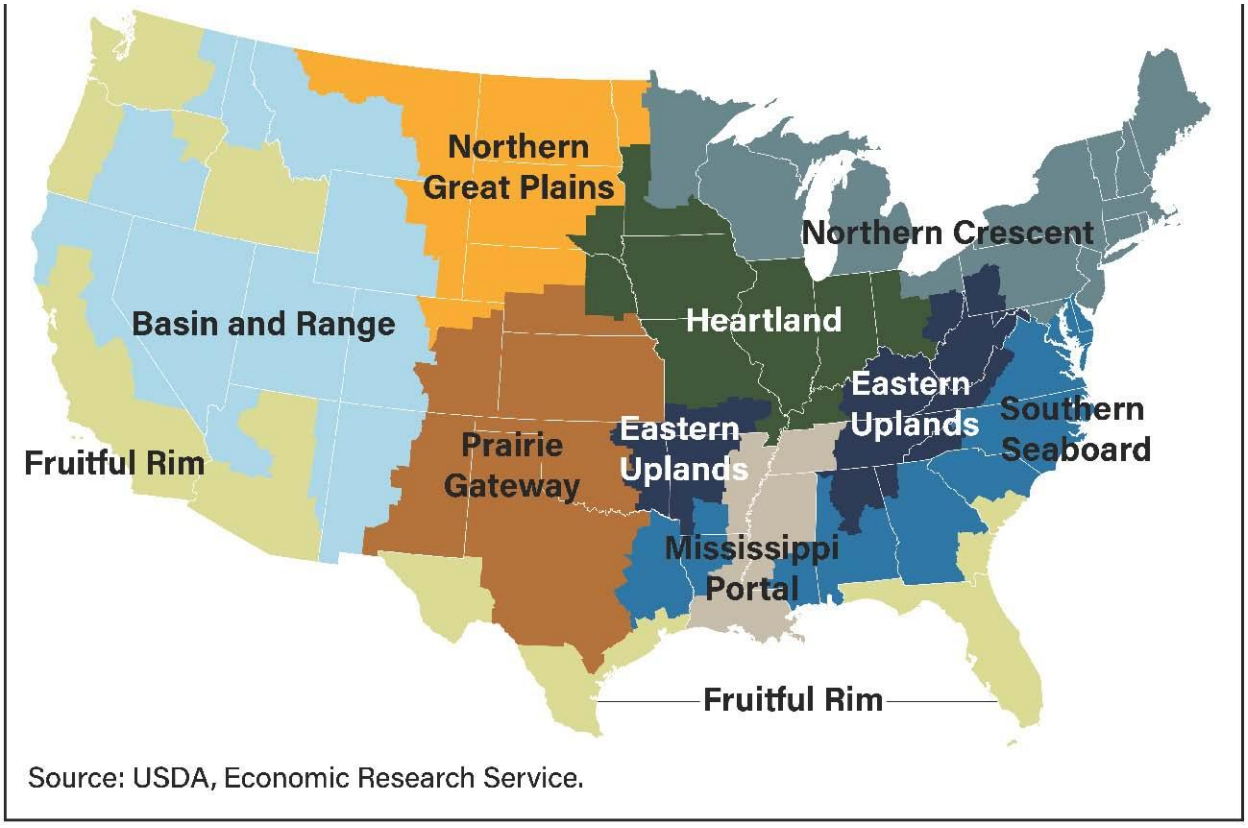
[297] Benefits Assessment Page 24; Table 6.

g. Impacts of Potential Combinational Bias in Mitigation Adoption Estimation

In Section 6d, e and f, we show that regional differences in point accumulation from certain mitigations would not have a significant impact on our findings when analyzed individually, but it's possible that the *combination* of regional differences from multiple mitigation options could "synergize" together if they tend to overestimate mitigation adoption in a certain region. For instance, if one state generally has higher application rates, higher irrigation rate, lower tillage rate and does not qualify for relief points, then our analysis could significantly overestimate corn or sugarcane acres in that state that currently qualify for mitigation points.

To test for this, we determined which regions of the U.S. our assumptions may have overestimated mitigation adoptions (and, therefore, points achieved) for Bin1 and Bin 2 watersheds, in order to identify whether there were any regions that could be over-represented.

For this analysis, we divided the U.S. into different regions used by the USDA.[298] The chart in this resource is reproduced below.



[298] USDA. Researchers looked at soybean production changes across farm resource regions designated by USDA, Economic Research Service. July 26, 2023. Available here: https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail?chartId=106936.

In analyzing where relief points could potentially be overestimated, we used the BASF ACS presentation analysis.[299] Potential overestimation in regional relief point accumulation could occur in "high runoff vulnerability" areas, which are located mainly in the Heartland and Mississippi Portal regions.[300] Potential overestimation in regional relief point accumulation could also occur in areas with high slopes, which are located mainly in the Eastern Uplands.[301] Potential overestimation in regional relief point accumulation could also occur in areas with low sand-content soils, which are located mainly in the Heartland, Eastern Uplands, Prairie Gateway.[302]

In analyzing where other mitigation points could potentially be regionally overestimated, we used EPA's benefits assessments. EPA notes that corn irrigation is highest in NE, GA and CO,[303] which could lead to potential overestimation in regional mitigation point accumulation in the Northern Great Plains, Heartland, Prairie Gateway and Southern Seaboard. Adoption of no-till and mulch-till is known to be lowest in the Northern Crescent and Northern Great Plains regions, which could lead to potential overestimation in regional mitigation point accumulation in those regions. The highest atrazine application rates, and potential for regional overestimation in mitigation point accumulation, occur in the Southern Seaboard region.[304]

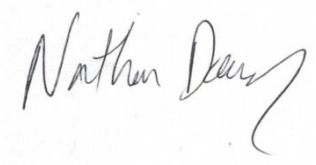
There does not appear to be any region in the U.S. that is overrepresented among parameters that could lead to an overestimation of point adoption. Therefore, we conclude that the totality of potential regional biases in mitigation point adoption will not significantly impact the conclusions of our analysis.

7) Supplemental Files

Supplemental File A

Supplemental File B

Respectfully submitted,



Nathan Donley, Ph.D.

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[299] [299] Campana, D and Hassinger, C. Quantifying field characteristic exemptions and runoff mitigation points from EPA's ESA Strategy Documents. Presentation at the American Chemical Society 2024 Fall Meeting. August 18, 2024. Available here: https://complianceservices.com/wp-content/uploads/Quantifying-the-Potential-Agricultural-Area-Affected-by-EPAs-Draft-Herbicide-Strategy_18Aug24.pdf. Document also submitted to the docket. (Hereafter "BASF ACS presentation").
[300] BASF ACS presentation Page 4.
[301] BASF ACS presentation Page 14.
[302] BASF ACS presentation Page 15.
[303] Benefits Assessment page 30.
[304] Benefits Assessment Page 24; Table 6.

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