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1200 Pennsylvania Ave. NW
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Submitted via regulations.gov

RE: Appendix to the ESA Workplan Update: **Nontarget Species Mitigation for Registration Review and Other FIFRA Actions; Docket No. EPA-HQ-OPP-2022-0908**

Dear Ms. Biscoe,

The Weed Science Society of America (WSSA), along with the Aquatic Plant Management Society (APMS), North Central Weed Science Society (NCWSS), Northeastern Weed Science Society (NEWSS), Southern Weed Science Society (SWSS) and Western Society of Weed Science (WSWS) ("the Weed Science Societies") represent over 3000 weed scientists from around the world. Members include academic, governmental, and private industry research scientists, university extension professionals, educators, graduate students, and federal, state, county, and private land managers. We welcome the opportunity to comment on the Appendix to the Endangered Species Act (ESA) Workplan Update (the "ESA Workplan"). We applaud the Environmental Protection Agency (EPA) for recognizing how critical this issue is for American agriculture. We need to strike a balance between protecting threatened and endangered (T&E) species while minimizing impacts to growers and pesticides that help feed the world. Thank you for allowing public comments to improve these mitigation measures. We also express our gratitude for extending the comment period to 75 days.

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Introduction

For decades, weed scientists have promoted the importance of utilizing diversified weed management programs that support the judicious use of herbicide chemistries to target known weed problems and that integrate cultural practices such as removing weed escapes, maximizing crop competitiveness, rotating crops, planting into weed-free fields, and reducing the additions of weed seed to the soil seedbank (Beckie 2006; Beckie and Harker 2017; Harker and O'Donovan 2017; Walsh and Powles 2007; Zimdahl 2018). These combined practices form the basic building blocks of a sound herbicide resistance management strategy, as recognized, and promoted by the EPA. However, growers and other land managers must have the tools available if they are to remain sustainable (U.S. EPA 2017). The approach of removing the practical use of critical herbicides needed to produce an economical and sustainable crop from a grower's toolbox must be taken very seriously. Decisions must be made that: 1) use sound science, 2) consider practical pesticide use patterns and production practices, and 3) evaluate the most recent data.

However, herbicide use may be accompanied by unintended off-site movement, which can have negative impacts to non-target species, including T&E plants. Extensive research and analysis have improved our understanding of the mechanisms of how pesticide products can move off-field and away from the intended target-site. With pesticide movement comes the potential for unintended ecological risks and surface water contamination, which may have negative impacts to non-target species, including T&E plants. The use of conventional pesticides is critically important to the continued development of a safe, economically sustainable, and environmentally sound U.S. food production system.

To support grower needs and minimize ecological concerns, scientists have devoted significant time to understanding the complex interactions between pesticides, the systems and regions in which they are used, and the crop production and application practices used to prevent movement away from application sites. The Weed Science Societies cannot emphasize enough that **"a one-size fits all" approach across the U.S. for ESA compliance will NOT work.** We encourage EPA and the Services to look at the first 50 years of ESA and FIFRA to identify areas where T&E species were either recovered or went extinct due to pesticides.

The Weed Science Societies are only aware of **T&E species successes,** cases where the habitat was restored, by managing weeds according to FIFRA approved herbicide labels (without additional ESA mitigations). Examples include:

- the areawide integrated weed management of leafy spurge (*Euphorbia esula*) in the Great Plains that helped re-establish habitat for the threatened western prairie fringed orchid (*Platanthera praeclara*);
- the California Delta Region Areawide Aquatic Weed Project that helped manage Brazilian egeria (*Egeria densa*) and waterhyacinth (*Eichhorna crassipes*), among other aquatic weeds, in the Sacramento & San Joaquin River Delta that is habitat for 56 rare and T&E species; and
- The Areawide Management and Evaluation (TAME) of melaleuca (*Melaleuca quinquenervia*) project in south Florida that has helped "tame" large scale infestations of this Federal Noxious Weed, one of 111 weeds listed. Melaleuca caused the serious habitat degradation of several endangered wildlife species including the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*), wood stork (*Mycteria americana*), red-cockaded woodpecker (*Leuconotopicus borealis*), and Florida panther (*Puma concolor couguar*). FIFRA registered herbicides are a critical part of melaleuca's integrated management.

Included below are comments provided by Weed Science Society members regarding EPA's ESA Workplan to develop a broad approach in addressing spray drift and mitigating pesticide runoff from treated fields and minimizing exposure to listed species.

General Topics

Aquatic Habitats: Pest Management is Necessary

There are many situations where aquatic weeds need to be controlled and they may be adjacent to T&E species and their habitats. In some sites invasive species must be controlled so that the native species (including T&E species) can survive. This removal of invasive species is also critical step during native plant restoration in habitats. For example, members of the Aquatic Plant Management Society (APMS) Netherland and Schardt (2021) describe the factors that influence decisions and outcomes of aquatic plant control. The APMS could provide additional valuable insight regarding the intersection these species and their current methods to control offsite movement of pesticides.

Buffer Areas: Pest Management is Necessary

The ESA Workplan describes many types of buffers where invasive, noxious, difficult to control and prolific weed species will be present and need to be controlled. In many cases mechanical control, if allowed under the description, will not control all weed species or will favor weediness in certain plant species. The document lists several buffers such as: vegetative buffers, filter strips, grassed waterways, field borders, contour buffer strips, vegetative barriers, vegetated ditch banks, and riparian buffers. These areas will still need weed control options as shown by Japanese knotweed (*Polygonum cuspidatum*). This highly invasive weed native to Asia, grows in dense stands that shades out other vegetation. Control of Japanese knotweed requires either multiple herbicide applications or mowing/cutting followed by an herbicide application (Gover, Johnson, and Sellmer, 2007). The ESA Workplan should consider and describe methods for pest control in these areas.

Buffers: Wind-Directional

Wind-directional buffers have been proposed as a way to reduce exposure to listed species. This type of label language would be easy for the pesticide applicator to follow because they are constantly checking the spray pattern and can immediately detect if the wind has shifted towards sensitive sites. Many pesticide labels already have instructions about maximum windspeed and avoiding spraying if the wind is towards sensitive sites. The instructions should also specify that if the wind is blowing at an angle relative to field edges, buffers must be maintained on the downwind edge of the field.

Communication Plan: No Description Provided

The Endangered Species Act was signed into law in 1973. For decades growers have heard that the ESA will impact farming practices but very few growers have been affected. The ESA Workplan clearly specifies numerous changes that farmers will need to incorporate into their operations, and it is crucial that this information be disseminated to stakeholders. The most effective way for the EPA to get farmers to protect T&E species is to clearly explain the endangered species act and why label changes are needed to safeguard them. In addition, many labels have been changed but the user community has never been told which of the changes are for the benefit of T&E species; this may leave the user to think that nothing has been done to support vulnerable species. Since the Pesticide Registration Improvement Extension Act of 2018 (PRIA 4) (and now PRIA 5, that was just passed in the FY 2023 Omnibus Appropriations Bill), has a **requirement for pesticide safety education programs,** it seems reasonable that some of that funding could be used to develop ESA training materials to describe ways to protect these T&E species for use during state run pesticide training classes.

Incorporate Stakeholder Input

When EPA is considering mitigation measures, it is essential that grower and applicator groups are involved. Without specific education on both what the new provisions are and why they are being implemented, including how the science supports the requirements, widespread support from growers and applicators will be challenging. It is incumbent on EPA to ensure this engagement occurs. The Weed Science Societies requests that relevant stakeholders should have ample opportunities to meaningfully participate in an efficient, defensible, and transparent process to share information with the goal of protecting vulnerable species, providing regulatory certainty, and offering a level of flexibility to growers and applicators.

Computer/Internet Access Is Limited

Not all farm operations have access to computers and, therefore, cannot access and print out bulletins or pesticide labels. A 2021 survey (USDA, NASS) shows that **only 67% of farms own or use desktop or laptop computers**. Only 77% of farms own or use a smart phone. For example the use of a computer is mentioned on page 3 and 11 where they would be needed to check Bulletins Live Two within 6 months of pesticide application and again on page 25 under Runoff Mitigation where it says " **Users of this product must access [website address] and follow the instructions …"** . Communities that could be impacted by the lack of access are the "Plain" (such as the Amish) and immigrant communities, socially and economically disadvantaged farmers, and growers living in regions where the necessary infrastructure is unsupported. Broadband access is also limited in rural areas of the United States. The Weed Science Societies suggest additional methods that do not require computers and internet access need to be developed so that the 23 - 33% of farmers that do not have on farm access to a smart phone or computer can get this information.

Conservation Practices: Not Widely Adopted in the U.S.

The United States lists the acreage enrolled in conservation practices through the National Resource Conservation Service (USDA, NRCS, 2021). In 2021 approximately 1% of total U.S. crop acres were enrolled in programs that include: conservation crop rotation, contour farming, cover crop, residue and tillage management (mulch till), residue and tillage management (no-till/strip till/direct seed), residue management (no-till/strip till), residue management seasonal, and terrace. Wallander et.al., (2021) suggest that cover crops are grown on 2% of the U.S. cropland. **Both references indicate that conservation practices are not widely used because they require additional economic and management inputs.** Therefore, time, training, and monetary incentives will be needed for growers to adopt these practices on their farms so that they can reduce risks to endangered species. The methyl-bromide critical use exemption program demonstrated that many growers needed 10+ years to adopt new production practices on their farms.

Conservation Practices: Link to Pesticide Runoff is Not Clear

Conservation practices have been widely researched to show their ability to reduce nutrient runoff. The research demonstrating the effectiveness of these practices goes back many decades.

However, evidence that these same conservation practices will reduce pesticide runoff has not been widely demonstrated. The evidence is often contradictory as is the case of a meta-analysis where dicamba and metribuzin had higher runoff loads under no-till cultivation (Elias et.al., 2018). If the EPA is going ask growers to make substantial investments in new production practices, they need to have clear and convincing evidence that these practices will be effective in reducing pesticide runoff and mitigate the risks to T&E species and their habitat. The WSSA plans to conduct research to demonstrate that conservation practices can reduce pesticide runoff as well as nutrient runoff.

Conservation Practices: Requiring Them Could Lead to Loss of Farmland
The United States loses over 1 million acres of farmland per year (USDA, NASS 2022). One of the greatest reasons for the loss of farmland is the conversion into new housing and other urban developments. Plant management is these areas if often repeated mowing. Therefore, these new subdivisions may not support or supply habitats suitable to endangered species. If appropriate time, training, and money are not provided for farmers to adopt new conservation practices, many farmers may sell off less productive areas for housing or other urban developments resulting in economic and social ramifications for these agricultural communities.

Conservation Practices: Conservation Measure Pick List Not Appropriate for All Crops
Many agricultural sites may not be able to incorporate items from the conservation measure pick list. Specialty crops, such as orchards, vineyards, small fruits and vegetables, are grown on smaller acreages compared to agronomic crops and would be greatly impacted by taking land out of production to establish buffers or other conservation practices. In some perennial systems, cover crops may not be feasible because they can harbor vertebrate or insect pests or plant pathogens or may interfere with harvestability.

In general, many vegetables cannot be successfully planted into cover crop stubble; if they are on a plasticulture system, the cover crop residue could tear the plastic tarps and allow weeds to grow through the openings. Additionally, some specialty crops are grown on level fields and some conservation practices described (e.g., terracing) may not be effective or necessary in those sites. In northern areas, plasticulture is used to raise soil temperatures, which is important for early development of vegetables. Cover crops are known to reduce soil temperatures which can slow vegetable development and reduce specialty crop production. In addition, in the drier western states it may be difficult to establish cover crops because rainfall is erratic and irrigation water, which is in limited supply, may be needed. Other agricultural sites such as forest, pasture, and rangeland do not appear to be addressed by the conservation measure pick list. We anticipate that the EPA will address these missing elements when the Herbicide Strategy is published in the spring of 2024.

Conservation Practices: Considerations

1. *Vegetative Filter Strip*
    - Vegetative filter strips are a valid mitigation measure, but are not an option that can be utilized by many growers. There are several reasons why this practice cannot be considered a widely adoptable practice for reducing surface water runoff and erosion:

i. In-field vegetative strips will need to be installed on millions of acres of farmland where pesticides are now used.
ii. There is no clear understanding of who (landowner, renter, farmer, pesticide applicator, etc.) will be responsible for the cost of implementing and maintaining this measure.
iii. Implementation of vegetative filter strips, will result in loss of valuable farmland from crop production.
iv. For small fields, or fields with little slope, this will not be a feasible option as undesirable effects surrounding runoff may occur (i.e. ponding).
v. Vegetative filter strips must be properly maintained. This will require significant maintenance programs including mowing, burning, and herbicide applications to control unwanted growth or invasive plant species. This increases wear on and commitment of equipment, may require the purchase of new equipment, could be costly with respect to labor and other resources, and could increase pesticide use within a system if herbicides must be employed.
vi. The use of vegetative filter strips should be unified with current NRCS conservation plans.
vii. Buffers can be expensive to install and maintain. In Maryland payments for conservation buffers range from $500/acre for an existing grass buffer to a maximum of $4,500/acre to install a riparian forest buffer with pasture fencing (Maryland, 2023).

2. *Field Border and Grassed Waterways*

- Field borders and grassed waterways are sound approaches and should be included as options, however, there are limitations with both that should be considered.
  i. Field borders and grassed waterways will be required on millions of acres of farmland where pesticides are utilized. For small fields, borders could take up a significant portion of a field.
  ii. There is no clear understanding of who (landowner, renter, farmer, pesticide applicator, etc.) will be responsible for implementing and maintaining this costly measure.
  iii. To implement field borders and grassed waterways, valuable farmland will likely need to be removed from crop production.
  iv. For small fields or fields with little slope, this will not be a feasible option, as undesirable effects surrounding runoff may occur (i.e. ponding).
  v. Field borders and grassed waterways must be properly maintained. This will require significant maintenance programs including mowing, burning, and herbicide applications to control unwanted growth. Many current invasive species thrive in field borders and these areas can be a conduit for invasive species to spread to adjacent areas. This increases wear on equipment, may require the purchase of new equipment, could be costly

with respect to labor and other resources, and could increase pesticide use within a system if herbicides must be employed.

vi. The use of vegetative filter strips should be unified with NRCS conservation plans.

3. *Field Terracing, Contour Buffer Strips, Contour Farming, and Vegetative Barriers*
    - These approaches are valid options and should be included on the list, but these practices will not be adoptable by many growers. Several reasons why this practice cannot be a widely adoptable practice are as follows:
        i. These mitigation practices are beneficial to fields with measurable slope that produce runoff, and less beneficial to fields with flat topography as are found in many U.S. agronomic producing regions. As discussed by Thompson and Sudduth (2017), the benefits of contour farming diminish as the slope becomes flatter, as these slopes do not result in as great a runoff rate. This limits implementation and advantages of contour and terrace-based mitigation options.
        ii. These mitigation measures are extremely costly to implement and difficult to maintain, therefore are not feasible for many farmers.
        iii. To implement contour and terrace-based mitigation measures, farmland will likely be removed from crop production, impacting food supplies.
        iv. The use of contour and terrace-based mitigation measures should be unified with NRCS and their conservation plans.

4. *Cover cropping and mulching with natural materials*
    - The use of cover crops is an excellent option for mitigating the movement of pesticides in surface water run-off from treated fields and are an extremely effective management tool for many growers around the county (Potter et al. 2004, 2011, 2015, 2016).
    - After four years of sampling, Potter et al. (2016) recorded 2.7 g ha^{-1} of aggregated total fomesafen runoff losses from conventional plots, compared to 0.05 g ha^{-1} from conservation tillage plots with a rye cover crop, which is over a 50-fold reduction in runoff.
    - It appears scientifically feasible that the use of a cover crop, following NRCS protocols, would be an effective stand-alone mitigation practice without the need of any additional tactics for some regions of the country (Potter et al. 2004, 2011, 2016).
    - As was mentioned previously, cover cropping may not be an effective strategy for some specialty crop growers. Additionally, moisture availability can limit the ability to produce cover crops in some western geographic regions.

5. *No Tillage/Reduced Tillage*

- Conservation tillage is an extremely effective practice for mitigating the movement of pesticides from treated fields and is possible for many growers to implement (Potter et al. 2004, 2011, 2016).
- However, not all agricultural situations allow no tillage/reduced tillage. Some growers, based on the spectrum of weeds controlled and cost, use soil incorporated herbicides which does not follow reduced tillage practices. Some specialty crop/vegetable crop growers have limited herbicides available and rely on cultivation for weed control. In some areas of the Midwest growers conduct fall tillage so that they are able to plant their crops in the spring, given the short time window for planting and potentially wet soil conditions.
- After four years of sampling, Potter et al. (2016) recorded 2.7 g ha^{-1} of aggregated total fomesafen runoff losses from conventional plots, compared to 0.05 g ha^{-1} from conservation tillage plots with a rye cover crop.
- After making seven fluometuron applications and measuring surface runoff for ten years, Potter et al. (2011) recorded that the level of surface runoff was 1.2% of the applied herbicide within conventional tillage systems, and 0.31% for strip-till systems which is almost a 4-fold reduction in runoff.
- It appears scientifically feasible that the use of no till or reduced tillage would be an effective stand-alone mitigation practice without the need of any additional tactics for some regions of the country (Potter et al. 2004, 2011, 2014, 2015, 2016).

6. *Riparian Buffer Zone and Riparian Herbaceous Zone*
    - The use of a riparian buffer or herbaceous zone is a valid approach to mitigating pesticide runoff in surface water from treated fields; however there are limitations to adoption:
        i. Riparian buffers or herbaceous zones must be established in the transitional zone between a field and an aquatic habitat, therefore it is limited to sites that directly border a body of water.
        ii. Size specifications are vague, what are the minimum dimensions and size designations of a "stream" or "larger body of water"?
        iii. Implementing riparian buffers or herbaceous zones mitigation measures will remove significant arable land out of agronomic production, impacting food supplies.
        iv. Implementing these sites will be costly, and maintenance may be difficult, especially when managing undesirable plant or invasive plant material along the edge of a water body. As stated for Japanese knotweed above some invasive species can dramatically reduce the habitat needed by T&E species.

7. *Runoff Retention Ponds, Water and Sediment Control Basin, Sediment Catchment Basin, Constructed Wetland*

- The practice of catching and containing surface runoff water through retention ponds, control/catchment basins and constructed wetlands is a valid mitigation measure; however, there will be significant barriers to adoption that will limit their implementation:
    i. These mitigation measures are extremely costly to implement, require specialized equipment to install, and are difficult to maintain, therefore are not feasible for many growers.
    ii. In areas where fields are small (e.g., ~ 20 acres), installing a catchment basin will not be practical for each crop production field.
    iii. A catchment basin is often shallow and will result in development of significant aquatic, invasive species. Management of these areas will require additional pesticide inputs or other labor intensive practices.
    iv. How will the size of the catchment basin be determined for a given production field? Will it be based on field acreage and slope?
    v. Installing these mitigation measures will be disruptive to the land and will require significant arable land to be removed from agronomic production, impacting food supplies.

8. *Strip Cropping and Alley Cropping*
    - Depending on how it is implemented, strip cropping and alley cropping could be a valid mitigation measure. However, these practices will not be implemented around the country due to several reasons:
        i. It is not feasible to implement strip cropping on large tracts of land.
        ii. Within a strip cropping system, avoiding pesticide contamination across crops is often not achievable.
        iii. Many newer herbicide labels require large infield buffers next to non-labeled crops. All of the crops in the strip cropping system would need to be listed on the herbicide label, and the product might not be available to use in this type of strip cropping system.
        iv. This production system often has problems with harboring insects and diseases (Tillman et al. 2004).

Seed Treatment: Disposing of Excess Seed After Planting

"A 2-foot depth for burying treated seeds appears to be a practical measure for growers to avoid disturbance during plowing that may also address risk to birds and mammals from eating treated seed." In most agricultural situations, burying soil 2 feet deep would not be practical because the soil has not been disturbed to that depth and digging would be very difficult. Collecting and removing or burning seed as described elsewhere would be a more practical approach.

Seed Treatment: Seed Bag/Container Labeling.

The proposal is to use the following language "Do not use for food, feed, or oil purposes." Consider adding the word "ethanol" or "fuel" to the list of uses that are not allowed because of the contamination problems caused by using treated seed to produce ethanol.

Surface Water Runoff and Erosion Mitigation: Soil Incorporation

Appropriate amounts of overhead irrigation are an excellent approach to incorporating herbicides into the soil and reducing pesticide runoff. This tactic should be a clearly defined and approved mitigation measure. Potter et al. (2016) noted in their research, that less than 1% of applied fomesafen left the field through runoff when irrigation incorporation was used, leading to the conclusion that a "relatively low runoff rate was linked to post-application irrigation incorporation". These results were observed during a worse-case scenario, following a rain runoff event on the day of application. The relatively small amount of fomesafen lost in runoff was likely due to the herbicide being incorporated with 12.5 mm of irrigation following application. At the same location, irrigation was utilized to incorporate fomesafen in conventional plots at the same location, reducing fomesafen runoff nearly 2-fold (Potter et al. 2011).

- **"SURFACE WATER PROTECTION STATEMENT** • Do not apply during rain."
- *Definition of pesticides that can be lost due to soil erosion* - Pesticides with agricultural crop uses and an organic carbon partitioning coefficient (Koc) over 1000 L/kg (slightly mobile, hardly mobile, or immobile) across all soils tested (EPA, 2023). Herbicides such as glyphosate, s-metolachlor, and trifluralin are in this category (WSSA, 2014).

Data collected from consciously designed and scientifically sound studies indicates that the use of irrigation of appropriate amounts would be an effective stand-alone procedure to reduce potential pesticide runoff following significant rain events or erosion (within some regions of the country). The Weed Science Societies greatly supports EPA's efforts to both allow flexibility for growers and reduce pesticide loads in runoff through various tactics and would like the opportunity to assist in developing effective strategies.

Surface Water Protection

As acknowledged in the ESA Workplan, soils across the U.S. are varied and certain pesticides may be more prone to leave the field when dissolved in surface water runoff in some soils compared to others. The EPA is proposing surface water runoff mitigation measures across all soils for pesticides that are highly or moderately mobile in one or more soils, including the use of label language statements that users would follow when precipitation is forecasted.

1. *Do not apply pesticide during rain*
    - This is a reasonable mitigation measure to prohibit pesticide applications during periods of active rainfall, especially when considering that herbicide applications during rain would negate the effects of many products.

2. *Do not apply "a mobile or highly mobile non-persistent" pesticide when a storm event likely to produce runoff from the treated area is forecasted to occur within 48 hours following application*

- Scientific literature supports the reasonable mitigation measure of avoiding herbicide applications within 48 hours of a rainfall event likely to produce runoff from the treated area (Potter et al. 2014, 2016).

- *Definition of mobile or highly mobile* - These additional measures would generally apply to pesticides with agricultural crop uses and a Koc less than or equal to 1000 L/kg (highly to moderately mobile across all soils) for pesticides that are highly or moderately mobile in one or more soils (EPA, 2023). Herbicides such as atrazine, 2,4-D acid, and dicamba would be in this category.

- *Definition of non-persistent* - Pesticides that degrade in the soil or on foliage with half-lives (amount of time needed to degrade a chemical by 50%) of less than two days (EPA, 2023).

- To ensure consistency and compliance, more guidance is needed for growers to understand this mitigation practice, including:
    i. Where should rain forecasting information be obtained from?
    ii. How should the grower determine what amount of rainfall will produce runoff for their specific soil type, while factoring in slope, groundcover, etc.?
    iii. How to deal with weather forecasts that change rapidly, especially during summer months when "pop-up" thunderstorms are frequent. ForecastAdvisor evaluated the accuracy of weather forecasts in the Washington DC area in 2022 which range from 44 to 85% based on information from thirteen companies (Intellovations, 2023). How should a grower handle a situation where the decision was made to apply the herbicide, and the forecast changed to indicate a runoff producing rainfall, after the application was made?
    iv. Will there be an opportunity for this mitigation measure to be bypassed if certain practices are being implemented in the field which ensure the soil surface is covered, such as cover cropping?
    v. What if the grower's fields have very little or no slope which would mitigate run-off potential?

Additional Technologies to Avoid Off-Target Movement

Agricultural technology is expanding at a fast pace and many tools may help reduce total herbicide use in many systems. This includes:

- steam weeding in high value vegetable crops,
- electrical weeding in annual and perennial cropping systems,
- inter-row mowing to control weeds,
- unmanned aerial systems (UAS)/drone-based weed identification,
- vision-guided, targeted precision spraying and cultivation,
- and harvest weed seed control.

Many farms, especially in California, Arizona, and Europe, have already adopted these new technologies in specialty crops, although similar technology is also online for agronomic commodities. The growing agricultural robotics industry will, undoubtedly, change how crops and weeds are managed. The ESA Workplan did not describe a flexible path for how the EPA will review and incorporate novel weed control technologies into the risk mitigation process for endangered species and their habitats.

The symposium on novel weed technology for weed management at the 2023 WSSA/NEWSS joint annual meeting will be submitted for publication in a WSSA journal, this year and will discuss the opportunities related to automation and mechanization for the control of unwanted vegetation.

Spray Drift: Reducing Risks

For example, hooded sprayers are an additional drift reduction tool that is often not considered when mitigation measures are discussed. Hooded sprayers designs include multiple interrow hoods that allow post-directed applications of herbicides or can have a continuous shield over the entire spray boom to aid in drift reduction. Regardless of hood design or material, hooded sprayers generally reduce particle drift by minimizing spray exposure to wind forces (Ozkan et al. 1997). Drift reductions of 1.8 to 2.8 fold have been reported by use of hooded sprayers compared with open sprayers (Fehringer and Cavaletto 1990). Foster et. al. (2018) demonstrated that hooded sprayer applications reduced downwind drift, at 43 to 104 meters, by approximately 50% compared to open sprayer applications. For orchards directed air tower and the multi-headed fan towers can reduce offsite movement (Kasner et.al., 2020). Other commonly used equipment that can reduce drift in pastures and rangeland include boomless sprayers which use very coarse or larger droplet sizes.

The ESA Workplan acknowledges the years of proposals and subsequently required application restrictions implanted to reduce spray drift, including windspeed restrictions, minimum droplet sizes, and release height restrictions. As the EPA proposes restrictions on aerial applications based on ecological risks, along with spray drift buffers near aquatic habitats and conservation areas, this will have significant impacts on U.S. farmland and subsequent crop production.

1. *Aerial Applications*
    - Eliminating or restricting the ability of growers to apply specific pesticides through aerial applications will essentially limit their use during certain times of the year and production scenarios. In many crops, there is a short time frame available to treat numerous acres due to adverse weather conditions, equipment and/or labor constraints.

- Aerial applications provide the opportunity to effectively treat more land quickly and efficiently, while avoiding saturated soils or other adverse conditions, and improving the potential of making a timely application to a correctly sized weed.

2. *Spray Drift Buffers*
    - Further clarification is needed to understand the following regarding implementing spray drift buffers near aquatic habitats or conservation areas:
        i. What is included in the buffered area? Is this area within the crop field or outside arable land?
        ii. Will established forest be eligible for inclusion within the 10-ft windbreak?

    - The use of drift reducing technology (drift reducing agents/adjuvants) and drift minimizing application nozzles has demonstrated the ability to significantly reduce pesticide particle drift leaving the treated site (Etheridge et al. 1999; Fiestsam et al. 2003; Johnson et al. 2006; Lund et al. 2000; McMullan 2009; Yates et al. 1976).

Additional Comments and Concerns

1. *Interpretation and Adherence to the Guidelines*
    - Many production acres utilize rented land, with a third party and not the landowner, conducting the farming operations. The USDA (2014) survey demonstrated that 40% of all farmland is rented or leased. Furthermore, many producers hire custom applicators to apply pesticide products. In these situations, who would be responsible for the expenses and for selecting the correct set of mitigation measures from the picklist, and maintaining, complying, and reporting on those mitigation measures?

2. *Modeling Data*
    - Decisions based on modeling, including the input parameters, continue to raise questions for Weed Science Society members. The concern is that these models are overly conservative:
        i. They are not biologically or statistically tested models. They are physical chemical equations designed by soil scientists that account for the parameters they consider important.
        ii. The models appear to not be supported by statistical analysis from multiple sites and soil types as would be expected with a biological or statistical model.
        iii. In general, many Weed Science Society scientists continue to struggle with understanding the models and the methods used to generate outputs. Developing a working group to better understand the process, the calculations, and the input parameters so our members can become better

partners in helping EPA and the Services make scientific decisions would be beneficial.

iv. It would be helpful to our members if the list of herbicides used to develop and validate the physical chemical equations of models were available. A better understanding of the chemical and physical input parameters could be used by Weed Science Society members to develop research plans to target mitigation practices that would further reduce pesticide runoff. The list of herbicides used to develop and validate the model could be posted to www.regulations.gov so that all interested parties could see them.

3. *Counties Becoming Islands of Habitat Destruction*
   - Habitat loss and the spread of invasive species are the greatest threats to biodiversity (Wilcove et al. 1998). Wilcove and others (1998) provided insight into the need to manage invasive weed species in supplementing the regulatory controls of the ESA. Duenas et al. (2018) found that invasive species negatively impacted 85 out of 116 endangered species reviewed in a metanalysis. In addition, invasive species cause an economic loss of $120 billion per year in addition to posing a risk to 42% of the T&E species in the US (Pimentel et al. 2005).

   - With prevention ranking as the first "reasonable and prudent alternative" (RPA) in the ESA, removing entire counties from labels could result in those counties becoming "islands of habitat destruction." This could occur due to the other surrounding counties being able to control their pests with the labeled pesticide products. The county with the prohibited pesticides would allow the noxious and invasive weeds and other invasive pests to migrate in due to lack of control measures in that county. The resulting habitat loss will be the exact opposite effect the ESA is trying to attain which is the recovery of T&E species and their critical habitat.

Herbicides are critical tools of agriculture and are essential to the production of food and fiber to meet the demands of a growing population. Any decision that impacts the ability of a grower to meet those needs, and one that limits weed management options must be considered very seriously. The members of the Weed Science Societies believe that science is the building block of all sustainable integrated weed management programs, and that science should be the basis for regulatory decisions. Our willingness to cooperate is strong, and so is our commitment to providing data to support these critical regulatory decisions.

Sincerely,

Dr. Carroll Moseley
President
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Dr. Brett Hartis
President
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Dr. Reid Smeda
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Dr. Wesley Everman
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Mr. Eric Castner
President
Southern Weed Science Society

Dr. Joel Felix
President
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p.s. If our members can be of assistance in any way, please contact:

Dr. Bill Chism, chair of WSSA's Endangered Species Act Committee at **301-351-3852**; or

Dr. Lee Van Wychen, WSSA's Executive Director of Science Policy at **202-746-4686**.

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