July20, 2026

Amy Blankinship
Division Director
Office of Pesticide Programs
Environmental Protection Agency
Mail Code: 2227A
1200 Pennsylvania Ave. NW.
Washington, DC 20460

RE: Modifying how aquatic buffers for aerial applications are applied as mitigation options.

The National Agricultural Aviation Association (NAAA) would like to propose changes to the way EPA uses aquatic buffer zones to protect aquatic habitats from aerial applications. NAAA supports the aerial mitigations detailed in EPA's recent herbicide and insecticide strategies and feels they can provide a basis for modifying how buffer zones next to aquatic areas can be applied to mitigate risks from aerial applications.

U.S. Aerial Application Industry Background: NAAA represents the interests of the 1,560 aerial application industry owner/operators and 2,028 non-operator agricultural pilots throughout the United States licensed as commercial applicators that use aircraft to enhance the production of food, fiber and bio-energy; protect forestry; protect waterways and ranchland from invasive species; and provide services to agencies and homeowner groups for the control of mosquitoes and other health-threatening pests.

Within agriculture and other pest control situations, manned aerial application is an important method for applying pesticides, because it permits large areas to be covered rapidly and is by far the fastest application method of crop inputs, when it matters most. More than any other application method, manned aerial application capitalizes on the often limited windows of suitable spraying weather and allows for timely treatment of pests while they are in critical developmental stages, often over terrain that is too wet or otherwise inaccessible for terrestrial applications. It also treats above the crop canopy, thereby not disrupting the crop and damaging it. Aerial application has greater productivity, accuracy, speed, and is unobtrusive to the crop compared to ground application[1]. Although the average aerial application company is comprised of only six employees and two aircraft, as an industry these small businesses treat nearly 127 million acres of U.S. cropland each season, which is about 28% of all cropland used for crop production in the U.S. In addition to the cropland acres, aerial applicators annually apply to 5.1 million acres of forest land, 7.9 million acres of pasture and rangeland, and 4.8 million acres for mosquito control and other public health concerns.

[1] Kováčik, L., and A. Novák, 2020. "Comparison of Aerial Application vs. Ground Application." *Transportation Research Procedia* 44 (2020) 264–270.

While there are alternatives to making aerial applications of pesticides, aerial application has several advantages. In addition to the speed and timeliness advantage aerial application has over other forms of application, there is also a yield difference. Driving a ground sprayer through a standing crop results in a significant yield loss. Research from Purdue University[2] found that yield loss from ground sprayer wheel tracks varied from 1.3% to 4.9% depending on boom width. While this study was conducted in soybeans, similar results could be expected in other crops as well. Data from a Texas A&M University economics study[3] and the 2019 NAAA industry survey[4] were used to calculate that the aerial application industry is directly responsible for the production of 1.69 billion bushels of corn, 199 million bushels of wheat, 548 million pounds of cotton, 295 million bushels of soybeans, and 3.33 billion pounds of rice annually that would be lost every year without the aerial application of pesticides. The value in additional crop yield that the aerial application industry brings to farmers, input suppliers, processors, and agricultural transportation and storage industries for corn, wheat, cotton, soybean, and rice production in the U.S. is estimated to be about $37 billion[5].

Research summarized by the University of Minnesota[6] describes how soil compaction from ground rigs can negatively affect crop yields due to nitrogen loss, reduced potassium availability, inhibition of root respiration due to reduced soil aeration, decreased water infiltration and storage, and decreased root growth. Aerial application offers the only means of applying a crop protection product when the ground is wet and when time is crucial during a pest outbreak. A study on the application efficacy of fungicides on corn applied by ground, aerial, and chemigation applications[7] further demonstrates that aerial application exceeds ground and chemigation application methods in terms of yield response. The aerial application of crop protection products results in greater harvest yields of crops. This in turn results in less land being used for agricultural production, preserving more wetlands for natural water filtration, forest ecosystems for carbon sequestration and habitat for threatened and endangered species.

The Texas A&M[4] study revealed that the total area of cropland needed to replace the yield lost if aerial application was not available for corn, wheat, soybean, cotton, and rice production is 27.4 million acres, an area roughly the size of Tennessee. Aerial applicators seed 3.8 million acres of cover crops annually[5]. This means that aerial applicators are responsible for helping to sequester 1.9 million metric tons of CO_2 equivalent annually, which, according to the EPA, would be the equivalent of removing approximately 412,000 cars with carbon-combustion engines from the roads each year.

The aerial application industry is also actively involved in education and research efforts to improve the accuracy and safety of aerial applications. The National Agricultural Aviation

---

[2] Hanna, S., S. Conley, J. Santini, and G. Shaner. 2007. "Managing Fungicide Applications in Soybean." Purdue University Extension Soybean Production Systems SPS-103-W. https://www.extension.purdue.edu/extmedia/sps/sps-103-w.pdf

[3] Dharmasena, S. 2020. "How Much is the Aerial Application Industry Worth in the United States?" Research presented at the 2020 Ag Aviation Expo, Savannah, GA. https://www.agaviation.org/2020aatresearchpapers

[4] National Agricultural Aviation Association. May 2019. "2019 NAAA Aerial Application Industry Survey: Operators." https://www.agaviation.org//Files/Comments/NAAA%202019%20Operator%20Survey.pdf

[5] Dharmasena, S. 2021. "Value of the Agricultural Aerial Application Industry in the United States" Research presented at the 2021 Ag Aviation Expo, Savannah, GA. https://www.agaviation.org/2021aatresearchpapers

[6] University of Minnesota. "Soil Compaction." Accessed April 29, 2021. https://extension.umn.edu/soil-management-and-health/soil-compaction

[7] Thomas, D. 2009. Unpublished research results submitted to EPA. https://www.agaviation.org//Files/Comments/Fungicide%20efficacy%20results.pdf

Research and Education Foundation (NAAREF) is a non-profit organization dedicated to promoting research, technology transfer and advanced education among aerial applicators, allied industries, government agencies and academic institutions. NAAREF's Professional Aerial Applicators' Support System (PAASS) program is a four-hour course offered annually at all state and regional agricultural aviation association conventions. The curriculum is brand new every year and a minimum of one hour of PAASS is focused on environmental professionalism. This ensures aerial applicators are kept up to date on the latest information related to making accurate applications and drift mitigation. Nozzle selection, buffer zones, inversions, precision application technology, dissection of real-life drift incidents, and proper spray boom setup are some of the environmental professionalism topics that have been covered in PAASS.

Five years after PAASS became part of the aerial application annual curriculum in 1999, there was a 26% drop in drift incidents according to the Association of American Pest Control Officials' drift surveys. In addition, ag aircraft accidents have also significantly declined. From 1999 to 2010, the accident rate per 100,000 hours flown dropped by 21.6% compared to pre-PAASS accident rates. From 2011 to 2019, the accident rate dropped even more—30.8%—compared to pre-PAASS accident rates. Each year, we continue to see a drop in our accident rate since pre-PAASS days, but now it declines more incrementally. While aviation safety is the domain of the FAA and not the EPA, the reduction in accidents proves PAASS has had, and continues to have, a significant positive impact on the aerial application industry.

Another NAAREF program is Operation S.A.F.E. (Self-regulating Application & Flight Efficiency). The primary component of Operation S.A.F.E. is a fly-in clinic. At a S.A.F.E. fly-in, aerial applicators can have their aircraft calibrated and application patterns (both liquid and dry) measured and evaluated for accuracy and uniformity. Spray droplet size is also measured at a fly-in to ensure the agricultural aircraft is creating the droplet size required by the labels for products to be applied by the aircraft. Many of the concepts used to mitigate the risk of drift from agricultural aircraft have originated from ideas first tested at Operation S.A.F.E. fly-ins.

NAAA has created a professional certification program for the aerial application industry named C-PAASS for Certified Professional Aerial Application Safety Steward. To be certified under C-PAASS aerial applicators must take the PAASS program annually and Operation S.A.F.E. biennially, in addition to belonging as a member to their state/regional agricultural aviation association and the NAAA. C-PAASS professionals are also required to take and be tested on additional aviation safety and environmental stewardship curriculum offered on-line through a learning management system software managed by NAAA. The purpose of C-PAASS is to enhance professionalism in the aerial application industry as our statistics show that those who participate in our educational programs are safer from both an aviation and environmental perspective.

NAAA Comments on Aquatic Buffers

NAAA strongly opposes the continued use of non-wind-directional buffers for aquatic areas on the labels for aerial use and in proposed registration decisions for certain pesticides, including chlorothalonil, isocycloseram, benzovindiflupyr, malathion, norflurazon, thiophanate-methyl/carbendazim, methomyl and carbaryl. NAAA also recommends EPA re-evaluate the required distance for aerial application buffer zones when the wind is blowing towards an aquatic area. NAAA believes that the recently released herbicide and insecticide strategies as well as supporting documents provide a framework for making these changes.

To begin with, NAAA is not completely sure if the non-wind-directional aquatic buffer zones

EPA uses on some pesticide labels are intended to protect against surface water runoff, spray drift, or both. As an example, the proposed interim decision for chlorothalonil (dated 9/29/2023) makes the following references regarding the intent of aquatic buffers:

- Page 18, first paragraph – refers to aquatic buffers separately from drift mitigation, suggesting the intent is for runoff mitigation.
- Page 56, third paragraph – calls for buffers to all aquatic areas to mitigate "risks from spray drift and runoff", suggesting the intent is for both runoff and spray drift mitigation.
- Page 61, first paragraph – in explaining why the Interim Ecological Mitigation (IEM) measures were not proposed for chlorothalonil, it states the previously proposed buffers to all aquatic areas negates the need for both runoff and drift mitigations from the IEM, again suggesting the intent is for both runoff and spray drift mitigation.
- Page 61, third paragraph – mentions buffers to all aquatic areas as being necessary for mitigating ecological risks of concern and specifically calls out runoff and erosion risks but does not mention spray drift, suggesting the intent is for runoff mitigation.
- Page 93, row three – refers to the aquatic buffers as spray drift buffers with no mention of intent for protection against runoff, suggesting the intent is only for spray drift mitigation.

As NAAA detailed in our comments on the proposed interim decision for chlorothalonil, if aquatic buffers are intended to mitigate ecological risks of concern associated with spray drift, then the buffers should be wind directional. NAAA strongly feels all spray drift mitigation buffers proposed on all labels, whether they be for FIFRA or ESA obligations, should be wind directional. Science has consistently indicated that drift only moves downwind[8,9,10]. Wind-directional buffer zones will minimize impact to growers because these areas can still be treated by aerial applicators when the wind is blowing away from conservation areas. The buffers will also fully protect sensitive areas from spray drift because they will be implemented when the wind direction is towards the sensitive site. They provide a win-win solution that balances the need for optimum agricultural production and protection of aquatic and other conservation areas.

Aerial applicators currently have the technology to monitor both wind direction and speed during an application. Agricultural aircraft have smokers, an onboard meteorological measurement system, or both. These devices provide immediate and in field wind direction measurement, so if wind speed or direction does change during the application, the aerial applicator can respond immediately.

Wind-directional buffers to mitigate the risk of spray drift have been incorporated into the vulnerable species pilot project, the herbicide strategy and the insecticide strategy. NAAA is unclear why wind-directional buffers would be acceptable for protecting threatened and endangered species, critical habitat, and unmanaged areas from spray drift but not aquatic areas. This is especially confusing considering there are critical habitats and unmanaged areas that are aquatic.

---

[8] Kirk, I.W., M.E. Teske, H.W. Thistle. 2002. "What About Upwind Buffer Zones for Aerial Applications?" *Journal of Agricultural Safety and Health* 8(3): 333-336.
[9] Teske, M.E., S.L. Bird, D.M. Esterly, S.L. Ray, S.G. Perry. 2003. "A User's Guide for AgDRIFT ® 2.0.07: A Tiered Approach for the Assessment of Spray Drift of Pesticides." https://usermanual.wiki/Pdf/AgDriftusermanualpubFes2003.1946090729.pdf
[10] Butts, T.R., B.K. Fritz, K.B. Kouame, J.K. Norsworthy, L.T. Barber, W.J. Ross, G.M. Lorenz, B.C. Thrash, N.R. Bateman, J.J. Adamczyk. 2022. "Herbicide spray drift from ground and aerial applications: Implications for potential pollinator foraging sources." Scientific Reports (2022) 12:18017. https://doi.org/10.1038/s41598-022-22916-4

A non-wind-directional buffer adjacent to aquatic areas only makes sense if the goal is solely to mitigate runoff risks. If this is the case, however, NAAA is unclear why aerial application needs a greater buffer distance than a ground application, e.g. the proposed 150-foot buffer for aerial and chemigation applications versus the 25-foot buffer for ground applications from the proposed interim decision for chlorothalonil. As EPA is fully aware, most pesticides applied in an agricultural setting are applied at a specific rate of a given product per unit of surface area, typically acres. When considering runoff concerns, therefore, it doesn't matter what type of application platform was used to make the application. The concern is the amount of product applied per acre, and whether it's at risk of being carried from the application site as runoff. NAAA disagrees with having different buffer distances based on application methods for aquatic buffers intended to mitigate runoff risks.

Regarding the standardized distance of 150 feet for the aquatic buffers, NAAA disagrees with that distance; it predates EPA's recent ESA activities and is based on the use of the Tier 1 model in AgDRIFT. NAAA previously documented the inaccuracies associated with the Tier 1 AgDRIFT model in a letter sent from NAAA to the Office of Pesticide Programs in June of 2020[11]. A recent field study conducted at the University of Arkansas concluded the drift estimates from the Tier 1 model were "greatly over-predicting" the amount of drift physically measured in the field study[12]. The letter proposed EPA use the Tier 3 AgDRIFT model, which more accurately estimates drift from aerial applications. In the Ecological Mitigation Support Document released with the draft insecticide strategy, EPA acknowledged their intent to begin using the Tier 3 AgDRIFT model with most of the assumptions suggested by NAAA in numerous comments over the last several years. NAAA recommends EPA use the Tier 3 AgDRIFT model when assessing the need for and determining the distance of aquatic buffers.

NAAA examined the reduction in spray drift towards a wetland using Tier 3 AgDRIFT instead of Tier 1. Model parameters were set according to EPA's Ecological Mitigation Support Document to Support Endangered Species Strategies Version 2.0. Two additional AgDRIFT scenarios were run, with slight modifications to EPA's new parameters. The first was to increase droplet size to coarse and the second was to reduce boom length to 50% of wingspan along with the coarse droplet size. Effective swath width and the number of passes were adjusted accordingly for the 50% boom scenario. Drift was measured as the fraction of spray material applied at 150 ft (distance for the current aerial aquatic buffer zone) using the aquatic assessment tool and an EPA-defined wetland. Results are shown in the table below. The Tier 3 model results in a 37% reduction in spray drift deposition in the EPA-defined wetland. Increasing the droplet size and reducing the boom length further reduces spray drift.

In Appendix I of the Ecological Mitigation Support Document, EPA rejected NAAA's suggestion to change the default surface roughness parameter in AgDRIFT to reflect an aerial application to a standing canopy as opposed to bare ground. EPA also rejected NAAA's proposal to increase the boom drop to 2 feet to reflect the standard boom of the AT-802A aircraft. NAAA is working to better document the justification for both proposed changes, as they reflect real-world aerial applications. If NAAA's proposed values had been used for both surface roughness

[11] NAAA letter to EPA, June 29, 2020. https://www.agaviation.org//Files/Comments/EPA%20letter%20re%20AgDRIFT%20Tier%203%20aerial%20risk%20assessment%20use%2020200629.pdf
[12] Butts, T.R., B.K. Fritz, K.B. Kouame, J.K. Norsworthy, L.T. Barber, W.J. Ross, G.M. Lorenz, B.C. Thrash, N.R. Bateman, J.J. Adamczyk. 2022. "Herbicide spray drift from ground and aerial applications: Implications for potential pollinator foraging sources." Scientific Reports (2022) 12:18017. https://doi.org/10.1038/s41598-022-22916-4

and boom drop in EPA's Tier 3 AgDRIFT aerial application parameters, the fraction of applied 150 feet downwind is reduced by an additional 17%.

The Tier 1 AgDRIFT model estimates an initial average concentration of 7,212.94 ng/L at an EPA-defined wetland 150 feet downwind of the application area. Using Tier 3 with EPA's new aerial application parameters, the distance at which the initial average concentration is equal to 7,212.94 ng/L is only 65.62 feet. This is further evidence that a buffer distance of 150 feet is not needed when the more accurate Tier 3 model is used to model drift from aerial applications.

Tier	Wind speed	Boom length	Swath width	# passes	Droplet size	Swath displacement	Fraction of applied	% reduction from Tier 1
Tier 1	10 mph	75%	60 ft	20	Fine to medium	0.375	0.0385	NA
EPA Tier 3	10 mph	75%	80 ft	15	Medium	0.5	0.0242	37%
EPA Tier 3	10 mph	75%	80 ft	15	Coarse	0.5	0.0131	66%
EPA Tier 3	10 mph	50%	55 ft	22	Coarse	0.5	0.0055	86%

* Distance of 150 feet using the aquatic assessment tool and EPA-defined wetland.

Considering all these points, NAAA is currently working under the assumption that these aquatic buffer zones are intended to mitigate against both runoff and spray drift risks. NAAA therefore proposes the following for aquatic buffer zones for aerial applications:

- Labels should clearly state that the aquatic buffers are intended to mitigate both spray drift and runoff risks.
- If the wind is blowing away from the aquatic areas, then the buffer distance should be the same for all application methods, e.g. 25 feet as proposed for chlorothalonil.

If the wind is blowing towards an aquatic area, the buffer distance should be calculated using the Tier 3 AgDRIFT model in the ecological risk assessment process, as demonstrated in the discussion above. A minimum distance to protect against exposure from runoff is assumed. This proposal would offer protection for aquatic areas from both runoff and spray drift from aerial applications. It would also allow growers to more fully utilize aerial application to protect their crops from pests. If NAAA's assumption on the intent for aquatic buffers is incorrect, then NAAA recommends aquatic buffers be wind-directional, with the distance determined as described above if the intent is to protect against aerial spray drift. If the intent is only to protect against runoff, then NAAA recommends the buffer distance be equal for all application methods.

As a final thought on aquatic buffer areas, NAAA recommends two additional provisions from the herbicide and insecticide strategies be incorporated into aquatic buffers – the concept of managed areas and spray drift mitigations as options for reducing buffer distances. NAAA feels that if managed areas and spray drift mitigations provide suitable protection for endangered species and critical habitat, then it's logical to assume they will provide the same protection for aquatic areas. Three out of the last four seasons of PAASS have covered various aspects of EPA's ESA activities, so the manned agricultural aviation industry is quite familiar with the concept of how managed areas and spray drift mitigations are used to adjust the distance of downwind buffers. NAAA has previously documented the significant impact that two common aerial drift mitigations found on EPA's mitigation menu (using larger droplet size and shortened booms) have on reducing drift towards sensitive areas in a letter to EPA[13]. Aquatic specific modeling of the advantages of using a larger droplet size and reduced boom length were again demonstrated in the table above. For example, if the droplet size is increased from medium to coarse using Tier 3 with EPA's new aerial application parameters, the distance at which the initial average concentration is equal to 7,212.94 ng/L drops to just 9.84 feet.

[13] NAAA letter to EPA, June 29, 2023. https://www.agaviation.org/20230627-letter-to-epa-drift-mitigations/

Thank you for this opportunity to present these concerns regarding the continued use of non-wind-directional buffer zones to protect aquatic areas. NAAA looks forward to a follow-up discussion with EPA on our proposed strategy as an alternative that both protects aquatic areas and allows growers to maximize their use of aerial application to protect their crops.

Sincerely,

Scott Bretthauer

Scott Bretthauer, PhD
Director of Policy, Education, and Safety