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Atrazine

Proposed Interim Registration Review Decision
Case Number 0062

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Approved by: _____

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I. INTRODUCTION

This document is the Environmental Protection Agency's (the EPA or the agency) Proposed Interim Registration Review Decision (PID) for atrazine (PC Code 080803, case 0062), and is being issued pursuant to 40 CFR §§ 155.56 and 155.58. A registration review decision is the agency's determination whether a pesticide continues to meet, or does not meet, the standard for registration in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). The agency may issue, when it determines it to be appropriate, an interim registration review decision before completing a registration review. Among other things, the interim registration review decision may require new risk mitigation measures, impose interim risk mitigation measures, identify data or information required to complete the review, and include schedules for submitting the required data, conducting the new risk assessment and completing the registration review. Additional information on atrazine, can be found in the EPA's public docket (EPA-HQ-OPP-2013-0266) at www.regulations.gov.

FIFRA, as amended by the Food Quality Protection Act (FQPA) of 1996, mandates the continuous review of existing pesticides. All pesticides distributed or sold in the United States must be registered by the EPA based on scientific data showing that they will not cause unreasonable risks to human health or to the environment when used as directed on product labeling. The registration review program is intended to make sure that, as the ability to assess and reduce risk evolves and as policies and practices change, all registered pesticides continue to meet the statutory standard of no unreasonable adverse effects. Changes in science, public policy, and pesticide use practices will occur over time. Through the registration review program, the agency periodically re-evaluates pesticides to make sure that as these changes occur, products in the marketplace can continue to be used safely. Information on this program is provided at http://www.epa.gov/pesticide-reevaluation. In 2006, the agency implemented the registration review program pursuant to FIFRA § 3(g) and will review each registered pesticide every 15 years to determine whether it continues to meet the FIFRA standard for registration.

The EPA is issuing a PID for atrazine so that it can (1) move forward with aspects of the registration review that are complete and (2) implement interim risk mitigation (see Appendices A and B). The agency is currently working with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively referred to as, "the Services") to develop methodologies for conducting national threatened and endangered (listed) species assessments for pesticides in accordance with the Endangered Species Act (ESA) § 7. Therefore, although the EPA has not yet fully evaluated risks to federally-listed species, the agency will complete its listed species assessment and any necessary consultation with the Services for atrazine prior to completing the atrazine registration review. Likewise, the agency will complete endocrine screening for atrazine, pursuant to the Federal Food, Drug, and Cosmetic Act (FFDCA) § 408(p), before completing registration review. See Appendices C and D, respectively, for additional information on the listed species assessment and the endocrine screening for the atrazine registration review.

Atrazine is an herbicide that can be used to control broadleaf and grassy weeds. Atrazine is a member of the chlorotriazine chemical class, which includes simazine and propazine along with the three following chlorinated metabolites: desethyl-s-atrazine (DEA), desisopropyl-s-atrazine (DIA), and diaminochlorotriazine (DACT). The EPA has determined that the chlorotriazines (triazines) and their three chlorinated metabolites share a common mechanism of toxicity, and as such, human health risks were assessed together through a triazine cumulative risk assessment for atrazine, simazine, propazine, and their chlorinated metabolites. Pesticide products containing atrazine are registered for use on several agricultural crops, with the highest use on corn, sorghum, and sugarcane. Additionally, atrazine products are registered for use on wheat, guava, macadamia nuts, and range grasses and for several non-agricultural use sites such as ornamentals, Christmas trees, and sod. There are also registered residential and recreational uses on turf such as on parks, golf courses, school grounds, or home lawns and for some commercial and industrial use sites. The first product containing atrazine was registered in 1958, and therefore atrazine was subject to reregistration. There are four technical registrants for atrazine products: Syngenta Crop Protection, LLC., ADAMA USA, Drexel Chemical Company, and Sipcam Agro USA, Inc.

This document is organized in five sections: the *Introduction*, which includes this summary and a summary of public comments and the EPA's responses; *Use and Usage*, which describes how and why atrazine is used and summarizes data on its use; *Scientific Assessments*, which summarizes the EPA's risk and benefits assessments, updates or revisions to previous risk assessments, and provides broader context with a discussion of risk characterization; the *Proposed Interim Registration Review Decision*, which describes the mitigation measures proposed to address risks of concern and the regulatory rationale for the EPA's PID; and, lastly, the *Next Steps and Timeline* for completion of this registration review.

A. Summary of Atrazine Registration Review

Pursuant to 40 CFR § 155.50, the EPA formally initiated registration review for atrazine with the opening of the registration review docket for the case. The following summary highlights the docket opening and other significant milestones that have occurred thus far during the registration review of atrazine.

- June 2013 - The *Atrazine Preliminary Work Plan* (PWP) (June 2013), *Atrazine, Propazine, and Simazine. Human Health Risk Scoping Document in Support of Registration Review* (June 2013), and *Addendum to the Problem Formulation for the Ecological Risk Assessment to be Conducted for the Registration Review of Atrazine* (May 2013) were posted to the docket for a 60-day public comment period.

- December 2013 - The *Final Work Plan* (FWP) for atrazine was issued. The agency received public comment on the PWP, but the comments did not result in changes to the risk assessment and data needs, or time frame of registration review activities. No data needs were identified in the PWP or FWP, therefore a generic data call-in (GDCI) was not issued prior to development of the draft risk assessments.

- June 2016 - The agency announced the availability of the *Refined Ecological Risk Assessment for Atrazine* and took public-comment for 120-days. During the public-comment period, the agency received approximately 80,000 public comments either supporting or opposing the continued registration of atrazine, and/or providing information about the use and benefits of atrazine for growers. Comments were submitted by individual citizens, the atrazine technical registrants, various trade organizations (e.g., agricultural growers and industry groups), and other non-governmental organizations. These comments and the agency's responses are summarized below.

  As a result of these comments and other considerations, the agency has reconsidered its risk assessment methodology used in the draft ecological risk assessment. For more information see Section I.C. *Regulatory Update Since Publication of the Draft Risk Assessments* of this PID and the *Regulatory Update on the Registration Review of Atrazine* (October 22, 2019), which is available in the public docket.

- July 2018 - The agency announced the availability of the *Atrazine. Draft Human Health Risk Assessment for Registration Review* and the *Chlorotriazines: Cumulative Human Health Risk Assessment - Atrazine, Propazine, and Simazine* and took public-comment for 120-days. During the public-comment period, the agency received over 58,300 comments, either supporting or opposing the continued registration and use of atrazine, and/or providing information about the use and benefits of atrazine for growers. Comments were submitted by individual citizens, the atrazine technical registrants, various trade organizations (e.g., agricultural growers and industry groups), and other non-governmental organizations. These comments and the agency's responses are summarized below. These comments did not change the risk assessments or registration review timeline for atrazine.

- December 2018 - A Generic Data Call-In (GDCI) for atrazine was issued for multiresidue data that were identified as a deficiency in the draft human health risk assessments. The required data are currently under development and due to be submitted to the agency by December 20, 2020.

- December 2019 - The agency completed the PID for atrazine and soon will announce its availability in the atrazine docket and open a 60-day public comment period. Along with the PID, the following documents will also be posted to the atrazine docket:

  - *Atrazine – Environmental Fate and Effects Division's Response to Public Comments*. November 25, 2019.
  - *Atrazine, Simazine, Propazine: Response to Public Comments on Registration Review Human Health Risk Assessments*. November 25, 2019.
  - *Atrazine and Simazine Use on Sweet Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807).* November 25, 2019.
  - *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)*. November 25, 2019.

- *Atrazine and Simazine Use on Field Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807).* November 25, 2019.
- *Atrazine in Sugarcane: Usage, Benefits, Impacts of Potential Mitigation, and Response to Comments; PC Code (080803)*. November 25, 2019.
- *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits*. November 25, 2019.

B. Summary of Public Comments on the Draft Risk Assessments and Agency Responses

During the 120-day public comment period for the *Refined Ecological Risk Assessment for Atrazine*, which opened on June 6, 2016 and closed on October 5, 2016, the agency received public comments from approximately 80,000 sources either supporting or opposing the continued registration of atrazine, and/or providing information about atrazine use/usage and benefits to growers. Most of the comments were part of mass mailer campaigns that provided general, non-substantive comments either in favor of or against continued registration of atrazine (approximately 1,900 for and 77,000 against atrazine use). Excluding the mass mailers, there were approximately 770 comments, of which approximately 450 were for and 320 against atrazine use. Of all the comments, approximately 120 were substantive in nature, either about the draft ecological risk assessment or its use/usage and benefits to growers.

During the public comment period for the *Atrazine. Draft Human Health Risk Assessment for Registration Review* and the *Chlorotriazines: Cumulative Human Health Risk Assessment - Atrazine, Propazine, and Simazine*, which opened on July 26, 2018 and closed on November 23, 2018, the agency received public comments from approximately 58,300 sources either supporting or opposing the continued registration and use of atrazine, and/or providing information about atrazine use/usage and benefits to growers. Most of these submissions (approximately 58,000) were part of one mass mailer campaign against continued registration of atrazine, which expressed general concerns about drinking water and potential endocrine effects. In addition to the mass mailer, there were approximately 180 unique comments of which approximately 130 were for and 50 were against atrazine use. Of these comments, approximately 27 were substantive in nature about the draft human health risk assessments, draft ecological risk assessment, and/or provided use/usage and benefits information.

During both comment periods, comments were received from individual citizens, the atrazine technical registrants, various trade organizations (e.g., agricultural growers and industry groups) and other non-governmental organizations. In general, comments in support of continued use and registration said atrazine is a valuable herbicide to farmers and the agricultural industry particularly for its use on corn and sorghum because it is effective, economical, and a well-studied pesticide. In general, commenters against continued registration of atrazine said they were concerned about atrazine detections in both public water systems and the ecosystem, and its classification as an endocrine disruptor.

Comments that are technical in nature and specific to the *Refined Ecological Risk Assessment for Atrazine* are addressed in the *Atrazine – Environmental Fate and Effects Division's Response to*

Public Comments. Technical comments related to the *Atrazine. Draft Human Health Risk Assessment for Registration Review* and the *Chlorotriazines: Cumulative Human Health Risk Assessment - Atrazine, Propazine, and Simazine* are addressed in the *Atrazine, Simazine, Propazine: Response to Public Comments on Registration Review Human Health Risk Assessments*. Comments related to atrazine use and usage, benefits, and potential impacts of mitigation and the agency's responses are addressed in the *Response to Comments, and Usage, Benefits, and Impacts of Potential Mitigation* memorandums for sweet corn, grain, sorghum, fallow areas, field corn, forestry, rights of way, turfgrass and nursery uses. These documents will be posted to the atrazine registration review docket (EPA-HQ-OPP-2013-0266). In addition to the comments noted above, the agency received one substantive comment of a general/regulatory nature from the Center for Biological Diversity, which is summarized below and accompanied by the agency's response. The agency thanks all commenters for their comments and has considered them in developing this PID.

As a result of comments on the draft ecological risk assessment and other considerations, the agency has reconsidered its risk assessment methodology used in the draft ecological risk assessment. For more information see Section I.C. *Regulatory Update Since Publication of the Draft Risk Assessments* of this PID, and the *Regulatory Update on the Registration Review of Atrazine* (October 22, 2019), available in the public docket. The comments did not change the draft human health risk assessments or registration review timeline for atrazine.

Comments Submitted by Center for Biological Diversity (Docket ID: EPA-HQ-OPP-2013-0266-0831 and EPA-HQ-OPP-2013-0266-1247)

Comment: CBD's comments focus on the EPA's duty to consult with the Services on the registration review of atrazine in accordance with the Endangered Species Act (ESA). The CBD comments mention various aspects of the risk assessment process, specifically use of the best available data, including all necessary data and studies, particularly to develop listed species risk assessments, and evaluation of effects on listed species and their designated critical habitat. CBD also expressed concern regarding the rigor of the agency's preliminary determinations regarding the effects of atrazine on listed species and their designated critical habitat for the atrazine registration review. In addition, CBD expressed concern about effects on pollinators and other beneficial insects, effects on human health or environmental safety concerning endocrine disruption, and any additive, cumulative or synergistic effects of the use of the pesticide.

EPA Response: The EPA has reviewed CBD's comments and plans to address many of the concerns regarding listed species as part of the implementation plan for assessing the risks of pesticides to listed species based on the recommendations of the April 2013 National Academy of Sciences (NAS) report. See Endangered Species Assessment in Appendix C of this document for more information. The EPA will address concerns specific to atrazine particularly with regard to pollinators, ESA, and endocrine disruption, in connection with the development of its final registration review decision for this pesticide. See Endocrine Disruptor Screening Program in Appendix D of this document for more information regarding endocrine disruption. The EPA is currently developing an agency policy on how to consider claims of synergy being made by registrants in their patents. The EPA intends to release this policy for public comment. After the agency has received and considered public comment on the proposed policy, and once that

policy has been finalized, the EPA will consider its implications on the EPA's final decision for atrazine.

C. Regulatory Update Since Publication of the Draft Risk Assessments

In response to significant public comments, concerns, and inherent uncertainty related to the data, assumptions, and interpretations used to arrive at the aquatic plant community-equivalent level of concern (CE-LOC) in the 2016 draft atrazine ecological risk assessment, the EPA has considered alternate approaches for inclusion, evaluating/scoring, and interpretation of the atrazine ecosystem and related studies (*e.g.*, mesocosm and microcosm studies). The agency acknowledges that differences in the interpretation of effects, scoring methodology, and splitting of functional groups can greatly influence the resulting CE-LOC. There are also sources of uncertainty inherent in the models used to calculate the CE-LOC. Utilizing the scoring and study exclusions recommended by the 2012 Science Advisory Panel (SAP)[1] for mesocosm and microcosm studies, and accounting for model sources of uncertainty, the resulting CE-LOC ranges from 1.9 to 26 µg/L with a median of 8.5 µg/L.

Given the complex nature of mesocosm and microcosm studies, the various protocols used in the conduct of these studies, the model uncertainty described in the 2016 risk assessment, the recommendation of the SAP, the potential for recovery of the aquatic plant community following exposure, and the high agricultural benefits provided by atrazine, the agency considers it appropriate to present a range of concentrations that accounts for these factors for risk management purposes under Registration Review. In view of the range of 1.9 to 26 µg/L, the agency believes it is reasonable to focus on the upper end of the range as recovery is more likely at lower concentrations. Therefore, for the purpose of determining the need for any potential regulatory action or mitigation to protect aquatic plant communities during Registration Review, EPA will use the concentration of 15 µg/L as a 60-day average, which is at the upper end of the distribution of values. For more information see the October 22, 2019, *Regulatory Update on the Registration Review of Atrazine* available in the public docket (EPA-HQ-OPP-2013-0266).

II. USE AND USAGE

Atrazine is a triazine herbicide with products registered for use for pre- and post-emergent control of broadleaf and grassy weeds. Products containing atrazine are registered for use on corn, sweet corn, sorghum, sugarcane, macadamia nuts, guava, fallow crop lands, conifers, Christmas tree farms, sod farms, ornamental grasses, ornamental plants, ornamental turf, outdoor residential lawns, school grounds, parks, playgrounds, and athletic fields, turfgrass on golf course fairways, conservation reserve program (CRP) areas, roadsides, rights-of way, airfields, vacant lots, lumber yards, agricultural buildings, industrial sites, and storage sites. Atrazine products containing greater than 4% active ingredient are restricted use pesticides (RUP), which can only be applied by certified applicators or those under their supervision.

[1] In June 2012, the EPA held a meeting of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panel (SAP) to review the agency's problem formulation for the environmental fate and ecological risk assessment for atrazine. During this SAP, the EPA presented a refined methodology for determining the magnitude and frequency of atrazine exposures below which significant changes in aquatic plant community structure, function and productivity are not expected. The agency also presented its review of atrazine studies with amphibians published in the open literature since 2007. (Docket ID EPA-HQ-OPP-2012-0230. https://www.regulations.gov/docket?D=EPA-HQ-OPP-2012-0230).

Atrazine products are registered in a variety of formulations, including granular, water dispersible granules, emulsifiable concentrates, flowable concentrates, soluble concentrate, ready-to use products, and water-soluble packages. Atrazine may also be applied to various field crops in dry bulk fertilizers (DBF). Atrazine products may be applied via groundboom sprayer, aircraft, tractor-drawn spreader, rights-of way sprayer, low pressure hand-wand, backpack sprayer, lawn handgun, push-type spreader, and hand-crank spreader.

An average of about 72 million pounds is used annually in agriculture. Three crops, corn, sorghum and sugarcane, account for over 98 percent of this use. Corn accounts for most of the use with approximately 59 to 64 million pounds applied annually. Annual use of atrazine on sorghum is estimated between 5.4 and 7.2 million pounds; annual sugarcane use is estimated between 1.6 and 2.6 million pounds; and annual sweet corn use is estimated around 300,000 pounds. Total usage has remained relatively constant over the past decade. Use rates per acre have decreased, while total acres treated with atrazine have remained relatively stable.

In 2013, the most recent year with data available for non-agricultural sites, thousands of pounds of atrazine were applied to various non-agricultural sites: nursery/ornamental (120,000 lbs), residential turfgrass (438,000 lbs), non-residential turfgrass (120,000 lbs), and forestry (53,000 lbs).

III. SCIENTIFIC ASSESSMENTS

A. Human Health Risks

A summary of the agency's human health risk assessments is presented below. The agency used the most current science policies and risk assessment methodologies to prepare a risk assessment in support of the registration review of atrazine. In addition, EPA has made a determination of a common mechanism of toxicity for atrazine, simazine, propazine, and their chlorinated metabolites; therefore, in addition to assessing potential risk from atrazine, EPA evaluated the potential cumulative risk from combined exposure to the chlorotriazines and their chloro metabolites. For additional details on the draft human health risk assessments, see the *Atrazine. Draft Human Health Risk Assessment for Registration Review* and the *Chlorotriazines: Cumulative Human Health Risk Assessment - Atrazine, Propazine, and Simazine*, which are available in the public docket.

For registration review, the predominant adverse health effect of concern for chlorotriazines is suppression of the luteinizing hormone (LH) surge leading to neuroendocrine effects. This effect was observed in rat studies after four days of exposure; therefore, potential risk was assessed using a 4-day duration of exposure rather than EPA's typical short- or intermediate-term duration of exposure. Disruptive hormonal effects related to LH surge are different for different age groups and sexes, and the downstream adverse effects vary considerably. Exposures during early life may lead to effects later in life including delays in sexual maturation, inflammation of the prostate, effects related to development of the genitalia, and/or irregular menstrual cycles. Therefore, this endpoint is applicable for males and females, and all life-stages.

For acute assessment for atrazine and its chlorinated metabolites, the toxicological endpoint is delayed ossification in fetuses and is only applicable to females 13-49 years old. For the 4-day assessment for atrazine and its chlorinated metabolites, the endpoint is attenuation of LH surge and is applicable to all life-stages.

The hydroxy metabolites of atrazine are major metabolites in plants but not in livestock. Dermal and inhalation exposures are not expected for the hydroxy metabolites of atrazine; however, chronic dietary exposures are expected. The chronic endpoint (kidney effects) is applicable to all life-stages.

1. Risk Summary and Characterization

Dietary (Food + Water) Risks

The EPA's dietary risk assessments did not identify any potential acute, 4-day, chronic, or cancer risks of concern associated with dietary exposure to atrazine and its chlorinated metabolites or to the hydroxy metabolites of atrazine. Atrazine has been classified as "not likely to be carcinogenic to humans"; therefore, a quantitative cancer dietary risk assessment was not conducted.

Residential Handler Risks

Atrazine products are registered for use on residential turf, however most atrazine product labels require the use of baseline attire (e.g., long-sleeved shirt/long pants) and/or additional personal protective equipment (PPE) and are assumed to be applied by professional applicators in residential settings. Some granular formulations do not require PPE on the labels, and therefore the residential handler assessment included only granular products. There are no residential handler combined (dermal + inhalation) risk estimates of concern for the registered uses of atrazine on residential turf.

Residential Post-Application Risks

Residential post-application exposure is expected via the dermal route for adults, children 11 to 16 years old, children 6 to 11 years old, and children 1 to < 2 years old; and via incidental oral exposure (i.e., hand-to-mouth or object to mouth) for children 1 to < 2 years old as a result of being in an environment that was previously treated with atrazine (e.g., lawns, golf courses, playgrounds, recreational areas, etc). Since dermal and incidental oral exposure routes share a common toxicological endpoint, risk estimates have been combined for those routes for children 1 to < 2 years old. Chemical-specific predicted day-0 turf transferrable residues were adjusted in the post-application assessment for any differences between the study application rate and the registered application rates for atrazine. Then, a 4-day average residue was used to estimate risk from contact with treated turf because the point of departure (POD) is based on decreased LH surge and available toxicity data indicate that the decrease occurs after a 4-day exposure. EPA's assessment of these exposure pathways demonstrated potential post-application risks of concern (i.e., Margins of Exposure (MOEs) below the level of concern (LOC) of 30) for children 1 to <2 years old from combined dermal and incidental oral exposure to residential turf that has been

treated with atrazine at the currently labeled maximum application rates for spray applications. For formulations applied as sprays to residential turf, the combined (dermal + incidental oral) MOE for children 1 to < 2 years old is 28 (LOC = 30) at the currently labeled maximum application rate of 2.0 lb ai/A. The combined (dermal + incidental oral) MOE for children 1 to < 2 years old for spray applications on residential turf is 57 (LOC=30) at 1.0 lb ai/A (the maximum allowed application rate for residential turf liquid formulations per the 2004 Memorandum of Agreement for Atrazine (2004 Atrazine MOA)[2], and therefore not of concern[3].

Non-Occupational Spray Drift Risks

In addition to potential exposure from application directly to residential lawns treated with atrazine, EPA assessed potential human exposure from off-target movement and deposition (i.e., spray drift) of atrazine. There are no bystander spray drift risks of concern for adults or children at the edge of a field treated with atrazine. In addition, there are no expected inhalation risks associated with bystander exposure.

Aggregate Risks

The EPA evaluated acute and 4-day aggregate exposure to atrazine and its chlorinated metabolites (DEA, DIA, and DACT), and chronic aggregate exposure to hydroxy metabolites of atrazine. The acute and chronic aggregate assessments include dietary (food-only) and drinking water. The 4-day aggregate assessment includes dietary (food-only), drinking water, and residential exposures.

The EPA used a drinking water level of comparison (DWLOC) approach to evaluate aggregate risk. This approach determines acceptable levels of exposure in the total "risk cup" for drinking water, after accounting for exposures from food/residential uses. DWLOCs are then compared to estimated drinking water concentrations (EDWC) to determine whether there are potential aggregate risk concerns once exposure from drinking water is added in. The DWLOC approach is useful when there are multiple EDWCs, as is the case for atrazine or when there are potential aggregate risk estimates of concern.

There were no acute risks of concern for atrazine and its chlorinated metabolites, and no chronic aggregate risks of concern for the hydroxy metabolites of atrazine. For the 4-day aggregate assessment, there are aggregate risks of concern for children at the maximum labeled spray application rate of 2.0 lb ai/A, but no aggregate risks of concern for adults or children from spray applications of atrazine to residential turf at the rate of 1.0 lb ai/A, which is the rate specified for liquid formulations in the 2004 Atrazine MOA.

[2] 2004 EPA Memorandum of Agreement Between the U.S. Environmental Protection Agency and Agan Chemical Manufacturing, Dow AgroSciences, Drexel Chemical, Oxon Italia S.P.A., and Syngenta Crop Protection Concerning the Registration of Products Containing Atrazine. 2004.

[3] Although there were no risks from the use of atrazine alone, atrazine, simazine, propazine, and their chlorinated metabolites (DEA, DIA, and DACT) have been determined by the agency to share a common neuroendocrine mechanism of toxicity. In the cumulative assessment (results summarized below), cumulative risks of concern were identified from the use of granular formulations of atrazine on residential turf at the maximum labeled rates (2.2 lb ai/A). There were no cumulative risks of concern if the granular formulation application rate is reduced from 2.2 lb ai/A to 2.0 lb ai/A.

Cumulative Risks

The EPA has determined that atrazine shares a common mechanism of toxicity (neuroendocrine effects in rats that can cause developmental and reproductive toxicity) with the other triazine herbicides, simazine and propazine, and their chlorinated metabolites (DEA, DIA, and DACT). EPA assessed cumulative risk from the triazines and their chlorinated metabolites in the July 10, 2018, *Chlorotriazines: Cumulative Risk Assessment - Atrazine, Propazine, and Simazine*, which is available in the public docket.

There were no risks of concern identified for the chlorotriazine 4-day cumulative dietary (food only) exposure and risk assessment, or for the 4-day dietary cumulative aggregate (food + drinking water) exposure and risk assessment. There were also no cumulative risks of concern for the chronic dietary (food only) or screening-level aggregate (food + drinking water) assessment for the hydroxytriazines.

However, there were some 4-day cumulative aggregate (food + drinking water + residential) exposures that resulted in risks of concern at the maximum labeled rates for atrazine granular formulations (2.2 lbs ai/A) applied to residential turf and at the maximum labeled rates for atrazine spray applications (2.0 lbs ai/A) applied to residential turf for children 1 to < 2 years old.

For atrazine residential turf granular formulations, the cumulative aggregate (food + residential) DWLOC is less than the EDWC of 585 µg/L and therefore is of concern. However, at the rate of 2.0 lbs ai/A for application of atrazine granular products to residential turf, there are no cumulative aggregate risks of concern (DWLOC = 670 µg/L).

In addition, there are cumulative aggregate risks of concern for residential turf spray applications at the maximum labeled rate of 2.0 lb ai/A, but no cumulative aggregate risks of concern for the residential turf spray applications of atrazine at the rate of 1.0 lb ai/A, which is the maximum allowed rate for residential turf liquid formulations specified in the 2004 Atrazine MOA.

Occupational Handler Risks

There is potential for occupational handler risk from combined dermal and inhalation exposure to atrazine. The EPA calculated risk estimates based on combined dermal and inhalation exposure for various levels of PPE: at currently label-specified PPE (i.e., long sleeves, pants and socks and chemical resistant gloves), and for scenarios that did not pass at currently label-specified PPE, MOEs were calculated assuming additional PPE or engineering controls (EC) that would be needed to result in risk estimates that are not of concern. The occupational handler scenarios listed below resulted in risk estimates with MOEs ranging from 2.3 to 820 (LOC = 30) assuming label-specified PPE:

- mixing and loading dry flowable/water dispersible granule formulations for aerial application to sorghum, conservation reserve program areas, and fallow;
- mixing and loading dry flowable/water dispersible granule formulations for groundboom applications to sugarcane, sorghum, corn, conservation reserve program areas, and fallow areas via;

- mixing and loading liquid formulations for aerial applications to corn, sorghum, winter weeds, conservation control program areas, fallow areas, and sugarcane;
- mixing and loading liquid formulations for impregnated dry bulk fertilizer application to corn, sorghum, sod, and bioenergy crops;
- mixing and loading water soluble packet formulations for aerial application to guava, sod, corn, sorghum, winter weeds, conservation reserve program areas, fallow areas, and sugarcane;
- applying spray formulations of atrazine via mechanically pressurized handguns to roadsides;
- mixing, loading and applying dry flowable/water dispersible granule, liquid, and water-soluble packet formulations using backpack spray equipment to macadamia nuts, conifers, and landscape turf;
- mixing, loading and applying dry flowable/water dispersible granule, liquid and water-soluble packet formulations using mechanically pressurized handguns to macadamia nuts, sweet corn, and guava; and
- loading and making broadcast spray applications of dry flowable/water dispersible granule, liquid and water-soluble packet formulations to roadsides using backpack spray equipment

Based on EPA's risk assessment, requirement of additional PPE eliminates potential risk for some but not all scenarios. The scenarios for which potential occupational risks of concern remain (*i.e.*, MOEs remain below the LOC of 30) assuming the highest possible level of PPE and/or engineering controls include:

- mixing and loading dry flowable/water dispersible granule formulations for aerial application to sorghum and conservation reserve program areas (MOE = 15 with engineering controls);
- mixing and loading liquid formulations for impregnated dry bulk fertilizer application (MOE = 21 with engineering controls) to corn, sorghum, sod, and bioenergy crops;
- mixing and loading water soluble packets for aerial application to guava (MOE = 26 with engineering controls), sod (MOE = 26 with engineering controls), corn, sorghum, winter weeds, conservation reserve program areas (MOEs = 15 with engineering controls), fallow areas (MOE = 14 with engineering controls), and sugarcane (MOE = 7.7 with engineering controls);
- applying sprays via mechanically pressurized handguns to roadsides (MOE = 7.4 with double layer, gloves and particulate filtering facepiece respirator (PF 10 respirator); EC not applicable);
- mixing, loading and applying dry flowable/water dispersible granule, liquid formulations to landscape turf (MOE = 23 with double layer, gloves and PF 10 respirator; EC not applicable) using backpack spray equipment;
- mixing, loading and applying dry flowable/water dispersible granule, liquid and water soluble packets formulations using mechanically pressurized handguns to macadamia nuts (MOE = 3.8 with double layer, gloves and PF 10 respirator; EC not applicable), sweet corn (MOE = 7.4 with double layer, gloves and PF 10 respirator; EC not applicable), and guava (MOE = 7.4 with double layer, gloves and PF 10 respirator; EC not applicable);

- loading and making broadcast applications of dry flowable/water dispersible granule and liquid formulations to roadsides using backpack spray equipment (MOE = 15 with double layer, gloves and particulate filtering facepiece respirator (PF10); EC not applicable).

The occupational handler exposure assessment relied on maximum registered application rates, generic handler data in absence of chemical-specific unit exposure data, and standard area and amount treated assumptions. Registered atrazine labels vary with respect to required attire and PPE. Liquid, dry flowable/water dispersible granule, and spray formulations were evaluated assuming baseline attire and chemical resistant gloves, the lowest amount of PPE consistently required on all registered labels evaluated, and any additional PPE or mitigation required to result in risk estimates not of concern. Granular formulations were evaluated assuming baseline attire and any additional PPE or mitigation required to result in risk estimates not of concern. WSP formulations were considered an engineering control.

For dry bulk fertilizer scenarios, the assessment assumed closed loading for mixing/loading and open cab spreading. The agency does not have data regarding the mixing/loading or the application of atrazine-impregnated dry bulk fertilizer. The mixing/loading processing rate for commercial impregnation of dry bulk fertilizer has been estimated to be 500 tons of fertilizer processed per 8-hour day based on information found on the registered atrazine labels. Application of dry bulk fertilizer was assessed assuming application to up to 320 acres/day for commercial equipment based on information supplied by a registrant concerning the chemical alachlor.

Occupational Post-Application Risks

Based on the EPA's draft human health risk assessment which used atrazine-specific dislodgeable foliar residue (DFR) and turf transferable residue (TTR) data, there are no occupational post-application risks of concern for the registered uses of atrazine on the day of application. The occupational post-application MOEs range from 41 to 1,100 (LOC = 30) on the day of application.

2. Human Incidents and Epidemiology

EPA amended and updated its Review of Human Incidents and Epidemiology for the triazine herbicides[4] on November 1, 2017. A search for atrazine was conducted using the following incident databases: OPP Incident Data System (IDS); the National Pesticide Information Center (NPIC); the California Pesticide Illness Surveillance Program (CA PISP); and the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (CDC/NIOSH) Sentinel Event Notification System for Occupational Risk-Pesticides (SENSOR) databases.

In the current IDS analysis, from January 1, 2012 to January 12, 2017, 84 incidents (29 in Main IDS, and 55 in Aggregate IDS) involving atrazine were reported. Of the 29 incidents in Main IDS, 13 were for atrazine only and the other 16 involved multiple active ingredients. Of the 13

[4] S. Recore *et. al*., D444041 11/01/2017

atrazine only incidents, only one was classified as major severity, 11 were classified as moderate severity, and one was minor severity. 54 of the 55 incidents in Aggregate IDS were minor severity, and one had no or unknown effects.

A query of NPIC incidents from 2012 to 2017 found 14 incidents involving atrazine. Of the 14 reported incidents, four were reported as symptomatic and classified as probably or possibly related to atrazine exposure and minor severity. Ten were reported as either inconsistent or unlikely due to atrazine exposure or asymptomatic and unclassifiable.

A query of CA PISP incidents from 2010 to 2014 found no incidents involving atrazine.

A query of SENSOR-Pesticides from 2010-2013 identified 28 cases involving atrazine. The details regarding the reported incidents from the various sources can be found in the 11/1/2017 document. Ten cases involved a single active ingredient and 18 cases involved multiple active ingredients. Three cases were moderate in severity and 25 cases were low in severity.

Given the low frequency and severity of incidents reported for atrazine, there does not appear to be a concern at this time. The agency will continue to monitor for atrazine incidents.

The Agricultural Health Study (AHS) findings and epidemiological investigations for atrazine are discussed in a separate document, which is in the atrazine registration review docket[5].

3. Tolerances

Tolerances for combined residues of atrazine and its three chlorinated metabolites are established in 40 CFR §180.220. The atrazine human health risk assessment recommended changes to various tolerance levels to conform with the agency's rounding practice (i.e., adding a trailing zero) at that time. Since the risk assessment was issued, the agency has decided to follow the OECD rounding class practice, which does not recommend adding a trailing zero.

EPA has reevaluated the tolerances for atrazine and its chlorinated metabolites in/on a variety of crops and livestock commodities and intends to propose to establish and remove tolerances for the commodities listed in Table 1, in accordance with the Organisation for Economic Co-operation and Development (OECD) Rounding Class Practice. The agency is proposing to revise tolerances for meat, milk, poultry, and eggs in order to harmonize with Canada's Pest Management Regulatory Agency (PMRA). In addition, based on modified label instructions concerning the PHI, EPA is proposing to lower the established tolerance for sweet corn forage from 15 ppm to 1.5 ppm. The agency is proposing the deletion and/or establishment of several new tolerances in accordance with new crop grouping. Finally, rotational crop studies support the establishment of a tolerance for "Vegetable, foliage of legume, group 7" at 0.5 ppm under 180.220(d).

[5] A. Aldridge, D447696, 07/09/2018

The U.S. and Canadian residue definitions for atrazine are harmonized for corn grain. Upon establishment of the recommended tolerances, the U.S. tolerances and PMRA MRLs for meat, milk, poultry, and eggs will be harmonized. Codex has not established atrazine MRLs for any commodity, so harmonization with Codex is not needed.

The agency recommends that the residue definition for the tolerance expression for atrazine be modified in accordance with current policy on tolerance definitions (S. Knizner, 5/27/2009), to read:

> *"Tolerances are established for residues of the herbicide atrazine, including its metabolites and degradates, in or on the commodities in the table below. Compliance with the tolerance levels specified below is to be determined by measuring only the sum of atrazine,6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine, its metabolites 2-amino-4-chloro-6-isopropylamino-s-triazine, 2-amino-4-chloro-6-ethylamino-s-triazine, and 2,4-diamino-6-chloro-s-triazine, calculated as the stoichiometric equivalent of atrazine, in or on the commodity."*

Table 1: Summary of Proposed Tolerance Revisions for Atrazine (40 CFR §180.220)

Commodity/ Correct Commodity Definition	Established Tolerance (ppm)	Proposed Tolerance (ppm)	Comments
40 CFR §180.220(a)			
Cattle, fat	0.02	0.04	Harmonizes with PMRA
Cattle, meat	0.02	0.04	
Cattle, meat byproducts	0.02	0.04	
Corn, field, grain	0.20	0.2	OECD rounding class consistency
Corn, pop, grain	0.20	0.2	
Corn, sweet, forage	15	1.5	Based on field trial data (D272009, C. Eiden, 16-APR-2002)
Corn, sweet, kernel plus cob with husks removed	0.20	0.2	OECD rounding class consistency
Corn, sweet, stover	2.0	2	
Egg	--	0.04	Harmonizes with PMRA
Goat, fat	0.02	0.04	
Goat, meat	0.02	0.04	
Goat, meat byproducts	0.02	0.04	
Grass, forage	4.0	4	OECD rounding class consistency
Grass, hay	4.0	4	
Hog, fat	--	0.04	Harmonizes with PMRA
Hog, meat	--	0.04	
Hog, meat byproducts	--	0.04	
Horse, fat	0.02	0.04	
Horse, meat	0.02	0.04	
Horse, meat byproducts	0.02	0.04	
Milk	0.02	0.04	
Nut, macadamia	0.20	0.2	OECD rounding class consistency

Table 1: Summary of Proposed Tolerance Revisions for Atrazine (40 CFR §180.220)			
Commodity/ Correct Commodity Definition	**Established Tolerance (ppm)**	**Proposed Tolerance (ppm)**	**Comments**
Poultry, fat	--	0.04	Harmonizes with PMRA
Poultry, meat	--	0.04	
Poultry, meat byproducts	--	0.04	
Sheep, fat	0.02	0.04	
Sheep, meat	0.02	0.04	
Sheep, meat byproducts	0.02	0.04	
Sorghum, grain, grain	0.20	0.2	OECD rounding class consistency
Sorghum, grain, stover	0.50	0.5	
Sugarcane, cane	0.20	0.2	
Wheat, grain	0.10	0.1	
Wheat, hay	5.0	5	
Wheat, straw	0.50	0.5	
40 CFR §180.220(d)			
Arugula	--	0.25	Commodity displaced by the crop group conversion
Celtuce	--	0.25	
Fennel, Florence, fresh leaves and stalk	--	0.25	
Garden cress	--	0.25	
Leaf petiole vegetable subgroup 22B	--	0.25	Crop group conversion/revision
Leafy greens subgroup 4-16A	--	0.25	
Vegetable, leafy, except brassica, group 4	0.25	remove	
Upland cress	--	0.25	Commodity displaced by the crop group conversion
Vegetable, foliage of legume, group 7	--	0.5	Based on field trial data (D391524, W. Donovan, 10-JUL-2018)

The agency will use its (FFDCA) rulemaking authority to undertake any needed tolerance changes.

4. Human Health Data Needs

The human health risk assessment identified multiresidue method testing results (OCSPP 860.1360) for the chlorinated metabolites of atrazine, desethylatrazine (DEA), desisopropylatrazine (DIA), and diaminochloroatrazine (DACT), as a data deficiency. These data are needed to determine the suitability of multiresidue methodology for quantification of atrazine and its regulated metabolites. On December 12, 2018, the agency issued a generic data call-in (GDCI) to requiring submission of these data; these data are under development and due to the agency by December 20, 2020.

B. Ecological Risks

A summary of the agency's ecological risk assessment is presented below. The agency used the most current science policies and risk assessment methodologies to prepare a risk assessment in support of the registration review of atrazine. For additional details on the ecological assessment for atrazine, see the *Revised Ecological Risk Assessment for Atrazine*, which is available in the public docket.

The EPA is currently working with its federal partners and other stakeholders to implement an interim approach for assessing potential risk to listed species and their designated critical habitats. Once the scientific methods necessary to complete risk assessments for listed species and their designated critical habitats are finalized, the agency will complete its endangered species assessment for atrazine. See Appendix C for more details. As such, potential risks for non-listed species only are described below.

1. Risk Summary and Characterization

The EPA estimated potential exposure and risks associated with atrazine use to non-target birds, mammals, reptiles and amphibians; terrestrial invertebrates, including honeybees and other insect pollinators; and plants. Risk estimates (risk quotients, or RQs) were compared with EPA's LOCs. For ecological risk, RQs below the LOC are not of concern to the agency. For all taxa in the terrestrial assessment, except for plants, the LOC for acute exposure is 0.5 and the LOC for chronic exposure is 1.0. The LOC for plants is 1.0. In the draft ecological risk assessment, the agency identified potential chronic risk concerns for mammals, birds, terrestrial phase amphibians, reptiles, and aquatic invertebrates. The draft risk assessment assessed the maximum-labeled, reduced, and typical application rates.

Terrestrial Risks

Mammals

The ecological risk assessment did not identify acute risks of concern for mammals; however, chronic risk estimates exceed the agency's LOC of 1 for the majority of scenarios modeled for all uses. Chronic RQs range from 0.1 to 198. The toxicity endpoint is based on reproductive endpoints associated with decreased body weight, body weight gain and food consumption. In addition, chronic LOCs for mammals are exceeded from 25 to 250 feet off the field depending on the maximum application rate.

Birds, Reptiles, and Terrestrial-Phase Amphibians

Acute and chronic LOCs (0.5 for acute exposure and 1 for chronic exposure) are exceeded for birds for many atrazine uses. Birds serve as surrogates for reptiles and terrestrial-phase amphibians in the absence of taxa-specific data. Acute RQs range from <0.01 to 3.41, and chronic RQs range from 0.2 to 23. The adverse effect upon which the acute endpoint is based is mortality, and the chronic endpoint is based on decreased hatchling weight observed in a mallard reproduction study. Higher tier models utilized in the risk assessment also suggest potential risk

concerns for sublethal effects on birds, which occur at lower exposures than levels where acute (mortality) effects were seen

EPA's Terrestrial Herpetofaunal Exposure Residue Program Simulation (T-HERPS) model was used to provide refined EECs and RQs for reptiles and terrestrial phase amphibians using bird toxicity data. Chronic RQ values exceeded the agency's LOC, with RQs ranging from 1.2 to 22.6.

Terrestrial Invertebrates (honeybees)

Available acute contact toxicity data indicate that atrazine is practically non-toxic to bees on an acute oral exposure basis. Additionally, based on EPA's pollinator guidance, the calculated RQ of 0.11 is below the agency's LOC of 0.4 for acute exposure. However, there is uncertainty about potential risks to terrestrial invertebrates because a full tier 1 suite of terrestrial invertebrate toxicity studies is not available at this time.

Additional data may be necessary to fully evaluate risks to non-target terrestrial invertebrates, especially pollinators. No data needs (including pollinator) were identified in the atrazine problem formulation (PF) or the FWP. However, the atrazine PF and FWP were completed prior to the EPA's issuance of the June 2014 *Guidance for Assessing Pesticide Risks to Bees*[6]. This 2014 guidance lists pollinator studies that were not included in the atrazine registration review DCI. Therefore, the EPA is currently determining whether additional pollinator data are needed for atrazine. If the agency determines that additional pollinator exposure and effects data are necessary to help make a final registration review decision for atrazine, then the EPA will issue a DCI to obtain these data. The pollinator studies that could be required are listed in **Error! Reference source not found.** below.

Table 2: Potential Pollinator Data Requirements	
Guideline #	**Study**
Tier 1	
850.3020	Acute contact toxicity study with adult honey bees
850.3030	Honey bee toxicity of residues on foliage
Non-Guideline (OECD 213)	Honey bee adult acute oral toxicity
Non-Guideline (OECD 237)	Honey bee larvae acute oral toxicity
Non-Guideline	Honey bee adult chronic oral toxicity
Non-Guideline	Honey bee larvae chronic oral toxicity
Tier 2†	
Non-Guideline	Field trial of residues in pollen and nectar
Non-Guideline (OECD 75)	Semi-field testing for pollinators
Tier 3†	
850.3040	Full-Field testing for pollinators

† The need for higher tier tests for pollinators will be determined based upon the results of lower tiered tests and/or other lines of evidence and the need for a refined pollinator risk assessment.

[6] Available at https://www.epa.gov/sites/production/files/2014-06/documents/pollinator_risk_assessment_guidance_06_19_14.pdf

Terrestrial Plants

Consistent with its herbicidal mode of action, atrazine is highly toxic to monocot and dicot terrestrial plant species. Non-target terrestrial plants species in areas adjacent to treated fields are likely to be impacted by exposure to atrazine. At the maximum single application rate, RQs associated with exposure via spray drift, as well as the combination of runoff and spray drift exposure to dry areas and semi-aquatic habitats exceed the LOC of 1.0. RQs for spray drift-only exposure range from 2.5 to 67, RQs for runoff and spray drift deposition to dry areas range from 7.5 to 93, and RQs for runoff and spray drift deposition to semi-aquatic areas range from 53 to 333. RQs resulting from ground spray applications result in lower potential drift concerns than those resulting from aerial applications; however, these, applications contribute equally to potential runoff concerns. The adverse effect endpoint is based on impacts to seedling emergence.

For characterization, EPA evaluated potential risks to terrestrial plants at reduced application rates and developed species vegetative vigor and seedling emergence sensitivity distributions (SSDs), however RQs still exceed the LOC for terrestrial plants.

Aquatic Risks

Aquatic-Phase Amphibians

EPA conducted a Weight of Evidence (WoE) analysis of the available literature on effects of atrazine to amphibians based on feedback from the 2012 Science Advisory Panel. The WoE analysis concluded that there is potential risk to amphibians because there is significant overlap of multiple effects endpoints and the EECs estimated with the modeling, as well as surface water monitoring results. Due to the variability in the reported amphibian endpoints, establishment of a definitive, quantitative RQ values were not calculated.

Freshwater and Estuarine/Marine Fish

EPA's chronic LOC of 1 is exceeded for freshwater and estuarine fish through runoff and spray drift deposition into waterways following labeled applications for all registered atrazine uses, with RQs ranging from 0.94 to 61. The chronic fish endpoint is based on decreased egg production in the freshwater Japanese medaka fish.

Aquatic Invertebrates

The ecological risk assessment did not identify acute risks of concern for freshwater invertebrates; however, chronic risk estimates exceed the agency's LOC of 1, with RQs ranging from 0.5 to 3.3. For estuarine/marine invertebrates, acute and chronic risk estimates exceed LOCs, with RQs ranging from 0.5 to 4.3 (acute) and 6.2 to 52 (chronic). The acute effects endpoint is based on mortality. The chronic effects endpoint is based on observed reduction in growth and survival, with juvenile estuarine/marine shrimp being the most sensitive aquatic invertebrate tested.

Aquatic Vascular and Non-Vascular Plants

Risk estimates exceed the agency's LOC for aquatic vascular and non-vascular plants for all uses, rates, and scenarios including refinements such as reduced application rates and soil incorporation. RQs range from 1.1 to 68.7 for vascular plants, and 5.2 to 316 for non-vascular plants. The effects endpoint is based on reductions in chlorophyll production.

Aquatic Plant Communities

In addition to evaluating the effects to aquatic plants for individual species, EPA evaluated the toxicity of atrazine to aquatic plant communities as a whole. Evaluation of aquatic plant communities includes the determination of whether atrazine concentrations in watersheds cause significant changes in structure, function, and productivity of that community that could potentially impact the food chain and ecosystem integrity. The focus on toxicity to the aquatic plant community is necessary to determine whether atrazine concentrations in watersheds are likely to cause significant changes in the overall aquatic plant community that would impact the food chain (e.g., reducing food for fish, invertebrates, and birds) and ecosystem integrity (e.g., erosion control and animal habitat). In this approach, single-species plant toxicity data and microcosm/mesocosm (cosm) studies have been used to determine what atrazine exposure patterns and concentrations that are likely to change the productivity, structure, and/or function of aquatic plant communities. From these data, a level of concern was developed, which, together with monitoring data, is used to identify watersheds where atrazine levels pose a concern for these communities. This level of concern is referred to as the Concentration Equivalent Level of Concern (CE-LOC). The level can be compared to 60-day average concentrations of atrazine to identify watersheds that warrant further attention.

In response to significant public comments, concerns, and inherent uncertainty related to the data, assumptions, and interpretations used to arrive at the aquatic plant CE-LOC in the 2016 draft atrazine ecological risk assessment, EPA has considered alternate approaches for inclusion, evaluating/scoring, and interpretation of the atrazine ecosystem and related studies. The agency acknowledges that differences in the interpretation of effects, scoring methodology, and splitting of functional groups can greatly influence the resulting CE-LOC. There are also sources of uncertainty inherent in the models used to calculate the CE-LOC. Utilizing the cosm scoring and study exclusions recommended by the 2012 SAP and accounting for model sources of uncertainty, the resulting CE-LOC ranges from 1.9 to 26 µg/L with a median of 8.5 µg/L. The range of values are presented in table, below.

Table 3: Description of the distribution of CELOC values (µg/L) based on SAP recommendations considering model uncertainties

	CELOC incorporating SAP suggestions on 11 cosm studies
Median	8.5
5th Percentile	4.6
25th Percentile	6.7
75th Percentile	10.9
95th Percentile	15.7
Range	1.9 to 26

Given the complex nature of mesocosm and microcosm studies, the various protocols used in the conduct of these studies, the model uncertainty described in the 2016 risk assessment, the recommendation of the SAP, the potential for recovery of the aquatic plant community following exposure, and the high agricultural benefits provided by atrazine, the Agency considers it appropriate to present a range of concentrations that accounts for these factors for risk management purposes under Registration Review.

In view of the range of 1.9 to 26 µg/L presented in Table 1, the Agency believes it is reasonable to focus on the upper end of the range as recovery is more likely at lower concentrations. For the purposes of determining the need for any potential mitigation to protect aquatic plant communities during Registration Review, EPA will use the concentration of 15 µg/L as a 60-day average, which is at the upper end of the distribution of values presented in Table 1.

For more details about EPA's decision to use the concentration of 15 µg/L as a 60-day average for the purposes of determining the need for any potential mitigation to protect aquatic plant communities during Registration Review, please see the *Regulatory Update on the Registration Review of Atrazine* (October 21, 2019) in the atrazine docket (EPA-HQ-OPP-2013-0266).

2. Ecological Incidents

As part of the refined ecological risk assessment, the Ecological Incident Information System (EIIS) and the Avian Incident Monitoring System (AIMS) were searched for incidents of adverse effects to wildlife, fish, invertebrates, and plants resulting from exposure to atrazine. The search reflects all reported incidents since the registration of atrazine through May 2015.

667 incidents were found in EIIS between 1970 and 2015. Most of these incidents involved damage to terrestrial plants, 48 involved aquatic animals, and 18 involved terrestrial animals. There were 23 incidents associated with aquatic or terrestrial animal kills. The presence of atrazine in water at levels high enough to cause effects was confirmed in 3 aquatic incidents, and there were 14 incidents in which atrazine's presence in water was not confirmed, but the timing of application correlated with the incident. In addition, 340 aggregate incidents have been reported to the agency through EIIS with dates ranging from 1995 to 2014). The AIMS database included 3 reports of bird incidents involving atrazine, which already captured in the EIIS database.

The agency will continue to monitor ecological incident information as it is reported to the agency. Detailed analyses of these incidents are conducted if reported information indicates concerns for risk to non-target organisms.

3. Ecological and Environmental Fate Data Needs

Except for the potential pollinator data requirements described previously, the ecological and environmental fate database for atrazine is complete.

C. Benefits Assessment

Atrazine is a chlorinated triazine herbicide and is classified as a Weed Science Society of America (WSSA) Group 5 herbicide. Atrazine is applied before or after the crop emerges (or, pre or post emergence) to prevent weeds from emerging and to control some small, emerged broadleaf and grass weeds. Atrazine is an important herbicide for warm-season grass crops, such as corn, sorghum, and sugarcane, because it is economical, has a flexible use pattern, has a long residual period, has good crop safety, and is highly effective against a broad spectrum of weeds. There are also similar benefits of atrazine in non-agricultural sites, e.g. turfgrass and nurseries/ornamentals.

FIELD CORN

On average, approximately 58% of field corn or 53.3 million acres are treated with 62.3 million pounds of atrazine per year. Corn acres in the Corn Belt (Illinois, Indiana, Iowa, Missouri, and Ohio) and the Northern Plains (Colorado, Nebraska, North Dakota, South Dakota) account for about 67% of atrazine usage in the United States. The majority of atrazine is applied before crop emergence (66%) and 99% is applied by ground equipment. On average, corn growers made 1.2 applications of atrazine per year, with the average single application rate of 0.95 pounds active ingredient per acre (lbs. a.i./acre).

If atrazine were not available to corn growers, pest control alternatives would vary by region, application timing and pest pressure. In the Corn Belt, likely alternatives include saflufenacil followed by a later application of 2,4-D, which is more than three times as expensive as a single application of atrazine. Applications after crop emergence may include a single application of tembotrione or a co-application of flumetsulam with acetochlor and halosulfuron. These options could increase costs three to seven times more than a single application of atrazine. Losses for the Corn Belt could range from $8 to $20 per acre or 4% to 9% of grower net operating revenue.

Similarly, in the Plains States, mesotrione alone or with saflufenacil could be used before crop emergence and is nearly three to six times more expensive than atrazine per acre. Post-emergent alternatives could include mesotrione with primisulfuron and cost six times as much per acre. For the Plains States, potential losses of $9 to $16 per acre or 17% to 32% of net operating revenue.

In the Southern States (Alabama, Delaware, Georgia, Maryland, North Carolina, South Carolina, Virginia, Arkansas, Louisiana, Mississippi, Tennessee), alternatives could include simazine or flumetsulam plus dimethenamid prior to crop emergence followed by an application of dicamba, with control costs being slightly more to more than double the cost of a single atrazine application. For post-emergent control in the Southern States, likely alternatives include ametryn and linuron, which could increase control costs by up to three times. Regionally, the Southern corn growing states could see the greatest impacts if atrazine is not available to growers. Losses to grower net operating revenue could range from $1 to $43 per acre or from 1% to as high as 40% of net operating revenues factoring in alternative costs and poor pest control resulting in potential yield loss.

For more information refer to *Atrazine and Simazine Use on Field Corn: Response to comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)* in the docket.

SORGHUM

On average, approximately 68% of sorghum acres, or 7 million acres, are treated with 6.4 million pounds of atrazine annually. Nationally, sorghum growers apply atrazine aerially on 77,200 acres (1.1% of atrazine treated acres) annually and nearly 99% is applied by ground equipment. Approximately 69% of atrazine is applied before crop emergence. On average, 40% sorghum acres are treated twice, with the average single application rate of 0.913 lbs. a.i./acre.

In the absence of atrazine, applications of mesotrione before crop emergence would likely provide similar level of weed control as atrazine. However, mesotrione is nearly two and a half times more expensive than atrazine, and grower net operating revenue would decrease 33% from $24/acre to $16/acre. If a postemergence application is required, growers would likely use prosulfuron at a $5/acre premium, further reducing net operating revenue to $11/acre, or a 54% loss. If a follow-up treatment is necessary to catch any emerging weeds, then dicamba would likely be used at an extra cost of $3/acre, further reducing grower net operating revenue to $8/acre, or a 67% loss.

For more information refer to *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)* in the docket.

SUGARCANE

Nearly all of the Florida sugarcane crop and about one-third of the Louisiana sugarcane crop are treated with atrazine. On average, two atrazine applications in Florida and one application in Louisiana are made in a year. In the absence of atrazine, Florida growers would likely apply one application of metribuzin followed by one application of ametryn or one application of metribuzin and one application of mesotrione. The cost increases from using these alternative weed control scenarios range from $5/acre to $11/acre, which represents a decrease of approximately 2 to 4% in grower net operating revenue. For Louisiana, growers would likely replace atrazine with an application of metribuzin or mesotrione resulting in an increase in cost of $8 to $13 per acre, which represents approximately 11 to 17% of grower net operating revenue.

For more information refer to *Atrazine in Sugarcane: Usage, Benefits, Impacts of Potential Mitigation, and Response to Comments; PC Code (080803)* in the docket.

SWEET CORN

On average, approximately 75% of sweet corn or 368,000 acres are treated with 303,000 pounds of atrazine. Growers in the North Central / Northeastern region account for a large percentage of atrazine usage (56%). Approximately two-thirds of atrazine is applied before crop emergence and 99% is applied by ground equipment.

In the absence of atrazine, farmers would likely apply a mix of herbicides, which would differ by region and by application timing. In the North Central / Northeast region, triazines may be replaced prior to crop emergence with mesotrione or simazine, which would increase herbicide costs by between $2 and $13 (a decrease in net operating revenue of 5-32% acre). In the Northwest, atrazine may be replaced with topramezone after crop emergence, which would increase herbicide costs by $13 per acre (a 32% decrease in net operating revenue). In the Southeast, either simazine or s-metolachlor and mesotrione could replace atrazine prior to or after crop emergence, which would increase herbicide costs by $2 and $27 per acre (equivalent to a net revenue decrease of 5-66%). Depending on whether the alternatives provide adequate weed control, growers in the Southeast may need to follow-up with herbicide applications that target emerged weeds, which could cost an additional $2 to $8 per acre, depending on the active ingredient selected.

Additionally, there may be yield losses if the level of pest control produced by atrazine cannot be achieved with an alternate selection of herbicides; assuming an 8% yield loss and constant prices, this could lead to a further decrease in gross revenue of up to $138 per acre. Yield loss is more likely in the Southeast due to the greater variety of pest pressure and lack of alternative active ingredients to target those pests.

For more information refer to *Atrazine and Simazine Use on Sweet Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)* in the docket.

FALLOW

For fallow systems to be successful, it is important to have a weed-free field so that weeds are not using water and that water is available for the crop planted the following year. Herbicides with residual activity, like atrazine, are important for this system because residual herbicides prevent weeds from emerging. Atrazine is the leading residual herbicide in fallow systems. On average, about 3% of fallow acres (1,140,800 acres) that receive herbicide applications are treated with atrazine. The average application rate is 0.867 lbs. a.i./acre. Of the acres treated with atrazine, less than 10,000 acres are treated aerially per year. The remaining applications are applied by ground. The majority of atrazine applications are made with liquid formulations.

For more information refer to *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)* in the docket.

TURFGRASS AND NURSERIES/ORNAMENTALS

Atrazine is effective, inexpensive, and requires little additional management input because its effectiveness and optimum timing are well understood after decades of usage by applicators in turfgrass and nursery/ornamental use sites. Atrazine was one of the top five herbicides used in terms of pounds applied in nursery/ornamental use sites. Atrazine is used to control annual grass and broadleaf weeds, both pre and post-emergence in these sites.

Turfgrass use of atrazine includes institutional uses (e.g., cemeteries, parks, and schools), golf courses, and residential lawns. Atrazine can only be used on warm season turfgrass species

without causing turf injury. Warm season species can be grown in the warm season region and the transition zone region of the United States. The turf category is the largest non-agricultural use in terms of pounds of atrazine used. Atrazine targets some of the top weeds in turf farms/sod with the cheapest price range (in terms of cost per acre for typical product rates) relative to other herbicides. Atrazine was estimated to be one of the top five herbicides impregnated on lawn fertilizers for use as a weed and feed product in the consumer/homeowner market. The Golf Course Superintendents Association of America said that atrazine was used at rates of 1.0 to 1.5 lbs ai/acre and the National Association of Landscape Professionals (institutional and home turf) said that their members use atrazine at 1.0 lb ai/acre.

For more information refer to *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits; PC Codes (080803 and 080807)* in the docket.

IV. PROPOSED INTERIM REGISTRATION REVIEW DECISION

A. Proposed Risk Mitigation and Regulatory Rationale

The EPA has identified potential human health risks of concern from cumulative aggregate exposure (food + drinking water + residential) associated with use of granular formulated atrazine products on residential turf, and to occupational handlers mixing, loading and applying atrazine for various use scenarios. In addition, atrazine use poses potential ecological risks to mammals, birds, reptiles, amphibians, fish, aquatic invertebrates, terrestrial plants, and aquatic plant communities.

The EPA is presenting the proposed mitigation by the risks to be addressed and then will discuss the expected impacts by use site unless otherwise noted. The intent is to clarify to which situations specific mitigation will apply and for each user group to determine how they will be impacted by all proposed mitigation. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

To address potential cumulative aggregate (food + drinking water + residential) risk concerns associated with the use of atrazine granular formulations on residential turf, the EPA is proposing to reduce the maximum single application rate of atrazine on residential turf for granular formulations from 2.2 to 2.0 lbs ai/A and from 2.0 to 1.0 lbs ai/A for spray formulations. The 2004 Atrazine MOA already specifies a maximum single application rate of 1.0 lb ai/A for residential turf liquid formulations, the proposed mitigation expands upon this to include all spray formulations for residential turf. To address potential occupational handler risk concerns identified for various atrazine use scenarios, the EPA is proposing to:

- require additional PPE and engineering controls for certain uses (see below for more details);
- restrict aerial applications to liquid formulations only and prohibit all other product formulation types (e.g., DF/WDG, WSP) from being applied by airplane;
- restrict the impregnation of dry bulk commercial fertilizer to 340 tons per worker per day for no more than 30 days per calendar year for use on corn, sorghum, bioenergy, and sod;

- require a minimum water volume of 87 gallons and additional PPE for mechanically pressurized handgun application to roadsides;
- restrict landscape turf application via backpack sprayer to spot treatments rather than broadcast spray; and
- prohibit application via mechanically pressurized handgun for macadamia nuts, sweet corn, and guava.

To address potential ecological risks of concern, the EPA is proposing to require mandatory spray drift reduction measures and label language for all atrazine labels. In addition, the EPA is proposing required product stewardship measures to be implemented by the atrazine technical registrants as part of a nation-wide atrazine stewardship program to ensure proper use of atrazine products. Collectively, these proposed mitigation measures and stewardship measures are expected to reduce overall ecological exposure and potential risk to non-target species.

In evaluating potential risk mitigation for atrazine, the EPA considered the risks, the benefits, and the use pattern. Although there are potential risks of concern associated with the use of atrazine, with the adoption of the mitigation measures discussed in this section, any remaining potential worker and/or ecological risks are outweighed by the benefits associated with use of atrazine.

The EPA is also proposing label changes to address herbicide resistance management, as well as other general labeling requirements for all atrazine products and uses, as applicable. The proposed label changes include but are not limited to, updated glove and respirator label language, a non-target organism advisory label statement, and standardized label directions for mixing/loading water-soluble packages, etc. For more information see Section IV.A.6. *Additional Proposed Label Changes*.

1. Residential Turf Rate Reduction

The human health chlorotriazine cumulative aggregate (food + drinking water + residential) risk assessment identified potential risks of concern for atrazine granular and spray use on residential turf. To mitigate potential cumulative aggregate risks of concern associated with atrazine granular residential turf use, the agency is proposing to reduce the maximum single application rate from 2.2 lbs ai/A to 2.0 lbs ai/A. To mitigate potential cumulative aggregate risks of concern associated with spray applications of atrazine to residential turf use, the agency is proposing to reduce the maximum single application rate from 2.0 lbs ai/A to 1.0 lbs ai/A, which is the maximum rate that is specified in the 2004 Atrazine MOA for liquid formulations to residential turf. There are no cumulative aggregate risks of concern if the residential turf maximum single application rates are reduced to 2.0 lbs ai/A for atrazine granular formulations and 1.0 lb ai/A for spray applications. See the simazine PID for proposed mitigation specific to simazine.

2. Occupational Handler Proposed Risk Mitigation for Various Use Scenarios

Require Additional Personal Protective Equipment (PPE)

Some use scenarios result in occupational handler risks of concern for workers who mix, load, and/or apply atrazine at currently label-specified PPE. The proposed requirement of additional PPE eliminates potential risk for some but not all scenarios. Potential worker risks are fully mitigated with the addition of PPE for the following scenarios and therefore, the EPA is proposing to require additional PPE for the following atrazine use scenarios. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

To address potential mixer/loader risks, propose requiring:

- Particulate Filtering Facepiece (in addition to currently labeled specified PPE of single layer clothing and gloves) for dry-flowable/water dispersible (DF/WDG) granular formulations for groundboom applications to corn, sorghum, conservation reserve program areas, fallow, and sugarcane. For uses covered by the Worker Protection Standard[7] (WPS) the associated respirator fit test, training, and medical evaluation will be needed. See *Respirator Requirement for Handlers* below for more information.
- Engineering Controls (e.g., closed mixing/loading system) for liquids for aerial applications to corn, sorghum, winter weed control, conservation reserve program areas, fallow, and sugarcane.

To address potential mixer/loader/applicator risks, propose requiring:

- Double Layer and Gloves for DF/WDG and water-soluble package (WSP) backpack spray applications to macadamia nuts and conifers
- Double Layer, Gloves, and Particulate Filtering Facepiece for WSP backpack spray applications to roadsides

Respirator Requirement for Atrazine Handlers

As mentioned above, to mitigate potential inhalation risk to occupational handlers, the agency is proposing requiring a respirator for certain uses and, for those pesticide uses covered by the Worker Protection Standard[7] (WPS), the associated fit test, training, and medical evaluation is required for the following:

- (Mixer/Loader) DF/WDG formulations for groundboom application to corn, sorghum, conservation reserve program areas, fallow, and sugarcane

The EPA has recently required fit testing, training, and medical evaluations[8] for all handlers who are required to wear respirators and whose work falls within the scope of the WPS.[9] If an

[7] 40 CFR 170
[8] Fit testing, training, and medical evaluations must be conducted according to OSHA regulations 29 CFR § 1910.134, 29 CFR § 1910.134(k)(1)(i) through(vi), and 29 CFR § 1910.134, respectively.
[9] 40 CFR 170 (see also Appendix A of Chapter 10 of the Label Review Manual, available at https://www.epa.gov/pesticide-registration/label-review-manual)[10] 29 CFR § 1910.134

atrazine handler currently does not have a respirator, an additional cost will be incurred by the handler or the handler's employer, which includes the cost of the respirator plus, for WPS-covered products, the cost for a respirator fit test, training, and medical exam. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

Respirator fit tests are currently required by the Occupational Safety and Health Administration (OSHA) for other occupational settings to ensure proper protection.[10]

The EPA acknowledges that requiring a respirator and the associated fit testing, training, and medical evaluation places a burden on handlers or employers. However, the proper fit and use of respirators is essential to accomplish the protections respirators are intended to provide. In estimating the inhalation risks, and the risk reduction associated with different respirators, the EPA's human health risk assessments assume National Institute for Occupational Safety and Health (NIOSH) protection factors (*i.e.*, respirators are used according to OSHA's standards). If the respirator does not fit properly, use of atrazine may cause unreasonable adverse effects on the pesticide handler.

Restrict Aerial Application to Liquid Formulations Only / Prohibit Aerial Application of All Other Formulation Types

To address potential mixer/loader risks associated with DF/WDG and WSP formulations for aerial application to corn, sorghum, conservation reserve programs, winter weed control, guava, sod, fallow and sugarcane, the EPA is proposing to restrict aerial application to liquid formulations across all registered uses. In other words, except for liquid formulations, the EPA is proposing to prohibit aerial application for products with all other formulation categories, such as DF/WDG and WSP.

Require Engineering Controls for Liquid Formulations Applied by Air at Rates Equal to or Greater than 2 lbs ai/A

To address potential mixer/loader risks, EPA is proposing to require closed mixing/loading transfer systems (engineering controls) of liquid formulations for all uses applied by air with maximum single application rates equal to or greater than 2 lbs ai/A. This will mitigate risks identified for corn, sorghum, conservation reserve programs, winter weed control, fallow, and sugarcane. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

Restrict Amount of Atrazine to be Impregnated into Dry Bulk Fertilizer per Worker per Day
In order to address potential mixer/loader risk for liquids for impregnated dry bulk fertilizer application (commercial), EPA is proposing to restrict the impregnation of dry bulk fertilizer for use on corn, sorghum, bioenergy, and sod to 340 tons per worker per day for no more than 30 days per calendar year. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

[10] 29 CFR § 1910.134

Minimum Water Volume in Handgun Spray Mixtures for Roadside Use

In order to address potential risks to workers applying atrazine to roadsides via mechanically pressurized handguns, EPA is proposing to require a minimum water volume of 87 gallons in the spray mixture be specified on the label for mechanically pressurized handgun application to roadsides. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

Restrict Landscape Turf Application via Backpack Spray to Spot Treatment + Require Additional PPE

In order to address potential mixer/loader/applicator risk associated with broadcast backpack spray application of atrazine to landscape turf, the EPA is proposing to restrict landscape turf application via backpack spray to spot treatments only and require double layer and gloves. In addition, per the 2004 Atrazine MOA, labels must be amended to reduce the maximum single application rate from 2.0 lb ai/A to 1.0 lb ai/A for residential turf liquid formulations. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

Prohibition of Mechanically Pressurized Handgun Application to Certain Crops

To address potential mixer/loader/applicator risk when applying atrazine to macadamia nuts, sweet corn, and guava via mechanically pressurized handgun, EPA is proposing to prohibit mechanically pressurized handgun application to these crops. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

3. Spray Drift Managment

The agency is proposing label changes to reduce off-target spray drift and establish a baseline level of protection against spray drift that is consistent across all atrazine products. Reducing spray drift will reduce the extent of environmental exposure and risk to non-target plants and animals. Although the agency is not making a complete endangered species finding at this time, these label changes are expected to reduce the extent of exposure and may reduce risk to listed species whose range and/or critical habitat co-occur with the use of atrazine.

The agency is proposing the following spray drift mitigation language to be included on all atrazine product labels for products applied by liquid spray application. The proposed spray drift language is intended to consist of mandatory, enforceable statements and supersedes any existing language already on product labels (either advisory or mandatory) covering the same topics. In addition to proposed mandatory mitigation language, the agency is proposing advisory language which allow atrazine registrants to standardize the language across atrazine product labels. Registrants must ensure that any existing advisory language left on labels does not contradict or modify the new mandatory spray drift statements proposed in this PID, once effective.

- Applicators must not spray during temperature inversions.
- For aerial applications, do not apply when wind speeds exceed 15 mph at the application site. If the windspeed is greater than 10 mph, the boom length must be 65% or less of the wingspan for fixed wing aircraft and 75% or less of the rotor diameter for helicopters. Otherwise, the boom length must be 75% or less of the wingspan for fixed-wing aircraft and 90% or less of the rotor diameter for helicopters.
- For aerial applications, if the windspeed is 10 miles per hour or less, applicators must use ½ swath displacement upwind at the downwind edge of the field. When the windspeed is between 11-15 miles per hour, applicators must use ¾ swath displacement upwind at the downwind edge of the field.
- For aerial applications, the release height must be no higher than 10 feet from the top of the crop canopy or ground, unless a greater application height is required for pilot safety.
- For groundboom applications, do not apply when wind speeds exceed 15 mph at the application site.
- For ground boom applications, apply with the release height no more than 4 feet above the ground or crop canopy.
- For ground and/or aerial applications, select nozzle and pressure that deliver medium or courser droplets as indicated in nozzle manufacturers' catalogues and in accordance with American Society of Agricultural & Biological Engineers Standard 572.1 (ASABE S572.1).

In addition to including the spray drift restrictions on atrazine labels, all references to volumetric mean diameter (VMD) information for spray droplets are proposed to be removed from all atrazine labels where such information currently appears. The proposed new language above, which cites ASABE S572.1, eliminates the need for VMD information.

For information about the impacts of the spray drift management proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

4. Non-target Advisory Statement

The agency is also proposing the addition of a non-target organism advisory statement. The protection of pollinating organisms is a priority for the agency. Risk to pollinators from the use of atrazine is uncertain. It is possible that pollinators may be exposed to atrazine from residues in pollen or nectar through spray drift. This may negatively impact forage and habitat of pollinators and other non-target organisms. It is the agency's goal to reduce spray drift whenever possible and to educate growers on the potential for indirect effects on the forage and habitat of pollinators and other non-target organisms. Therefore, the EPA is proposing non-target organism advisory language to be placed on atrazine labels to address this potential concern. The proposed statement is below.

> "NON-TARGET ORGANISM ADVISORY STATEMENT: This product is toxic to plants and may adversely impact the forage and habitat of non-target organisms, including pollinators, in areas adjacent to the treated site. Protect the forage and habitat of non-target organisms by following label directions intended to minimize spray drift."

5. Herbicide Resistance Management

On August 24, 2017, the EPA finalized a Pesticide Registration Notice (PRN) on herbicide resistance management.[11] Consistent with the Notice, the EPA is proposing the implementation of herbicide resistance measures for existing chemicals during registration review, and for new chemicals and new uses at the time of registration. In registration review, herbicide resistance elements will be included in every herbicide PID.

The development and spread of herbicide resistant weeds in agriculture is a widespread problem that has the potential to fundamentally change production practices in U.S. agriculture. While herbicide resistant weeds have been known since the 1950s, the number of species and their geographical extent, has been increasing rapidly. Currently there are over 250 weed species worldwide with confirmed herbicide resistance. In the United States, there are over 155 weed species with confirmed resistance to one or more herbicides.

Management of herbicide resistant weeds, both in mitigating established herbicide resistant weeds and in slowing or preventing the development of new herbicide resistant weeds, is a complex problem without a simple solution. Coordinated efforts of growers, agricultural extension, academic researcher, scientific societies, pesticide registrants, and state and federal agencies are required to address this problem.

The EPA is requiring measures for the pesticide registrants to provide growers and users with detailed information and recommendations to slow the development and spread of herbicide resistant weeds. This is part of a more holistic, proactive approach recommended by crop consultants, commodity organizations, professional/scientific societies, researchers, and the registrants themselves.

6. Additional Label Changes

In addition to the above-mentioned proposed mitigation, the EPA is also proposing the following label changes to address generic labeling requirements for all atrazine products and uses:

- *Label Statement Prohibiting Application of Atrazine and Propazine Products to the Same Sorghum Acre*: the EPA is proposing to add a statement to the application rate tables and "Directions for Use" sections of atrazine product labels prohibiting the application of atrazine and propazine products to the same sorghum acre. This is not a new requirement and is already on some labels, but placement is not uniform across labels and may not be apparent to users. The agency thinks that users frequently use rate tables; therefore, these changes are intended to make labels clearer for applicators.
- *Updated Glove and Respirator Label Language*: The agency is also proposing general label changes to update the glove and respirator statements currently on labels to be consistent with the Label Review Manual[12]. The proposed new glove and respirator language does not

[11] PRN 2017-2, "Guidance for Herbicide Resistance Management Labeling, Education, Training, and Stewardship". Available at https://www.epa.gov/pesticide-registration/pesticide-registration-notices-year
[12] https://www.epa.gov/pesticide-registration/label-review-manual

fundamentally change the personal protective equipment that workers need to use, and therefore should impose no impacts on users. For gloves, all statements that refer to the chemical resistance category selection chart are proposed to be removed from atrazine labels, as they might cause confusion for users. These statements are proposed to be replaced with specific chemical-resistant glove types, as appropriate. For information about the impacts of the proposed mitigation, please refer to Section IV.B, Expected Impacts of Proposed Mitigation.

- *Directions for Mixing/Loading Water Soluble Packages (WPS) Label Language*: see Appendix B

7. Atrazine Stewardship Program

In addition to the proposed mitigation measures outlined above, the EPA is proposing to require an atrazine stewardship program to be implemented by the technical registrants on a nationwide scale to highlight the proper use and handling of atrazine products. The proposed stewardship program would consist of educational and informational materials to be distributed to users at the point of sale of atrazine products, as well as being made available on the internet. Materials will be required to include information on atrazine label education, weed resistance management, vulnerable watersheds, and atrazine product knowledge.

B. Status of Atrazine Water Monitoring Programs and Proposed Changes

Two atrazine water monitoring programs, the Atrazine Monitoring Program (AMP) and the Atrazine Ecological Exposure Monitoring Program (AEEMP), were required through a 2004 Generic Data Call-In (GDCI-080803-20871) and the 2003 Atrazine Interim Reregistration Decision (IRED). The technical registrants agreed to conduct the AMP and AEEMP water monitoring programs through the 2004 Atrazine MOA[13]. The AMP monitors community drinking water systems (CWS), primarily in the midwest United States in areas of high atrazine use, to assesses atrazine levels in surface drinking water sources. The AMP is conducted in conjunction with a similar monitoring program for simazine. The AEEMP assesses atrazine levels in streams in watersheds that are exposed to atrazine runoff from corn and sorghum production (small streams, high atrazine use areas, and vulnerable soils).

The EPA recognizes that the totality of available triazine monitoring data, including data collected through the atrazine (AMP) and the AEEMP, is robust and comprehensive. The availability of robust monitoring data enabled the EPA to refine and characterize its draft human health and ecological risk assessments. While having monitoring data specific to community water systems is useful, given the conclusions of the 2018 draft triazine human health risk assessments, the EPA is proposing to discontinue the requirement for atrazine drinking water monitoring (the AMP). Model-estimated atrazine concentrations, as well as measured concentrations for community water systems are well below the drinking water level of concern (DWLOC). The vast majority of atrazine samples from the AMP show concentrations below 1

[13] 2004 EPA Memorandum of Agreement Between the U.S. Environmental Protection Agency and Agan Chemical Manufacturing, Dow AgroSciences, Drexel Chemical, Oxon Italia S.P.A., and Syngenta Crop Protection Concerning the Registration of Products Containing Atrazine. 2004.

ppb, while the highest atrazine concentration ever measured was 227 ppb, which is well below the triazine DWLOC of 580 ppb. Therefore, the agency does not see value in continuation of the AMP. For these reasons, EPA will suspend the requirements for the AMP for calendar year 2020, during which time the agency will accept and evaluate comments on the triazine PIDs and the proposal to permanently discontinue the AMP. After comments are evaluated, EPA will make a final decision about the future of the AMP.

Regarding the AEEMP program, the EPA's draft ecological risk assessment identified potential ecological risks from surface water exposure (i.e., estimated and measured concentrations) and has continued to show atrazine concentrations of potential ecological concern in the most vulnerable watersheds, even when stewardship programs are employed. Therefore, the EPA sees value in continuing the requirement for atrazine water monitoring (the AEEMP) in streams and watersheds that are exposed to atrazine runoff from corn and sorghum to monitor atrazine concentrations. 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. In the future, if access to current and relevant ecological water monitoring data were not available to the agency, the EPA would not be able to integrate it into risk assessment and would have to rely on model estimated concentrations. However, in continuing the AEEMP program, the EPA believes there is the potential to sample less frequently and still have a robust data set for use in future ecological risk assessment and risk management of atrazine. The EPA held a FIFRA Scientific Advisory Panel (SAP) in November 2019 to obtain feedback about tools and approaches to interpret pesticide monitoring data collected at less frequent sampling intervals. After obtaining feedback from the SAP, the agency will reconsider ways to update the current AEEMP that could lessen the burden associated with the current monitoring program while still providing valuable data for use in ecological risk assessment and management of atrazine.

C. Expected Impacts of Proposed Mitigation

The expected impacts of the proposed mitigation are presented below by use site unless otherwise noted. The intent is to help clarify to which situations specific mitigation apply and for each user group to determine how they will be impacted by all proposed mitigation. The agency encourages submission of comments about these and other possible impacts of the proposed mitigation measures. For more information see, *Atrazine and Simazine Use on Sweet Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)*; *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)*; *Atrazine and Simazine Use on Field Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)*; *Atrazine in Sugarcane: Usage, Benefits, Impacts of Potential Mitigation, and Response to Comments; PC Code (080803).* November 25, 2019; and *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits,* in the docket.

Impacts of Spray Drift Management

Given that spray drift language applies to all use sites, this category of mitigation is not addressed on an individual use site basis.

- *Impacts of Inversion Restriction*- This requirement could reduce the amount of time users have to apply triazines. Users may switch to other products that only have advisory language for this restriction if they encounter temperature inversions when needing to treat a field.

- *Impacts of the Percent of Usable Boom Length and Wind Speed Restrictions*- If this mitigation is adopted, there will be no impact on atrazine applications when boom length is 75% or less for fixed wing aircraft. However, flexibility will be increased by allowing applications to occur at reduce percentage of useable boom lengths (65% or less) but when wind speeds are greater than 10 mph and less than 15 mph. Given that applications with fixed wing aircraft were previously prohibited at wind speeds greater than 10 mph, this change would increase flexibility.

  For rotary aircraft, there would be a 15% increase in boom length when wind speeds are less than 10 mph, which could mean more area can be covered in less time. Additionally, there would be no reduction in boom length for applications made with helicopters when the wind speed is between 10 and 15 mph, which would provide greater flexibility for applicators given that aerial applications are not allowed above 10 mph.

  The agency has not assessed the impacts of windspeed restrictions for aerial applications and the requirement of a ½ swath displacement upwind at the downwind edge of the field.

- *Impacts of Establishing a Mandatory Maximum Spray Release Height Requirement for Ground Applications*- Spray release height is important to minimize overlap of spray from nozzles while maintaining proper coverage. The agency has determined that a maximum release height of 4-feet, allows adequate coverage for the majority of nozzles[14]. Therefore, the EPA does not anticipate any negative impacts to growers.

- *Impacts of Windspeed Restrictions for Ground Applications*- Wind conditions vary across the U.S. and wind speed restrictions could prevent timely applications of atrazine. Survey data[15] indicate that most applicators consider wind speed when making applications and typically apply at wind speeds of 15 mph or lower. However, there are situations when applicators will spray at wind speeds greater than 15 mph (less than 10 percent of survey respondents). Mandatory wind speed restrictions complicate weed and crop management by reducing the available time to make applications and make it more likely that a grower may need to alter weed control plans. Once the window of application passes for either the

[14] Tindall, K. and C. Hanson. 2018. Qualitative Benefits and Usage Assessment of Diflufenzopyr (PC Code 005108) and Diflufenzopyr-Sodium (PC Code 005107). Available at: https://www.regulations.gov/document?D=EPA-HQ-OPP-2011-0911-0022

[15] Bish, M. and K.W. Bradley. 2017. Survey of Missouri Pesticide Applicator Practices, Knowledge, and Perceptions. Weed Technology 31:165–177. Available at: https://weedscience.missouri.edu/Pesticide%20Applicator%20Knowledge_2017.pdf.

crop or weed, the weeds may be too large to be adequately controlled by atrazine, which could accelerate the development of resistance, or there may be phytotoxicity issues at the later crop stage, either of which could reduce yields. Alternatively, a grower may develop another weed control strategy. However, changing plans may be more costly given that a different, more expensive herbicide(s) may be used, or multiple applications needed to achieve the same level of weed control as atrazine. Additionally, growers are likely to incur higher costs if they hire a custom applicator or purchase additional spray equipment and hire additional personnel to operate the sprayers to make applications in a timely manner. If applications were not made in a timely manner, weed control could decline, leading to additional herbicide applications and/or yield losses.

- *Impacts of Droplet Size*- The agency is proposing a restriction on droplet size because coarser droplets have been demonstrated to decrease spray drift, and therefore, reduce potential risks to non-target species. Because chemical-specific data for the performance of droplet sizes is limited, EPA was not able to evaluate the effects of medium or coarser droplet sizes (as defined by ASABE S572.1) specifically for atrazine. Therefore, the EPA does not know the effect this requirement will have on the performance of atrazine across various use patterns, especially regarding tank mix partners that require a finer droplet size. In general, potential negative impacts to growers from requiring larger droplets could include reductions in efficacy, increased selection pressure for the evolution of herbicide resistance due to a decrease in lethal dose delivered to target weeds, increased application rates used by growers, increased costs associated with reduced yield, more herbicide applications, purchase of alternative products, or an inability to use tank mix or premix products. The EPA encourages comments on any potential impacts to growers from specifying a mandatory minimum droplet size on product labels.

  In addition to including the spray drift restrictions on atrazine labels, all references to volumetric mean diameter (VMD) information for spray droplets are proposed to be removed from all atrazine labels where such information currently appears. The proposed new language, which cites ASABE S572.1, eliminates the need for VMD information.

- *Impacts of Interaction of Individual Components of Spray Drift Mitigation*- The agency acknowledges the impacts of multiple mitigation measures could be compounded and further reduce the time in which applicators could apply herbicides. For instance, applicators may deal with wind restrictions by spraying early in the morning/late evenings when winds are calmer; however, temperature inversions are more likely to occur several hours before sunset and can persist until 1-2 hours after sunrise. As the window of application gets smaller, growers will be forced to switch to products without these restriction on short notice. Therefore, the alternative may be based on availability and not cost and/or performance, which could be costly and reduce weed control. Additionally, growers may have situations where a tank is loaded and ready to spray, but they are not able to spray due to prolonged weather conditions that prevent application due mandatory multi-layered restrictions. In rare situations, there could be scenarios where applicators cannot spray what is mixed in the tank for a long period of time and would need to dispose of a large quantity of mixed herbicides in order to switch to an alternative mixture. There

may be additional concerns (e.g., tank clean-out when products settle out) when a loaded tank sits hours, and possibly days.

Impacts of Mitigation by Use Site

FIELD CORN

Require a Particulate Filtering Facepiece for Groundboom Applications Using DF/WDG Formulations

The impact of the proposed respirator requirement is likely to be substantially lower for an atrazine handler who is already using a respirator because the handler or handler's employer uses other chemicals requiring a respirator in the production system or as part of the business (*i.e.*, the handler or employer will only incur the cost of purchasing filters for the respirator on a more frequent basis). Mixers and loaders who do not already have the appropriate equipment would have to purchase the requisite equipment themselves, hire a commercial firm to make applications, or use other herbicides, which could be more expensive. The agency does not know how many mixers and loaders currently have respirators. Additionally, pending implementation of the 2015 revised Worker Protection Standard rule, mixers and loaders would have to be fit-tested for use of respirators on a yearly basis. The agency previously estimated the cost of a respirator fit test to be about $180 per applicator per year, including fees and the time required to obtain the test.

In addition to potential monetary costs of respirators, the use of a respirator can reduce productivity of workers wearing a respirator, which could increase the time required to mix and load tanks, which could increase costs. Alternatively, applicators may choose to use a different, more expensive herbicide that does not require a respirator.

Engineering Controls for Aerial Applications at Rates Equal to or Greater than 2 Pounds Active Ingredient per Acre

Given that less than 1% of corn acres are treated with atrazine aerially nationally, and that application rates are on average, less than 2 lbs a.i. of atrazine per acre, the agency does not anticipate significant impacts. Additionally, contracted applicators likely have engineering controls[16] and the impacts of engineering control requirements would likely be small for situations where hired applicators are used.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations

Of the 1.5 million acres of corn treated aerially with atrazine, applicators prefer to use liquid formulation of atrazine on 99% of aerial acres treated, and DF/WDG/Soluable Granules (SG) formulations account for the remaining 1% of acres treated (approximately 9,000 acres). Because there are relatively few acres treated with these formulations the agency anticipates minimal impacts on growers.

[16] *2019 NAAA Aerial Application Industry Survey: Operators* reports that 10% of respondents never used a closed system; *NAAA Professional Operating* Guidelines recommends using closed systems to the maximum extent possible for mixing and loading.

Reduce the Amount of Dry-Bulk Commercial Fertilizer Impregnated
The current assumption is that 960 tons of dry bulk commercial fertilizer are treated in a day (EPA 2007). The agency is proposing limiting the amount of fertilizer that can be impregnated (at a rate of 20 lbs of atrazine per ton) in a day to 340 tons of fertilizer. The agency does not have any data on the use of the atrazine-impregnated fertilizer, but assumes its absence in extension guides, indicates this is an uncommon application method for atrazine. However, the agency is uncertain if this reduction would have negative impacts to growers. The EPA invites public comments to aid in determining what impact this could have on this practice.

Spray Drift
For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use on Field Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)* in the docket.

SORGHUM
Require a Particulate Filtering Facepiece for Groundboom Applications Using DF/WDG Formulations
The impact of the proposed respirator requirement is likely to be substantially lower for an atrazine handler who is already using a respirator because the handler or handler's employer uses other chemicals requiring a respirator in the production system or as part of the business (*i.e.*, the handler or employer will only incur the cost of purchasing filters for the respirator on a more frequent basis). Mixers and loaders who do not already have the appropriate equipment would have to purchase the requisite equipment themselves, hire a commercial firm to make applications, or use other herbicides, which could be more expensive. The agency does not know how many mixers and loaders currently have respirators. Additionally, pending implementation of the 2015 revised Worker Protection Standard rule, mixers and loaders would have to be fit-tested for use of respirators on a yearly basis. The agency previously estimated the cost of a respirator fit test to be about $180 per applicator per year, including fees and the time required to obtain the test.

In addition to potential monetary costs of respirators, the use of a respirator can reduce productivity of workers wearing a respirator, which could increase the time required to mix and load tanks, which could increase costs. Alternatively, applicators may choose to use a different, more expensive herbicide that does not require a respirator.

Engineering Controls for Aerial Applications at Rates Equal to and Greater than 2 Pounds Active Ingredient per Acre
Given that less than 2% of sorghum acres are treated with atrazine aerially nationally, and that application rates are on average, less than 2 lbs of atrazine per acre, the agency does not anticipate significant impacts to growers. Additionally, contracted applicators likely have

engineering controls[17] and the impacts of engineering control requirements would likely be small for situations where hired applicators are used.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations
Of the 77,000 acres of sorghum treated aerially with atrazine, applicators prefer to use liquid formulation of atrazine on 88% of aerial acres treated, and DF/WDG/SG formulations account for the remaining 12% (approximately 9,000 acres) of acres treated. Because there are relatively few acres treated with these formulations the agency anticipates minimal impacts to growers.

Reduce the Amount of Dry-Bulk Commercial Fertilizer Impregnated
The current assumption is that 960 tons of dry bulk commercial fertilizer are treated in a day (EPA 2007). The agency is proposing limiting the amount of fertilizer that can be impregnated (at a rate of 20 lbs of atrazine per ton) in a day to 340 tons of fertilizer. The agency does not have any data on the use of the atrazine-impregnated fertilizer, but assumes its absence in extension guides, indicates this is an uncommon application method for atrazine. However, the agency is uncertain if this reduction would have negative impacts to growers. The EPA invites public comments to aid in determining what impact this could have on this practice.

Spray Drift
For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)*
in the docket.

SUGARCANE
Require a Particulate Filtering Facepiece for Groundboom Applications Using DF/WDG Formulations
The impact of the proposed respirator requirement is likely to be substantially lower for an atrazine handler who is already using a respirator because the handler or handler's employer uses other chemicals requiring a respirator in the production system or as part of the business (*i.e.*, the handler or employer will only incur the cost of purchasing filters for the respirator on a more frequent basis). Mixers and loaders who do not already have the appropriate equipment would have to purchase the requisite equipment themselves, hire a commercial firm to make applications, or use other herbicides, which could be more expensive. The agency does not know how many mixers and loaders currently have respirators. Additionally, pending implementation of the 2015 revised Worker Protection Standard rule, mixers and loaders would have to be fit-tested for use of respirators on a yearly basis. The agency previously estimated the cost of a respirator fit test to be about $180 per applicator per year, including fees and the time required to obtain the test.

[17] *2019 NAAA Aerial Application Industry Survey: Operators* reports that 10% of respondents never used a closed system; *NAAA Professional Operating* Guidelines recommends using closed systems to the maximum extent possible for mixing and loading.

In addition to potential monetary costs of respirators, the use of a respirator can reduce productivity of workers wearing a respirator, which could increase the time required to mix and load tanks, which could increase costs. Alternatively, applicators may choose to use a different, more expensive herbicide that does not require a respirator.

Engineering Controls for Aerial Applications at Rates Equal to or Greater than 2 Pounds Active Ingredient per Acre
No impact is expected from this mitigation because there is no aerial use of atrazine reported on sugarcane.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations
No impact is expected from this mitigation because there is no aerial use of atrazine reported on sugarcane.

Spray Drift
For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine in Sugarcane: Usage, Benefits, Impacts of Potential Mitigation, and Response to Comments; PC Code (080803)* in the docket.

SWEET CORN
Engineering Controls for Aerial Applications at Rates Equal to or Greater than 2 Pounds Active Ingredient per Acre
Given that only 5% of atrazine sweet corn acres treated are by aerial application, and that application rates for are on average, less than 1 lb of atrazine per acre, the agency does not anticipate significant impacts to growers. Additionally, contracted applicators likely have engineering controls and the impacts of engineering control requirements would likely be small for situations where hired applicators are used.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations
Though the agency does not have data on the formulations applied aerially, data indicate that growers use liquid formulations of atrazine on approximately 84% of the acres treated and the remaining 16% are DF/WDG/SG formulations. Because there are relatively few acres treated by air with these formulations, the agency anticipates minimal impact to growers.

Prohibition of Mechanically Pressurized Handguns
The agency anticipates that mechanically pressurized handguns would be used for spot treatments to small areas, not for broadcast treatments over large acreages in sweet corn. In some instances, applicators may use a mechanically pressurized handgun attached to small ground boom sprayers to treat around an obstruction (e.g., telephone pole) or the perimeter of a field (e.g., fencerows). The growers who use mechanically pressurized handguns to make spot applications of triazines would either not make the applications and suffer any yield losses that may occur from poor weed control in areas normally spot treated; have to make a second application using a different application method; or choose a different herbicide(s) to treat the entire area, which may be more expensive and possibly less effective.

Spray Drift
For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use on Sweet Corn: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080807)* in the docket.

FALLOW
Require a Particulate Filtering Facepiece for Groundboom Applications Using DF/WDG Formulations
The impact of the proposed respirator requirement is likely to be substantially lower for an atrazine handler who is already using a respirator because the handler or handler's employer uses other chemicals requiring a respirator in the production system or as part of the business (*i.e.*, the handler or employer will only incur the cost of purchasing filters for the respirator on a more frequent basis). Mixers and loaders who do not already have the appropriate equipment would have to purchase the requisite equipment themselves, hire a commercial firm to make applications, or use other herbicides, which could be more expensive. The agency does not know how many mixers and loaders currently have respirators. Additionally, pending implementation of the 2015 revised Worker Protection Standard rule, mixers and loaders would have to be fit-tested for use of respirators on a yearly basis. The agency previously estimated the cost of a respirator fit test to be about $180 per applicator per year, including fees and the time required to obtain the test.

In addition to potential monetary costs of respirators, the use of a respirator can reduce productivity of workers wearing a respirator, which could increase the time required to mix and load tanks, which could increase costs. Alternatively, applicators may choose to use a different, more expensive herbicide that does not require a respirator.

Engineering Controls for Aerial Applications at Rates Equal to or Greater than 2 Pounds Active Ingredient per Acre
Of the fallow acres treated with atrazine, less than 1% are treated aerially per year. Additionally, application rates for are on average, less than 1 lb of atrazine per acre. Therefore, the agency does not anticipate significant impacts to growers. Additionally, contracted aerial applicators likely have engineering controls and the impacts of engineering control requirements would likely be small for situations where hired applicators are used.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations
As mentioned above, less than 1% of acres treated with atrazine are treated aerially. Of those acres, 84% of the treated acres are treated with the liquid formulation, and the remaining 16% is treated with DF/WDG/SG. Because there are relatively few acres treated with these formulations, the agency anticipates minimal impact.

Spray Drift
For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Propazine Use on Grain Sorghum and Fallow Areas: Response to Comments, Usage, Benefits, and Impacts of Potential Mitigation; PC Codes (080803 and 080808)*
in the docket.

ORCHARDS (GUAVA AND MACADAMIA NUTS)

Prohibition of Aerial Applications with DF/WDG/WSP Formulations

The agency does not have any pesticide usage data for these use sites but assumes impacts would be minimal given that other use sites prefer liquid applications. In addition, for the orchards sites for which there is usage data, simazine not atrazine is the triazine that is typically used. The EPA invites public comments to aid in determining what impact this could have on guava production.

Double-layers and Gloves for Macadamia Nuts

Requiring double-layer coveralls and gloves for users applying via backpack will not likely impact the overall use of atrazine since it is likely rarely applied via backpack. However, users who apply with backpack equipment, may incur some additional costs or burdens. For example, the use of a PPE (e.g., wearing double layers when applying pesticides) can reduce productivity of workers because of the physiological stress when working in high temperatures and/or humid conditions[18]. Workers may need to take more frequent breaks in certain situations than if extra PPE were not required. Individuals will respond differently depending on many factors, such as fitness level, hydration, acclimatization, etc. The requirement of additional PPE when individuals are applying atrazine with a backpack applicator could decrease productivity, which will increase the time required for an application to be made, and likely increase costs. Alternatively, applicators may choose to use a different herbicide, which could be more expensive and potentially less effective than atrazine.

Prohibition of Mechanically Pressurized Handguns for Macadamia Nuts and Guava

The agency does not have data on applications of atrazine made to these sites via mechanically pressurized handguns. This application method type is most likely used for spot treatments. It may also be used for strip or trunk to trunk spray treatments when making applications from a handgun sprayer that is attached to the groundboom sprayers. Most groundboom sprayers used in orchards and vineyards have booms smaller than those used in large-acreage row crops, and they may have attached handguns. The EPA invites public comments to aid in determining what impact this could have on guava production.

Spray Drift

For impacts of the spray drift mitigation see above.

TURF

For atrazine use on turfgrass sites, the agency is proposing potential mitigation for risks to human health and the environment including requiring application rate reductions of atrazine on residential turfgrass; requiring application rate reductions for applications made with

[18] O'Brien, C., L.A. Blanchard, B.S. Cadarette, T.L. Endrusick, X. Xu, L.G. Berglund, M.N. Sawka, and R.W. Hoyt. 2011. Methods of evaluating protective clothing relative to heat and cold stress: thermal manikin, biomedical modeling, and human testing. Journal of Occupational and Environmental Hygiene 8: 588-599.

mechanically pressurized handguns and backpack sprayers; reducing the amount of impregnated fertilizer treated in a day; and prohibiting aerial applications. The application rate reductions are not expected to severely impede use and aerial applications to turfgrass sites are not common. The agency does not have information on the impacts of limiting the amount of impregnated fertilizer treated in a day, but this is product type (herbicide impregnated on fertilizer) is a common one for atrazine. For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits PC Codes (080803 and 080807)* in the docket.

RIGHTS-OF-WAY

For rights-of-way sites, the agency is proposing potential mitigation for risks to human health and the environment from use of atrazine including requiring an application rate reduction, double layer clothes and gloves for backpack sprayers, and a particulate filtering facepiece for ground applications. For mechanically pressurized handguns, it is proposed that the application would be required to have a minimum of 87 gallons of spray solution per acre. In addition, the agency is considering prohibiting aerial applications to rights-of-ways. For droplet size, maximum spray release height, wind restrictions, temperature inversions the mitigations are similar to those listed for forestry use. Atrazine does not appear to be widely used in rights-of-way sites, so any potential mitigation proposed is not expected to have high impacts on weed control in rights-of-way. For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits; PC Codes (080803 and 080807)* in the docket.

NURSERY AND ORNAMENTALS

For nursery/ornamental sites, the agency is proposing potential mitigation for risks to human health and the environment from use of atrazine including restricting mechanically pressurized handguns to spot treatments only. It is expected that the primary use of mechanically pressurized handguns in these sites is for spot treatments, so this proposed mitigation is not expected to be impactful for users. For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits; PC Codes (080803 and 080807)* in the docket.

FORESTRY

For forestry use sites, the agency is proposing potential mitigation for risks to human health and the environment from the use of atrazine including requiring double layers of clothes for backpack applications and requiring respirators for ground applications of certain formulations. In addition, the agency is also proposing mitigation for aerial applications to these sites including requiring liquid formulations only, requiring engineering controls (e.g., closed systems for mixing/loading and modifying the boom width based on wind speed) and application rate reductions for certain formulations. All of the aforementioned proposed mitigation measures are

not expected to have high impacts on users. This is because these proposed mitigation measures only apply to certain formulations of atrazine (e.g., the requirement for respirators) or they align with current practices (e.g. typically using liquid formulations with aerial applications). For impacts of the spray drift mitigation see above.

For more information refer to *Atrazine and Simazine Use in Forestry, Rights of Way, Turfgrass, and Nursery: Response to Comments, Usage, and Benefits; PC Codes (080803 and 080807)* in the docket.

CONSERVATION RESERVE PROGRAM AND WINTER WEED CONTROL AREAS

Require a Particulate Filtering Facepiece for Groundboom Applications Using DF/WDG Formulations

The impact of the proposed respirator requirement is likely to be substantially lower for an atrazine handler who is already using a respirator because the handler or handler's employer uses other chemicals requiring a respirator in the production system or as part of the business (*i.e.*, the handler or employer will only incur the cost of purchasing filters for the respirator on a more frequent basis). Mixers and loaders who do not already have the appropriate equipment would have to purchase the requisite equipment themselves, hire a commercial firm to make applications, or use other herbicides, which could be more expensive. The agency does not know how many mixers and loaders currently have respirators. Additionally, pending implementation of the 2015 revised Worker Protection Standard rule, mixers and loaders would have to be fit-tested for use of respirators on a yearly basis. The agency previously estimated the cost of a respirator fit test to be about $180 per applicator per year, including fees and the time required to obtain the test.

In addition to potential monetary costs of respirators, the use of a respirator can reduce productivity of workers wearing a respirator, which could increase the time required to mix and load tanks, which could increase costs. Alternatively, applicators may choose to use a different, more expensive herbicide that does not require a respirator. For impacts of the spray drift mitigation see above.

Engineering Controls for Aerial Applications at Rates Greater than 2 Pounds Active Ingredient per Acre

The agency does not have any pesticide usage data for these use sites but assumes impacts would be similar to other use sites (i.e., minimal impact). The EPA invites public comments to aid in determining what impact this could have on this practice.

Prohibition of Aerial Applications with DF/WDG/WSP Formulations

The agency does not have any pesticide usage data for these use sites but assumes impacts would be similar to other use sites (i.e., minimal impact). The EPA invites public comments to aid in determining what impact this could have on this practice.

Spray Drift

For impacts of the spray drift mitigation see above.

BIOENERGY CROPS

Reduce the Amount of Dry-Bulk Commercial Fertilizer Impregnated

The current assumption is that 960 tons of dry bulk commercial fertilizer are treated in a day (EPA 2007). The agency is proposing limiting the amount of fertilizer that can be impregnated (at a rate of 20 lbs of atrazine per ton) in a day to 340 tons of fertilizer per day per worker. The agency does not have any data on the use of the atrazine-impregnated fertilizer, but assumes its absence in extension guides, indicates this is an uncommon application method for atrazine. However, the agency is uncertain if this reduction would have negative impacts to growers. The EPA invites public comments to aid in determining what impact this could have on this practice.

Spray Drift

For impacts of the spray drift mitigation see above.

D. Tolerance Actions

The EPA is proposing the establishment and revocation, as well as amendment of tolerances for several commodities. Refer to Section III.A.3 for details. The agency will use its FFDCA rulemaking authority to make the needed changes to the tolerances.

E. Proposed Interim Registration Review Decision

In accordance with 40 CFR §§ 155.56 and 155.58, the agency is issuing this PID. Except for the Endocrine Disruptor Screening Program (EDSP), the Endangered Species Act (ESA), and pollinator components of this case, the agency has made the following PID: (1) with the exception of the outstanding GDCI data requirements, no additional data are required at this time; and (2) changes to the affected registrations and their labeling are needed at this time, as described in Section IV.A and Appendices A and B.

In this PID, the agency is making no human health or environmental safety findings associated with the EDSP screening of atrazine, nor is it making a complete endangered species finding. Although the agency is not making a complete endangered species finding at this time, the proposed mitigation described in this document is expected to reduce the extent of environmental exposure and may reduce risk to listed species whose range and/or critical habitat co-occur with the use of atrazine. The agency's final registration review decision for atrazine will be dependent upon the result of the agency's ESA assessment and any needed § 7 consultation with the Services, and an EDSP FFDCA § 408(p) determination.

F. Data Requirements

On December 12, 2018, the EPA issued a generic data call-in (GDCI) requiring multiresidue method testing results (OCSPP Guideline 860.1360) for the chlorinated metabolites of atrazine [desethylatrazine (DEA), desisopropylatrazine (DIA), and diaminochloroatrazine (DACT)]; the data are required to be submitted to the agency by December 20, 2020. These data are needed to determine the suitability of multiresidue methodology for quantification of atrazine and its regulated metabolites.

The analytical reference standards for desisopropylatrazine (DIA) and diaminochloroatrazine (DACT) have expired and must be submitted to the EPA's National Pesticide Standards Repository (see https://www.epa.gov/pesticide-analytical-methods/national-pesticide-standard-repository).

No additional data are anticipated to be needed to be called-in for this registration review at this time. The EPA will consider requiring submission of pollinator data as a separate action.

V. NEXT STEPS AND TIMELINE

A. Proposed Interim Registration Review Decision

A Federal Register Notice will announce the availability of this PID for atrazine and will allow a 60-day comment period on the PID. If there are no significant comments or additional information submitted to the docket during the comment period that leads the agency to change its PID, the EPA may issue an interim registration review decision for atrazine. However, a final decision for atrazine may be issued without the agency having previously issued an interim decision. A final decision on the atrazine registration review case will occur after: (1) an EDSP FFDCA § 408(p) determination, and (2) an endangered species determination under the ESA and any needed § 7 consultation with the Services.

B. Implementation of Mitigation Measures

Once the Interim Registration Review Decision is issued, the atrazine registrants must submit amended labels that include the label changes described in Appendices A and B. The revised labels and requests for amendment of registrations must be submitted to the agency for review within 60 days following issuance of the Interim Registration Review Decision in the docket.

Appendix A: Summary of Proposed Actions for Atrazine

Registration Review Case#: 0062
PC Code: 080803
Chemical Type: Herbicide
Chemical Family: Triazine
Mode or Mechanism of Action: Group 5 - Inhibition of photosynthesis at photosystem II

Affected Population(s)	Source of Exposure	Route of Exposure	Duration of Exposure	Potential Risk(s) of Concern	Proposed Actions	Comment
• Children 1 to <2 years old	• Chlorotriazine cumulative aggregate exposure (food +water + residential post-application exposure to treated residential turf)	• Dietary (food) • Combined dermal and incidental oral (residential post-application to treated residential turf)	• 4-day and longer	• LH surge suppression	• Require rate reduction (atrazine residential turf granular formulations, from 2.2 lbs ai/A to 2.0 lbs ai/A)	
• Occupational handler (mixer/loader)	• Air (e.g., respirable particles at/on site while mixing/loading) • Residues (e.g., at /on site while mixing/loading)	• Combined dermal and inhalation	• 4-day and longer	• LH surge suppression	• Require additional PPE and/or EC for certain uses • Restrict aerial application to liquid formulations only • Restrict impregnation of dry bulk fertilizer for use in agricultural settings to 340 tons per worker per day	
• Occupational handler (mixer/loader/applicator)	• Air (e.g., respirable particles at/on site while mixing/ loading/ applying) • Residues (e.g., residues at/on site while mixing/ loading/ applying)	• Combined dermal and inhalation	• 4-days and longer	• LH surge suppression	• Require additional PPE for certain uses • Require a minimum water volume of 87 gallons in handgun spray mixtures for roadside use. • Restrict landscape turf application via backpack spray to spot treatments only and require additional PPE • Prohibit mechanically pressurized handgun application to macadamia nuts, sweet corn, and guava	
• Terrestrial Plants; Avian; Mammals; Terrestrial Invertebrates	• Aerial and ground applications	• Foliar absorption; consumption of food items with residues on treated field	• Acute, chronic	• Mortality and sublethal effects	• Require mandatory spay drift reduction measures/language	
• Fish; Aquatic Invertebrates; Aquatic Plants	• Run-off and spray drift	• Foliar absorption; consumption of food items with residues on treated field	• Acute, chronic	• Mortality and sublethal effects	• Require Atrazine Stewardship Program	

Appendix B: Proposed Labeling Changes for Atrazine Products

Description	Proposed Label Changes for Atrazine Products	Placement on Label
Aerial Application Prohibition	Restrict aerial application to liquid formulations only. For products applied by air remove all other formulation types from labels (e.g., dry flowable/water dispersable granular and water-soluble packages).	
Mechanically Pressurized Handgun Application Prohibition	Prohibit application via mechanically pressurized handguns to macadamia nuts, sweet corn, and guava and remove this application method (mechanically pressurized handguns) from product labels for these uses.	
Residential Turf Use Rate Reduction for Residential Turf	• Residential turf, granular formulations- reduce the single maximum application rate to 2.0 lbs ai/A • Residential turf, sprays- reduce the single maximum application rate to 1.0 lb ai/A	
Use Restrictions for Dry Bulk Fertilizer; Sorghum; Roadsides; and Landscape Turf	• Dry bulk fertilizer- Restrict the impregnation of dry bulk commercial fertilizer to 340 tons per worker per day for no more than 30 days per calendar year for use on corn, sorghum, bioenergy, and sod • Sorghum- Do not apply atrazine and propazine products to the same sorghum acre • Applications made by mechanical pressurized hand-guns to roadsides- Require a minimum water volume of 87 gallons in spray mixture • Applications made by backpack-spray to landscape turf- Restrict backpack application to spot treatments only	
Proposed Label Language for End Use Products		
Mechanism of Action Group Number	**Note to registrant:** • Include the name of the **ACTIVE INGREDIENT** in the first column • Include the word "**GROUP**" in the second column • Include the **MECHANISM OF ACTION CODE "5"** in the third column • Include the type of pesticide **"HERBICIDE"** in the fourth column. **Atrazine** | **GROUP** | **5** | **HERBICIDE**	Front Panel, upper right quadrant. All text should be black, bold face and all caps on a white background, except the mode of action code, which should be white, bold face and all caps on a black background; all text and columns should be surrounded by a black rectangle.
Label Statement prohibiting application of	Add the following language to all labels with sorghum uses: "Do not apply atrazine and propazine products to the same sorghum acre."	Directions for Use and under use rate tables

Description	Proposed Label Changes for Atrazine Products	Placement on Label
atrazine and simazine products to same sorghum acre, for all atrazine labels with sorghum uses		
Updated Gloves Statement	Update the glove statements to be consistent with Chapter 10 of the Label Review Manual	In the Personal Protective Equipment (PPE) within the Precautionary Statements and Agricultural Use Requirements, if applicable
Updated Respirator Language	[**Note to registrant**: If your end-use product only requires protection from particulates only (low volatility), use the following language:] "Wear a minimum of a NIOSH-approved particulate filtering facepiece respirator with any N*, R or P filter; OR a NIOSH-approved elastomeric particulate respirator with any N*, R or P filter; OR a NIOSH-approved powered air purifying respirator with HE filters." *Drop the "N" option if there is oil in the product's formulation and/or the product is labeled for mixing with oil-containing products. [**Note to registrant:** For respiratory protection from organic vapor and particulates (or aerosols), use the following language:] "Wear a minimum of a NIOSH-approved elastomeric half mask respirator with organic vapor (OV) cartridges and combination N*, R, or P filters; OR a NIOSH-approved gas mask with OV canisters; OR a NIOSH-approved powered air purifying respirator with OV cartridges and combination HE filters." [**Note to registrant:** For products requiring protection for organic vapor only, use the following language:] "Wear a minimum of a NIOSH-approved elastomeric half mask respirator with organic vapor (OV) cartridges; OR a NIOSH-approved full face respirator with OV cartridges; OR a gas mask with OV canisters; OR a powered air purifying respirator with OV cartridges." *Drop the "N" option if there is oil in the product's formulation and/or the product is labeled for mixing with oil-containing products.	In the Personal Protective Equipment (PPE) within the Precautionary Statements
Non-target Organism Advisory Statement	"NON-TARGET ORGANISM ADVISORY STATEMENT: This product is toxic to plants and may adversely impact the forage and habitat of non-target organisms, including pollinators, in areas adjacent to the treated site. Protect the forage and habitat of non-target organisms by following label directions intended to minimize spray drift."	Environmental Hazards

Description	Proposed Label Changes for Atrazine Products	Placement on Label
HERBICIDE RESISTANCE MANAGEMENT: Weed Resistance Management	Include resistance management label language for herbicides from PRN 2017-1 and PRN 2017-2 (https://www.epa.gov/pesticide-registration/pesticide-registration-notices-year)	Directions for Use, prior to directions for specific crops under the heading "WEED RESISTANCE-MANAGEMENT"
Additional Required Labelling Action- Applies to all products delivered via liquid spray applications	Remove information about volumetric mean diameter from all labels where such information currently appears.	Directions for Use
Directions for mixing/loading products packaged in water soluble bags	Instructions for Introducing Water Soluble Packages Directly into Spray tanks: "Soluble Packages (WSPs) are designed to dissolve in water. Agitation may be used, if necessary, to help dissolve the WSP. Failure to follow handling and mixing instructions can increase your exposure to the pesticide products in WSPs. WSPs, when used properly, qualify as a closed mixing/loading system under the Agricultural Worker Protection Standard [40 CFR 170.607(d)]. Handling Instructions Follow these steps when handling pesticide products in WSPs. 1.Mix in spray tank only. 2.Handle the WSP in a manner that protects package from breakage and/or unintended release of contents. If package is broken, put on PPE required for clean-up and then continue with mixing instructions. 3.Keep the WSP in outer packaging until just before use. 4.Keep the WSP dry prior to adding to the spray tank. 5.Handle with dry gloves and according to the label instructions for PPE. 6.Keep the WSP intact. Do not cut or puncture the WSP. 7.Reseal the WSP outer packaging to protect any unused WSP(s). Mixing Instructions Follow the steps below when mixing this product, including if it is tank-mixed with other pesticide products. If being tank-mixed, the mixing directions 1 through 9 below take precedence over the mixing directions of the other tank mix products. WSPs may, in some cases, be mixed with other pesticide products so long as the directions for use of all the pesticide product components do not conflict. Do not tank-mix this product with products that prohibit tank-mixing or have conflicting mixing directions.	Directions for Use

Description	Proposed Label Changes for Atrazine Products	Placement on Label
	1.If a basket or strainer is present in the tank hatch, remove prior to adding the WSP to the tank. 2.Fill tank with water to approximately one-third to one-half of the desired final volume of spray. 3.Stop adding water and stop any agitation. 4.Place intact/unopened WSP into the tank. 5.Do not spray water from a hose or fill pipe to break or dissolve the WSP. 6.Start mechanical and recirculation agitation from the bottom of tank without using any overhead recirculation, if possible. If overhead recirculation cannot be turned off, close the hatch before starting agitation. 7.Dissolving the WSP may take up to 5 minutes or longer, depending on water temperature, water hardness and intensity of agitation. 8.Stop agitation before tank lid is opened. 9.Open the lid to the tank, exercising caution to avoid contact with dusts or spray mix, to verify that the WSP has fully dissolved and the contents have been thoroughly mixed into the solution. 10.Do not add other allowed products or complete filling the tank until the bags have fully dissolved and pesticide is thoroughly mixed. 11.Once the WSP has fully dissolved and any other products have been added to the tank, resume filling the tank with water to the desired level, close the tank lid, and resume agitation. 12.Use the spray solution when mixing is complete. 13.Maintain agitation of the diluted pesticide mix during transport and application. 14.It is unlawful to use any registered pesticide, including WSPs, in a manner inconsistent with its label. ENGINEERING CONTROLS STATEMENT Water soluble packets, when used correctly, qualify as a closed mixing/loading system under the Worker Protection Standard [40 CFR 170.607(d)]. Mixers and loaders handling this product while it is enclosed in intact water-soluble packets may elect to wear reduced PPE of long-sleeved shirt, long pants, shoes, socks, a chemical-resistant apron, and chemical-resistant gloves. When reduced PPE is worn because a closed system is being used, handlers must be provided all PPE specified above for "applicators and other handlers" and have such PPE immediately available for use in an emergency, such as in case of a spill or equipment break-down."	
Spray Drift Management Application Restrictions for all products delivered via liquid spray application and allow aerial application	**"SPRAY DRIFT** **Aerial Applications**: • Do not release spray at a height greater than 10 ft above the ground or vegetative canopy, unless a greater application height is necessary for pilot safety. • Applicators are required to use a medium or coarser droplet size (ASABE S572.1). • If the windspeed is 10 miles per hour or less, applicators must use ½ swath displacement upwind at the downwind edge of the field. When the windspeed is between 11-15 miles per hour, applicators must use ¾ swath displacement upwind at the downwind edge of the field. • Do not apply when wind speeds exceed 15 mph at the application site. If the windspeed is greater than 10 mph, the boom length must be 65% or less of the wingspan for fixed wing aircraft and 75% or less of the rotor diameter	Directions for Use, in a box titled "Spray Drift" under the heading "Aerial Applications"

Description	Proposed Label Changes for Atrazine Products	Placement on Label
	for helicopters. Otherwise, the boom length must be 75% or less of the wingspan for fixed-wing aircraft and 90% or less of the rotor diameter for helicopters • Do not apply during temperature inversions."	
Spray Drift Management Application Restrictions for products that are applied as liquids and allow ground boom applications	**"SPRAY DRIFT** **Ground Boom Applications:** • User must only apply with the release height recommended by the manufacturer, but no more than 4 feet above the ground or crop canopy. • Applicators are required to use a medium or coarser droplet size (ASABE S572.1). • Do not apply when wind speeds exceed 15 miles per hour at the application site. • Do not apply during temperature inversions."	Directions for Use, in a box titled "Spray Drift" under the heading "Ground Boom Applications"
Spray Drift Management Application Restrictions for products that are applied as liquids and allow boom-less ground sprayer applications	**"SPRAY DRIFT** **Boomless Ground Applications:** • Applicators are required to use a medium or coarser droplet size (ASABE S572.1) for all applications. • Do not apply when wind speeds exceed 15 miles per hour at the application site. • Do not apply during temperature inversions.	Directions for Use, in a box titled "Spray Drift" under the heading "Boomless Applications"
Advisory Spray Drift Management Language for all products delivered via liquid spray application	**"SPRAY DRIFT ADVISORIES** THE APPLICATOR IS RESPONSIBLE FOR AVOIDING OFF-SITE SPRAY DRIFT. BE AWARE OF NEARBY NON-TARGET SITES AND ENVIRONMENTAL CONDITIONS. **IMPORTANCE OF DROPLET SIZE** An effective way to reduce spray drift is to apply large droplets. Use the largest droplets that provide target pest control. While applying larger droplets will reduce spray drift, the potential for drift will be greater if applications are made improperly or under unfavorable environmental conditions. **Controlling Droplet Size – Ground Boom** ***(note to registrants:*** *remove if ground boom is prohibited on product labels)*	Directions for Use, just below the Spray Drift box, under the heading "Spray Drift Advisories"

Description	Proposed Label Changes for Atrazine Products	Placement on Label
	• Volume - Increasing the spray volume so that larger droplets are produced will reduce spray drift. Use the highest practical spray volume for the application. If a greater spray volume is needed, consider using a nozzle with a higher flow rate. • Pressure - Use the lowest spray pressure recommended for the nozzle to produce the target spray volume and droplet size. • Spray Nozzle - Use a spray nozzle that is designed for the intended application. Consider using nozzles designed to reduce drift. **Controlling Droplet Size – Aircraft** ***(note to registrants:*** *remove if aerial application is prohibited on product labels)* • Adjust Nozzles - Follow nozzle manufacturers' recommendations for setting up nozzles. Generally, to reduce fine droplets, nozzles should be oriented parallel with the airflow in flight. **BOOM HEIGHT – Ground Boom** ***(note to registrants:*** *remove if ground boom is prohibited on product labels)* For ground equipment, the boom should remain level with the crop and have minimal bounce. **RELEASE HEIGHT - Aircraft** ***(note to registrants:*** *remove if aerial application is prohibited on product labels)* Higher release heights increase the potential for spray drift. **SHIELDED SPRAYERS** Shielding the boom or individual nozzles can reduce spray drift. Consider using shielded sprayers. Verify that the shields are not interfering with the uniform deposition of the spray on the target area. **TEMPERATURE AND HUMIDITY** When making applications in hot and dry conditions, use larger droplets to reduce effects of evaporation. **TEMPERATURE INVERSIONS** Drift potential is high during a temperature inversion. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. The presence of an inversion can be indicated by ground fog or by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing. Avoid applications during temperature inversions. **WIND** Drift potential generally increases with wind speed. AVOID APPLICATIONS DURING GUSTY WIND CONDITIONS. Applicators need to be familiar with local wind patterns and terrain that could affect spray drift."	

Description	Proposed Label Changes for Atrazine Products	Placement on Label
Advisory Spray Drift Management Language for products that are applied as liquids and allow boom-less ground sprayer applications	**"SPRAY DRIFT ADVISORIES** **Boomless Ground Applications:** Setting nozzles at the lowest effective height will help to reduce the potential for spray drift."	Directions for Use, just below the Spray Drift box, under the heading "Spray Drift Advisories"
Advisory Spray Drift Management Language for all products that allow liquid applications with handheld technologies	**"SPRAY DRIFT ADVISORIES** **Handheld Technology Applications:** • Take precautions to minimize spray drift."	Directions for Use, just below the Spray Drift box, under the heading "Spray Drift Advisories"

Appendix C: Endangered Species Assessment

This Appendix provides general background about the agency's assessment of risks from pesticides to endangered and threatened (listed) species under the Endangered Species Act. Additional background specific to atrazine appears at the conclusion of this Appendix.

In 2013, the EPA, along with the Fish and Wildlife Service (FWS), the National Marine Fisheries Service (NMFS), and the United States Department of Agriculture (USDA) released a summary of their joint Interim Approaches for assessing risks to endangered and threatened (listed) species from pesticides[19]. These Interim Approaches were developed jointly by the agencies in response to the National Academy of Sciences' (NAS) recommendations that discussed specific scientific and technical issues related to the development of pesticide risk assessments conducted on federally threatened and endangered species.

Since that time, EPA has conducted biological evaluations (BEs) on three pilot chemicals representing the first nationwide pesticide consultations. These initial consultations were pilots and were envisioned to be the start of an iterative process. The agencies are continuing to work to improve the consultation process. For example, advancements to the initial pilot interim methods have been proposed based on experience conducting the first three pilot BEs. Public input on those proposed revisions is currently being considered.

Also, a provision in the December 2018 Farm Bill included the establishment of a FIFRA Interagency Working Group to provide recommendations for improving the consultation process required under section 7 of the Endangered Species Act for pesticide registration and Registration Review and to increase opportunities for stakeholder input. This group includes representation from EPA, NMFS, FWS, USDA, and the Council on Environmental Quality (CEQ). Given this new law and that the first nationwide pesticide consultations were envisioned as pilots, the agencies are continuing to work collaboratively as consistent with the congressional intent of this new statutory provision. EPA has been tasked with a lead role on this group, and EPA hosted the first Principals Working Group meeting on June 6, 2019.

Given that the agencies are continuing to develop and work toward implementation of approaches to assess the potential risks of pesticides to listed species and their designated critical habitat, the ecological risk assessment supporting this PID for atrazine does not contain a complete ESA analysis that includes effects determinations for specific listed species or designated critical habitat. Although the EPA has not yet completed effects determinations for specific species or habitats, for this PID, the EPA's evaluation assumed, for all taxa of non-target wildlife and plants, that listed species and designated critical habitats may be present in the vicinity of the application of atrazine. This will allow the EPA to focus its future evaluations on the types of species where the potential for effects exists once the scientific methods being developed by the agencies have been fully vetted. Once that occurs, these methods will be applied to subsequent analyses for atrazine as part of completing this registration review.

[19] https://www.epa.gov/endangered-species/draft-revised-method-national-level-endangered-species-risk-assessment-process

Atrazine is one of the chemicals in stipulated partial settlement agreement in the case of Center for Biological Diversity et. al., v. United States Environmental Protection Agency et al., No. 3:11 cv 0293 (N.D. Cal.). Among other provisions, this agreement sets an August 14, 2021, deadline for EPA to complete nationwide ESA section 7(a)(2) effects determination for atrazine and, as appropriate, request initiation of any ESA section 7(a)(2) consultations with the Services that EPA may determine to be necessary as a result of those effects determinations.

Appendix D: Endocrine Disruptor Screening Program

As required by FIFRA and FFDCA, the EPA reviews numerous studies to assess potential adverse outcomes from exposure to chemicals. Collectively, these studies include acute, sub-chronic and chronic toxicity, including assessments of carcinogenicity, neurotoxicity, developmental, reproductive, and general or systemic toxicity. These studies include endpoints which may be susceptible to endocrine influence, including effects on endocrine target organ histopathology, organ weights, estrus cyclicity, sexual maturation, fertility, pregnancy rates, reproductive loss, and sex ratios in offspring. For ecological hazard assessments, the EPA evaluates acute tests and chronic studies that assess growth, developmental and reproductive effects in different taxonomic groups. As part of its most recent registration decision for atrazine, the EPA reviewed these data and selected the most sensitive endpoints for relevant risk assessment scenarios from the existing hazard database. However, as required by FFDCA § 408(p), atrazine is subject to the endocrine screening part of the Endocrine Disruptor Screening Program (EDSP).

The EPA has developed the EDSP to determine whether certain substances (including pesticide active and other ingredients) may have an effect in humans or wildlife similar to an effect produced by a "naturally occurring estrogen, or other such endocrine effects as the Administrator may designate." The EDSP employs a two-tiered approach to making the statutorily required determinations. Tier 1 consists of a battery of 11 screening assays to identify the potential of a chemical substance to interact with the estrogen, androgen, or thyroid (E, A, or T) hormonal systems. Chemicals that go through Tier 1 screening and are found to have the potential to interact with E, A, or T hormonal systems will proceed to the next stage of the EDSP where the EPA will determine which, if any, of the Tier 2 tests are necessary based on the available data. Tier 2 testing is designed to identify any adverse endocrine-related effects caused by the substance, and establish a dose-response relationship between the dose and the E, A, or T effect.

Under FFDCA § 408(p), the agency must screen all pesticide chemicals. Between October 2009 and February 2010, the EPA issued test orders/data call-ins for the first group of 67 chemicals, which contains 58 pesticide active ingredients and 9 inert ingredients. The agency has reviewed all of the assay data received for the List 1 chemicals and the conclusions of those reviews are available in the chemical-specific public dockets. Atrazine is on List 1 and the review conclusions are available in the atrazine public docket (see EPA-HQ-OPP-2013-0266). A second list of chemicals identified for EDSP screening was published on June 14, 2013,[20] and includes some pesticides scheduled for Registration Review and chemicals found in water. Neither of these lists should be construed as a list of known or likely endocrine disruptors. For further information on the status of the EDSP, the policies and procedures, the lists of chemicals, future lists, the test guidelines and the Tier 1 screening battery, please visit the EPA website.[21]

[20] See http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPPT-2009-0477-0074 for the final second list of chemicals.
[21] https://www.epa.gov/endocrine-disruption

In this PID, the EPA is making no human health or environmental safety findings associated with the EDSP screening of atrazine. Before completing this registration review, the agency will make an EDSP FFDCA § 408(p) determination.