Memorandum Supporting Final Decision to Approve Registration for the New Active Ingredient, Epyrifenacil

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I. INTRODUCTION

This memorandum presents the rationale to support the final decision of the U.S. Environmental Protection Agency (referred hereafter as EPA or the Agency) to register under Section 3(c)(5) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the new active ingredient (a.i.), epyrifenacil, for use on canola, field corn, soybean, wheat, and certain fallow lands and to maintain bare ground in non-crop areas.

Epyrifenacil (S-3100), ethyl 2-[[3-[2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2*H*)-pyrimidinyl]-4-fluorophenoxy]-2-pyridinyl]oxy]acetate, is a new a.i. that is proposed for use as a pre-plant burndown herbicide for agricultural use in canola, field corn, soybean, wheat, and fallow land (corn, soybean, and wheat), and for non-agricultural use on non-crop areas (including guard rails, above-ground pipelines, railroads and surrounding areas, parking and storage areas, airports, industrial areas, around farm buildings, fence rows, windbreaks, shelterbelts, road surfaces, and shoulders). Epyrifenacil is a uracil protoporphyrinogen oxidase (PPO) inhibiting herbicide; (Weed Science Society of America [WSSA] Group 14), that acts as a light-dependent peroxidizing herbicide (LDPH) by inhibiting PPO and causing the accumulation of oxygen free radicals that destroy plant cells. LDPH chemicals may exhibit enhanced toxicity in the presence of ultraviolet light. Epyrifenacil's three-ring chemical structure differs from most PPO inhibitor herbicides.

Valent U.S.A. LLC (Valent) proposed one technical, (S-3100 that contains 98.0% epyrifenacil), and two end-use products, S-3100 0.46 EC Herbicide (5.39% epyrifenacil) and V-10488 0.94 Herbicide (4.74% flumioxazin, 4.91% pyroxasulfone, and 1.09% epyrifenacil). S-3100 Technical Herbicide (EPA File Symbol 59639-EAL) is proposed for manufacturing or formulating into end-use products for agricultural uses on canola, field corn, soybean, wheat, fallow land (corn, soybean, and wheat), and non-crop areas. S-3100 0.46 EC Herbicide (EPA File Symbol 59639-EAE) is an emulsifiable-concentrate (EC) containing 0.46 pounds of epyrifenacil per gallon of product. V-10488 0.94 SE Herbicide (EPA file symbol 59639-EAG) is a suspoemulsion (SE) that contains 0.42 lb flumioxazin, 0.43 lb pyroxasulfone, and 0.10 lb epyrifenacil per gallon of product. Uses are summarized in Table 1. The proposed registrations 59639-EAL and 59639-EAE are epyrifenacil-only products, not combined with any other active ingredients, and 59639-EAG is formulated with epyrifenacil, flumioxazin, and pyroxasulfone.

II. REQUESTED ACTION

On January 25, 2022, the EPA received an application from Valent to register one technical (EPA Symbol 59639-EAL) and three end-use products (59639-EAU, 59639-EAE, and 59639-EAG) containing epyrifenacil (CAS Number 353292-31-6) for use on field corn, canola, soybean, wheat, and fallow land (corn, soybean, and wheat) and to maintain bare ground in non-crop areas (59639-EAU, a combo product containing epyrifenacil, was later withdrawn). Valent submitted a separate application for review by Health Canada's Pest Management Regulatory Agency (PMRA). Although not part of a formal joint review, EPA collaborated with PMRA during

the residue study reviews. In 2026, PMRA changed its name to the Pesticides Regulatory Directorate, but because this decision was nearly completed prior to that change both this and supporting documents refer to this organization as PMRA.

Under FIFRA Section 3(c)(4), EPA is required to notify the public when a request for registering a new active ingredient is made and allow a 30-day comment period. The EPA published a notice of receipt (NOR) on June 26, 2023, in the Federal Register on applications requesting registrations of epyrifenacil. In addition, the EPA published a notice of filing (NOF) on March 24, 2023, in the Federal Register announcing the receipt of the initial filing of a petition by Valent under the Federal Food, Drug, and Cosmetic Act (FFDCA) requesting the establishment of tolerance regulations for residues of epyrifenacil in/on canola, corn, soybean, and wheat. Each notice gave the public 30 days to review and comment. The public comment period for the NOR closed on July 26, 2023, with no comments received. The public comment period for the NOF closed on April 24, 2023 with no comments received. On November 3, 2025, EPA published the proposed decision to register epyrifenacil with a 30-day comment period. The comment period closed on December 3, 2025, with 67 comments received. For more information on the public comments refer to Section V. Public Comments or review the Response to Public Comments document posted to EPA-HQ-OPP-2022-0354.

On December 12, 2023, subsequent to the initial submission, the proposed multi-active ingredient (combo) end-use product 59639-EAU was voluntarily withdrawn by Valent.

III. USE PROFILE

Valent submitted two proposed end-use product labels, (59639-EAG (SE) and 59639-EAE (EC)), containing 1.09% a.i. (0.1 lb a.i./gal) and 5.39% a.i. (0.46 lb a.i./gal), respectively. The single maximum application rate for the combo product (69639-EAG) is 0.038 lb a.i./A for use in non-crop areas and 0.022 lb a.i./A for soybean, spring wheat, and fallow land (soybean and wheat). The single maximum application rate for the single-a.i. product, 59639-EAE, is 0.036 lb a.i./A for industrial non-crop areas, for high acreage field crops (field corn, soybean, wheat) and fallow seedbed (corn, soybean, wheat) and 0.018 lb a.i./A for canola including burndown. Epyrifenacil can be applied using several types of equipment including aerial, ground boom, and handheld (i.e., low-pressure hand wand, backpack, and high-pressure hand wand sprayers); however, chemigation is prohibited. Aerial applications are prohibited for non-agricultural uses. All proposed labels direct applicators and other handlers to wear “baseline” attire (i.e., long-sleeved shirt, long pants, shoes and socks, and no respirator), as well as personal protective equipment (PPE) consisting of chemical-resistant gloves. The restricted-entry interval (REI) listed on the proposed labels is 12 hours. **Table 1** provides a summary of the proposed use patterns for epyrifenacil.

Table 1. Summary of Directions for Proposed Uses of Epyrifenacil

Crop/Use Site	Application Method[1]	Max. # Apps/Year	Timing	Max. Single App Rate (lb a.i./A)[2]	Max. Annual App Rate (lb a.i./A)[2]	Use Directions and Restrictions
S-3100 0.46 EC Herbicide (5.39% Epyrifenacil) – 59639-EAE						
Canola	Broadcast soil; aerial; ground; handheld applications	1	Preplant (up to 7 days)	0.009/0.018	0.018	• Do not apply when weather conditions favor spray drift from treated areas. • Do not apply during low-level inversion conditions, including fog. • Observe all rotational intervals as listed on label. • Do not apply this product through any type of irrigation system.
Fallow land (corn, soybean, wheat)	Broadcast soil; aerial; ground; handheld applications	2	Apply in fall prior to spring planting	0.018/0.036	0.036	• Re-treatment interval (RTI) = 30 days • Do not apply to frozen or snow-covered soil. • Observe all rotational intervals as listed on label.
Field corn	Broadcast soil; aerial; ground; handheld applications	2	Preplant (up to 1 day), Apply as desiccate to corn stand prior to replanting	0.018/0.036	0.036	• RTI = 14 days • Do not apply when weather conditions favor spray drift from treated areas. • Do not apply during low-level inversion conditions, including fog. • Do not apply this product through any type of irrigation system. • Do not use in popcorn, sweet corn, or corn grown for seed. • Do not apply after crop has emerged.

Crop/Use Site	Application Method[1]	Max. # Apps/Year	Timing	Max. Single App Rate (lb a.i./A)[2]	Max. Annual App Rate (lb a.i./A)[2]	Use Directions and Restrictions
Soybean	Aerial, Boom (ground), Band (ground)	2	Postplant (up to 3 days)	0.018/0.036	0.036	• RTI = 14 days • Do not apply when weather conditions favor spray drift from treated areas. • Do not apply during low-level inversion conditions, including fog. • Do not apply this product through any type of irrigation system. • Do not apply after crop has emerged.
Wheat	Aerial, Boom (ground), Band (ground)	2	Preplant (up to 1 day)	0.018/0.036	0.036	• RTI = 14 days • Do not apply when weather conditions favor spray drift from treated areas. • Do not apply during low-level inversion conditions, including fog. • Do not apply this product through any type of irrigation system. • Do not apply after crop has emerged.
Non-crop areas (including guard rails, above-ground pipelines, railroads and surrounding areas, parking and storage areas, airports, industrial areas, around farm buildings, fence rows, windbreaks, shelterbelts, road surfaces, and shoulders)	Broadcast soil, Boom (ground), Band (ground)	1	Preemergent, burndown	0.036	0.036	• Do not apply aerially. • Do not apply when weather conditions favor spray drift from treated areas. • Do not apply during low-level inversion conditions, including fog. • Do not apply when soils are saturated or above field capacity. • Do not apply during rain. • Do not apply directly to water.
V-10488 0.94 SE Herbicide (epyrifenacil 1.09% a.i., flumioxazin 4.74% a.i., pyroxasulfone 4.91% a.i.) – 59639-EAG						
Soybean (including burndown)	Aerial, Boom (ground), Band (ground)	1	Preplant, Postplant (up to 3 days after)	0.022	0.022	• Do not graze treated soybean fields or feed treated forage or hay to livestock within 21 days of application. • Do not irrigate when soybeans are cracking.

Crop/Use Site	Application Method[1]	Max. # Apps/Year	Timing	Max. Single App Rate (lb a.i./A)[2]	Max. Annual App Rate (lb a.i./A)[2]	Use Directions and Restrictions
Wheat, spring (minimum and no-till)	Aerial, Boom (ground), Band (ground)	1	Preplant (up to 30 days)	0.022	0.022	• Do not use on durum wheat.
Fallow fields and postharvest uses associated with corn, soybean, and wheat production	Aerial, Boom (ground), Band (ground)	1	Fall prior to spring planting	0.022	0.022	• Observe all rotational intervals as listed on label.
Non-crop areas (including guard rails, above-ground pipelines, railroads and surrounding areas, parking and storage areas, airports, industrial areas, around farm buildings, fence rows, windbreaks, shelterbelts, road surfaces, and shoulders)	Broadcast soil, Boom (ground), Band (ground)	1	Preemergent, burndown	0.038	0.038	• Do not apply aerially. • Do not apply when soils are saturated or above field capacity. • Do not apply during rain. • Do not apply directly to water. • Do not rotate or feed crops after application to bare ground, non-crop areas. • Do not apply in enclosed greenhouse structures. • Do not apply when weather conditions favor spray drift from treated areas. • Do not incorporate into soil after application. • Do not apply to residential lawns, golf courses, or sod farms. • Do not apply to areas with adjacent non-dormant pome or stone fruit crops. • Do not apply this product through any type of irrigation system. • Do not apply with flood nozzles.

[1] Vocabulary: Broadcast is the uniform application of a pesticide or other material over an entire field or area; band is an application made to the furrow or trench in the soil which is opened for planting crop seeds.

[2] lb a.i./A is pounds of active ingredient per acre

IV. EVALUATION

In evaluating a pesticide registration application, the EPA assesses a wide variety of exposure (i.e., where and how the pesticide is used), environmental fate (i.e., persistence and mobility of the chemical in the environment) and toxicity (i.e., effects on humans and other non-target organisms) information to determine the likelihood of adverse effects (i.e., risk) from exposures associated with the proposed use of the product. Risk assessments are developed to evaluate the environmental fate of the compound as well as how it might affect a wide range of non-target organisms including humans and terrestrial and aquatic wildlife (plants and animals). In addition, a benefits assessment may be conducted.

When EPA grants a registration, FIFRA requires that the pesticide not cause "unreasonable adverse effects on the environment." This standard consists of two parts: the pesticide may neither cause an "unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide" nor, in the case of pesticide use resulting in residues in food and feed, cause a "human dietary risk" that is not safe.

Sections IV.A and IV.B describe the costs of the use of the pesticide in terms of the risk imposed by use of the pesticide on human health or the environment. These 'costs' of the use are a) measured using terms such as margins of exposure (MOEs) for human health and risk quotients (RQs) for ecological risks, b) can be described qualitatively, or c) may be described in both quantitative and qualitative terms. Risk assessments also describe who or what organism bears the identified risk. Section IV.D describes the benefits associated with the use of the pesticide. Benefit assessments use a weight of evidence approach to describe who will use the pesticide and how it will potentially improve outcomes (e.g., agricultural production, recreation, urban or residential aesthetics, or habitat restoration).

On the basis of these assessments, EPA evaluates and approves language for each pesticide label to ensure the directions for use are appropriate to mitigate potential risks to a level that they are not unreasonable. In this way, the pesticide label communicates essential limitations and mitigation that are necessary to avoid unreasonable adverse effects to the public and environment. It is a FIFRA violation to use a registered pesticide in a manner inconsistent with its labeling. Consistent with Endangered Species Act (ESA) Section 7(a)(2), EPA also assessed the potential effects of the proposed use of epyrifenacil on federally listed or proposed threatened or endangered (hereafter referred to as "listed") species and their designated or proposed critical habitats (CH).

A. Assessment of Risks to Human Health

The EPA requires a wide range of studies to assess a pesticide use scenario. For the proposed uses of epyrifenacil, the database of studies required to support the assessment of risk to human health is complete and adequate. EPA uses this complete database to make conclusions

regarding epyrifenacil and support the assessment of risk to human health. EPA has sufficient data to assess the hazards of and to make a determination on aggregate exposure for epyrifenacil including exposure resulting from the tolerances established by this action. EPA's assessment of exposures and risks associated with epyrifenacil can be found in the following sections.

This section summarizes EPA's *Epyrifenacil: Human Health Risk Assessment for the Section 3 Registration of the New Herbicide Active Ingredient Epyrifenacil on Field Corn, Canola, Soybean, Wheat, Fallow Land, Bare Ground, and Non-crop Areas.* The complete assessment can be found in docket ID number EPA-HQ-OPP-2022-0354 at https://www.regulations.gov/docket/EPA-HQ-OPP-2022-0354.

i. Toxicology Profile

Epyrifenacil is a uracil PPO-inhibiting herbicide and acts as a LDPH by inhibiting PPO and causing the accumulation of oxygen free radicals that destroy plant cells.

Repeated dose oral toxicity studies with epyrifenacil are available for rats, mice, and dogs. Across durations, the mouse was the most sensitive species, followed by the rat and then the dog. Male mice were more sensitive than female mice. The target organs/tissues identified following exposure to epyrifenacil were the liver and blood. Liver effects in mice and rats included an increase in liver weights, hepatocellular hypertrophy, and degeneration/necrosis. In blood, there is a mild decrease in red blood cell parameters resulting in secondary increased erythropoiesis in the bone marrow and increased extramedullary hematopoiesis in the spleen. Hematological changes, typically of a mild and adaptive nature, occurred at doses where more observable and notable liver-related effects were seen, highlighting the liver's heightened sensitivity as the primary/ target organ. In a subchronic (90-day) inhalation study in rats, adverse portal of entry effects included degenerative and inflammatory changes occurring in the upper respiratory tract (turbinates and pharynx). In a 28-day dermal toxicity study in rats, no adverse effects were observed in both sexes up to the limit dose (1000 mg/kg/day). Epyrifenacil showed no evidence of neurotoxicity in the available studies in rats. In vitro studies found no evidence of genotoxicity or mutagenicity for parent epyrifenacil or its metabolites. There is evidence of increased qualitative susceptibility in the two-generation reproductive toxicity study in rats. In a rat developmental study, adverse developmental toxicity (increased presence of supernumerary ribs in the cervical region) was observed at a higher dose than maternal toxicity.

The Food Quality Protection Act (FQPA) Safety Factor (SF) has been reduced to 1X because: (1) the toxicity database is adequate to characterize potential pre- and postnatal risk for infants and children; (2) although there were offspring and reproductive effects in the reproductive toxicity study, they occurred in the presence of parental toxicity; (3) there were developmental effects in the developmental study in rats; however, these effects occurred at doses above maternal toxicity; (4) there were no potential signs of neurotoxicity observed in the epyrifenacil database, including the acute neurotoxicity (ACN) or subchronic neurotoxicity (SCN) studies; (5)

clear NOAELs/LOAELs are established for the rat developmental and reproductive studies; and (6) the PODs selected for risk assessment purposes are protective of the developmental and offspring effects seen in the database. Based on a weight-of-evidence (WOE) approach, the Hazard and Science Policy Council (HASPOC) recommended to waive the immunotoxicity study (J. Hale, TXR #0058612, 07/31/2023). Epyrifenacil is classified as "not likely to be carcinogenic to humans below doses that induce hepatocellular injury" based on the acceptable tumorigenic MOA for liver tumors in male mice and no concern for mutagenicity. The chronic RfD approach is considered protective for any potential carcinogenicity following epyrifenacil exposure (C. Browning, TXR #0058629, 01-29-2024).

Epyrifenacil has low acute oral (Category III), dermal (Category III), and inhalation toxicity (Category IV). It is minimally irritating to the eye and skin (Category IV) and is not a skin sensitizer.

The end-use product (59639-EAE) has a moderate acute toxicity profile (Toxicity Category II) for primary eye irritation and primary dermal irritation. It has a moderate acute toxicity profile (Toxicity Category III) for acute oral toxicity and acute dermal routes. It has a low acute toxicity (Toxicity Category IV) for acute inhalation toxicity. The end-use product is not a dermal sensitizer. The signal word for the end-use product, S-3100 0.46 EC Herbicide, is Warning.

The end-use product (59639-EAG) has a moderate acute toxicity profile (Toxicity Category III) for primary eye irritation. It has a low acute toxicity (Toxicity Category IV) for acute oral toxicity, acute dermal routes, acute inhalation toxicity, and primary dermal sensitization. The signal word for the end-use product, V-10488 0.94 SE Herbicide, is Caution.

A summary of the points of departure (POD) and toxicological endpoints selected for human health risk assessments for epyrifenacil can be found in **Table 2** and **Table 3**. The acute dietary endpoint for females of childbearing age was selected from the developmental study based on supernumerary ribs in the cervical region. The chronic dietary endpoint was selected from the combined chronic/carcinogenicity study in mice based on increased incidence of centrilobular fibrosis in the liver in both sexes and increased incidence of karyocytomegaly and chronic centrilobular inflammation in males. The short- and intermediate-term adult oral endpoint was based on the subchronic oral toxicity based on increased SDH levels in both sexes; single cell degeneration/necrosis in both sexes; single cell necrosis/apoptosis in males; liver mixed cell infiltrates in females; and increased relative liver weight and hypertrophy in males.

Additionally, there were no adverse estrogen, androgen, or thyroid hormone-related effects observed for epyrifenacil, and the EPA has concluded that no additional estrogen, androgen, or thyroid data are needed at this time. For additional information, please see Appendix E of the human health risk assessment.

Table 2. Summary of Toxicological Doses and Endpoints for Epyrifenacil for Use in Dietary and Non-Occupational Human Health Risk Assessments.				
Exposure/ Scenario	**POD**	**Uncertainty /FQPA SFs**	**RfD, PAD, LOC for Risk Assessment**	**Study and Toxicological Effects**
Acute Dietary (Females 13-49)	NOAEL = 10 mg/kg/day	UF_A = 10X UF_H = 10X FQPA SF = 1X	Acute RfD = 0.6 mg/kg/day aPAD = 0.6 mg/kg/day	**MRID 51778780:** prenatal developmental in rats LOAEL = 200 mg/kg/day based on extra supernumerary ribs in the cervical region
Chronic Dietary (All Populations)	NOAEL = 0.1 mg/kg/day	UF_A = 10X UF_H = 10X FQPA SF = 1X	Chronic RfD = 0.001 mg/kg/day cPAD = 0.001 mg/kg/day	**MRID 51778783**: Combined chronic/carcinogenicity in mice LOAEL = 0.5 mg/kg/day based on liver centrilobular fibrosis (males and females), and karyocytomegaly and chronic centrilobular inflammation in males only
Incidental Oral/Adult Oral Short-and Intermediate-Term (1-30 days and 1-6 months)	NOAEL = 3.4 mg/kg/day	UF_A = 10X UF_H = 10X FQPA SF = 1X	Residential LOC for MOE = 100	**MRID 51778771**: 90 day oral toxicity in mice LOAEL = 14.3/14.8 mg/kg/day [M/F] based on increased SDH enzyme (M/F); single cell degeneration/necrosis (M/F); single cell necrosis/apoptosis (M); liver mixed cell infiltrates (F); increased relative liver weight and hepatocellular hypertrophy (M).
Dermal Short- and Intermediate-Term (1-30 days and 1-6 months)	NOAEL = 3.4 mg/kg/day DAF =5%	UF_A = 10X UF_H = 10X FQPA SF = 1X	Residential LOC for MOE = 100	**MRID 51778771**: 90 day oral toxicity in mice LOAEL = 14.3/14.8 mg/kg/day [M/F] based on increased SDH (M/F); single cell degeneration/necrosis (M/F); single cell necrosis/apoptosis (M); liver mixed cell infiltrates (F); increased relative liver weight and hepatocellular hypertrophy (M)
Inhalation Short- and Intermediate-Term (1-30 days and 1-6 months)	NOAEL = 3.4 mg/kg/day DAF =5%	UF_A = 10X UF_H = 10X FQPA SF = 1X	Residential LOC for MOE = 100	**MRID 51778771**: 90 day oral toxicity in mice LOAEL = 14.3/14.8 mg/kg/day [M/F] based on increased SDH (M/F); single cell degeneration/necrosis (M/F); single cell necrosis/apoptosis (M); liver mixed cell infiltrates (F); increased relative liver weight and hepatocellular hypertrophy (M)
Cancer (oral, dermal, inhalation)	Classification: "Not Likely to be Carcinogenic to Humans"; therefore, a cancer risk assessment is not required.			

Point of departure (POD) = A data point or an estimated point that is derived from observed dose-response data and used to mark the beginning of extrapolation to determine risk associated with lower environmentally relevant human exposures. NOAEL = no-observed adverse-effect level. LOAEL = lowest-observed adverse-effect level. UF = uncertainty factor. UF_A = extrapolation from animal to human (interspecies). UF_H = potential variation in sensitivity among members of the

human population (intraspecies). FQPA SF = FQPA Safety Factor. PAD = population-adjusted dose (a = acute, c = chronic). RfD = reference dose. DAF = dermal-absorption factor. MOE = margin of exposure. LOC = level of concern. SD = Sprague Dawley rat.

Table 3. Summary of Toxicological Doses and Endpoints for Epyrifenacil for Use in Occupational Human Health Risk Assessments.

Exposure Scenario	POD	Uncertainty Factors	LOC for Risk Assessment	Study and Toxicological Effects
Dermal Short- and Intermediate-Term (1-30 days and 1-6 months)	NOAEL = 3.4 mg/kg/day	UF_A = 10X UF_H = 10X	Occupational LOC for MOE = 100	**MRID 51778771**: 90 day oral toxicity in mice LOAEL = 14.3/14.8 mg/kg/day [M/F] based on increased SDH (M/F); single cell degeneration/necrosis (M/F); single cell necrosis/apoptosis (M); liver mixed cell infiltrates (F); increased relative liver weight and hepatocellular hypertrophy (M)
Inhalation Short- and Intermediate-Term (1-30 days and 1-6 months)	NOAEL = 3.4 mg/kg/day	UF_A = 10X UF_H = 10X	Occupational LOC for MOE = 100	**MRID 51778771**: 90 day oral toxicity in mice LOAEL = 14.3/14.8 mg/kg/day [M/F] based on increased SDH (M/F); single cell degeneration/necrosis (M/F); single cell necrosis/apoptosis (M); liver mixed cell infiltrates (F); increased relative liver weight and hepatocellular hypertrophy (M)
Cancer (oral, dermal, inhalation)	Classification: "Not Likely to be Carcinogenic to Humans"; therefore, a cancer risk assessment is not required.			

Point of departure (POD) = A data point or an estimated point that is derived from observed dose-response data and used to mark the beginning of extrapolation to determine risk associated with lower environmentally relevant human exposures. NOAEL = no-observed adverse-effect level. LOAEL = lowest-observed adverse-effect level. UF = uncertainty factor. UF_A = extrapolation from animal to human (interspecies). UF_H = potential variation in sensitivity among members of the human population (intraspecies). DAF = dermal-absorption factor. MOE = margin of exposure. LOC = level of concern. SD = Sprague Dawley rat.

ii. Dietary (Food + Water) Risks

In estimating acute and chronic dietary exposure, EPA used food consumption information from the United States Department of Agriculture (USDA) 2005-2010 *National Health and Nutrition Examination Survey, What We Eat in America*, (NHANES/WWEIA). For acute dietary exposure, an endpoint was identified for acute dietary exposure for the female 13–49 years old population subgroup only; no appropriate toxicological effect attributable to a single dose was observed for the U.S. population or any other population subgroup. As to residue levels in food, EPA conducted an unrefined acute dietary exposure assessment for female 13-49 years old population and chronic dietary exposure risk assessment for all population subgroups using 100 percent crop treated (PCT) for all commodities. The acute dietary risk for females 13-49 years old utilizes <1% of the acute population-adjusted dose (aPAD) and is below HED's LOC (<100% aPAD). The chronic dietary risk for the highest exposed population subgroup, all infants, utilizes 53% of the chronic population-adjusted dose (cPAD). All chronic exposures are below HED's LOC (<100% cPAD).

The Agency used screening level water exposure models in the dietary exposure analysis and risk assessment for epyrifenacil in drinking water. These simulation models take into account data on the physical, chemical, and fate/transport characteristics of Epyrifenacil.

Epyrifenacil is classified as "not likely to be carcinogenic to humans below doses that induce hepatocellular injury" based on the acceptable tumorigenic MOA for liver tumors in male mice and no concern for mutagenicity. The cPAD will be protective of potential carcinogenic effects. Therefore, a separate cancer dietary assessment was not required.

iii. Occupational Risks

Epyrifenacil may be applied using several types of equipment – including aerial, groundboom, and handheld (i.e., low pressure handwand, backpack, and high pressure handwand sprayers); chemigation is prohibited. Occupational handler dermal and inhalation exposures are expected from the proposed uses of epyrifenacil. These exposures are expected to be both short- (1 to 30 days) and intermediate-term (1 to 6 months). There are no risks of concern for occupational handlers when considering label-required PPE.

iv. Residential Risks

There are no proposed residential uses at this time, and an assessment is not required. There are also no currently registered residential uses for epyrifenacil. Therefore, no residential scenarios are recommended for use in the aggregate assessment.

v. Aggregate Risk

For this action, the only relevant pathway of exposure to epyrifenacil is dietary exposure. Therefore, aggregate risk is equivalent to the acute and chronic dietary (food plus drinking water) exposure and there are no aggregate risks of concern.

vi. Cumulative Risk

Epyrifenacil is a PPO inhibiting herbicide. As part of the ongoing process to review registered pesticides, the Agency intends to apply EPA's Office of Pesticide Programs' guidance document entitled, Pesticide Cumulative Risk Assessment: Framework for Screening Analysis, to determine if the available toxicological data for epyrifenacil suggests a candidate common mechanism group (CMG) may be established with other pesticides. If a CMG is established, a screening-level toxicology and exposure analysis may be conducted to provide an initial screen for multiple pesticide exposure.

vii. Non-Occupational Spray Drift Exposure and Risk

Spray drift is a potential source of exposure to those nearby pesticide applications. This is particularly the case with aerial application, but, to a lesser extent, spray drift can also be a potential source of exposure from the ground application methods (e.g., groundboom and airblast) employed for epyrifenacil. There is the potential for non-occupational indirect dermal and incidental oral exposures from spray drift. Exposures from spray drift are expected to be short-term only.

Adult dermal and children (1 to <2 years old) dermal, incidental oral, and combined (dermal + oral) exposures resulting from bare ground/non-crop spray drift residues were estimated using default turf transferable residue (TTR) data. Children (1 to <2 years old) dermal and incidental oral risk estimates were combined because the toxicity endpoint for each route of exposure was based on the same study and toxicity effect. Exposures were considered for 50 feet wide lawns where the nearest side of the property was directly adjoining the treated field (at field edge) and at varied distances up to 300 feet downwind of a treated field. Results indicate that there are no risks of concern at the field edge.

B. Endocrine Disruptor Screening Program

The FFDCA §408(p) requires EPA to develop a screening program to determine whether certain substances (including pesticide active and other ingredients) may have an effect in humans similar to an effect produced by a "naturally occurring estrogen, or other such endocrine effects as the Administrator may designate." (21 U.S.C. 346a(p)). In carrying out the Endocrine Disruptor Screening Program (EDSP), FFDCA section 408(p)(3) requires that EPA "provide for the testing of all pesticide chemicals," which includes "any substance that is a pesticide within the meaning of the Federal Insecticide, Fungicide, and Rodenticide Act [FIFRA], including all active and pesticide inert ingredients of such pesticide." (21 U.S.C. §§ 321(q)(1) and 346a(p)(3)). However, FFDCA section 408(p)(4) authorizes EPA to, by order, exempt a substance from the EDSP if the EPA "determines that the substance is anticipated not to produce any effect in humans similar to an effect produced by a naturally occurring estrogen." (21 U.S.C. 346a(p)(4)). The Agency has concluded that the point of departures (PODs) for human health risk assessment selected to evaluate potential risk associated with the proposed uses of epyrifenacil are protective of potential adverse estrogen, androgen, and thyroid effects in humans.

C. Assessment of Environmental Fate and Ecological Risks

The ecological risk assessment (ERA) examines the potential for adverse effects to non-listed non-target organisms associated with proposed uses of epyrifenacil which will be discussed here. EPA also conducted a Biological Evaluation (BE) to evaluate potential effects on listed and proposed species and designated and proposed critical habitats (CH) and includes EPA's predictions of the potential likelihood of future jeopardy (J) for proposed or listed federally threatened or endangered ("listed") species or adverse modification (AM) of proposed or

designated ("designated") CHs. The BE also includes EPA's assessment of labeled mitigation that is predicted to avoid the potential likelihood of future J/AM which will be discussed in Section D. These assessments also considered potential effects of the co-formulated active ingredients flumioxazin and pyroxasulfone in one of the proposed products. While EPA is making predictions about the potential likelihood of future J/AM, the U.S. Fish and Wildlife Service or the National Marine Fisheries Service (collectively referred to as "the Services") are responsible for making the actual J/AM findings for these species and CHs and have the sole authority to do so.

EPA's assessment accounts for any mitigation on the labels as submitted by the applicant in their application as well as additional mitigation proposed by EPA and agreed to by the applicant and incorporated in the final accepted labels subsequent to the original application.

The taxa evaluated in the ERA and BE include mammals, birds (which serve as surrogates for reptiles and terrestrial-phase amphibians), terrestrial invertebrates (*Apis* and non-*Apis* species), fish (where freshwater fish serve as surrogates for aquatic-phase amphibians), aquatic invertebrates, and aquatic, terrestrial, and wetland plants. Ecological risk characterization integrates environmental exposure and ecotoxicity data to evaluate the potential for adverse ecological effects using a risk quotient method. For this method, RQs are calculated by dividing point estimates of exposure (*i.e.*, estimated environmental concentration [EEC]) by point estimates of toxicity (RQ = EEC/toxicity endpoint), for both acute and chronic effects. The RQs are then compared to EPA's acute and chronic risk Levels of Concern (LOC) for each taxon (**Table 4**).

The LOC indicates whether a pesticide, when used as directed, has the potential to cause adverse effects of concern to non-target organisms. RQs below the LOC indicate there are no risk concerns for that taxon. If the RQ exceeds the LOC, then the EPA further characterizes and describes the associated risk concern.

These findings can also play a role in EPA's assessment of potential effects to listed species, as required by the ESA. If the RQs are below the listed species LOC (indicating potential exposures are below threshold doses) for a particular taxon, then EPA does not expect direct effects to listed species in that taxon. However, further analysis may be necessary to complete an effects determination for listed species within that taxon because there may be effects to a listed species from potential direct effects to another taxon on which the listed species depends for prey, pollination, habitat, and/or dispersal (referred to as "PPHD"). In making its effects determinations, EPA evaluates both potential direct and PPHD effects to listed species and designated CHs. EPA followed the approach described in the Herbicide Strategy[1] to assess potential population- and community-level impacts to terrestrial, wetland, and aquatic plants; further details on this approach are provided below.

[1] Herbicide Strategy: https://www.regulations.gov/document/EPA-HQ-OPP-2023-0365-1137

Table 4. Risk Quotients (RQ) and Levels of Concern (LOC) by Taxon (Endpoints Typically Used for FIFRA and May Affect/No Effect Calls for ESA).				
Taxon	**Exposure Duration[1]**	**Listed/non-listed**	**RQ[2]**	**LOC[2]**
Fish and aquatic-phase amphibians	Acute	Non-listed	Daily EEC/LC_{50}	0.5
		Listed direct effects	Daily EEC/LC_{50}	0.05
	Chronic	Listed and non-listed	60-day EEC/NOAEC	1
Aquatic invertebrates	Acute	Non-listed	Daily EEC/LC_{50}	0.5
		Listed direct effects	Daily EEC/LC_{50}	0.05
	Chronic	Listed and non-listed	21-day EEC/NOAEC	1
Birds, terrestrial-phase amphibians, reptiles	Acute	Non-listed	Upper bound EEC/LC_{50} (Dietary) Upper bound EEC/LD_{50} (Dose)	0.5
		Listed direct effects	Upper bound EEC/LC_{50} (Dietary) Upper bound EEC/LD_{50} (Dose)	0.1
	Chronic	Listed and non-listed	Upper bound EEC/NOAEC	1
Mammals	Acute	Non-listed	Upper bound EEC/LD_{50} (Dose)	0.5
		Listed direct effects	Upper bound EEC/LD_{50} (Dose)	0.1
	Chronic	Listed and non-listed	Upper bound EEC[1]/NOAEC (Dietary) Upper bound EEC[1]/NOAEL (Dose)	1
Terrestrial invertebrates	Acute	Non-listed	EEC/LD_{50} (contact) EEC/LD_{50} (diet)	0.4[3]
		Listed direct effects	EEC/LD_{50} (contact) EEC/LD_{50} (diet)	0.05[4]
	Chronic	Listed and non-listed	EEC/NOAEC (diet)	1[3]
Aquatic plants	Not applicable	Non-listed	Daily EEC/IC_{50} or EC_{50} WPEZ EEC (in µg a.i./L)/IC_{50} or EC_{50}	1
		Listed direct effects	Daily EEC/NOAEC WPEZ EEC (in µg a.i./L)/NOAEC	1
Terrestrial plants	Not applicable	Non-listed	TPEZ EEC/IC_{25}	1
		Listed direct effects	TPEZ EEC/NOAEC	1
Wetland plants	Not applicable	Non-listed	WPEZ EEC/IC_{25}	1
		Listed direct effects	WPEZ EEC/NOAEC	1

EC_{50}= Concentration resulting in 50% effect; EEC = Estimated environmental concentration; IC_{25} = Concentration resulting in 25% inhibition; LC_{50} = Concentrations resulting in lethality for 50% of the organisms tested; LD_{50} = Dose resulting in lethality for 50% of the organisms tested; NOAEC = No observed adverse effect concentration; TPEZ = Terrestrial Plant Exposure Zone; WPEZ = Wetland Plant Exposure Zone.

[1]Non-definitive endpoints are directly compared to EECs; RQs were not quantified, and no LOC was used.

[2]USEPA, 2004. Overview of the ecological risk assessment process in the Office of Pesticide Programs, U.S. Environmental Protection Agency. Endangered and Threatened Species Effects Determinations. Office of Pesticide Programs, Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.

[3]USEPA ; Health Canada Pest Management Regulatory Agency (PMRA); & California Department of Pesticide Regulation (CDPR). 2014. Guidance for Assessing Pesticide Risks to Bees. Office of Pesticide Programs, U.S. Environmental Protection Agency. June 19, 2024. Available at https://www.epa.gov/sites/default/files/2014-06/documents/pollinator_risk_assessment_guidance_06_19_14.pdf.

[4]USEPA, 2007. Interim Policy: Acute Endangered Species Level of Concern (LOC) for Terrestrial Invertebrates. Memorandum from S. P. Bradbury to Environmental Fate and Effects Division. May 15, 2007. Environmental Fate and Effects Division. Office of Chemical Safety and Pollution Prevention. U.S. Environmental Protection Agency.

EPA has determined that all relevant data requirements specified in 40 CFR Part 158 based on the proposed use patterns of epyrifenacil discussed in this document have been satisfied

(completed, waived, or not triggered). The database required to evaluate the environmental fate and ecological effects of the uses of epyrifenacil is complete and is considered adequate.

This section summarizes EPA's *"Epyrifenacil (S-3100): Ecological Risk Assessment for a Proposed FIFRA Section 3 New Chemical Registration and Final Biological Evaluation with Associated Effects Determinations for Federally Listed and Threatened Species and Designated Critical Habitat."* The complete assessment can be found in docket ID number EPA-HQ-OPP-2022-0354 at https://www.regulations.gov/docket/EPA-HQ-OPP-2022-0354.

i. Environmental Fate Profile

Epyrifenacil will enter the environment through direct application to use sites, with potential offsite movement occurring via spray drift and runoff/erosion. Epyrifenacil is not persistent in soil and aquatic environments and is unlikely to bioaccumulate. It has moderate solubility in water, is not expected to volatilize from the moist or dry soil surfaces or from water, and is characterized as moderately mobile in soil. As a result, offsite ecological exposure is driven primarily by spray drift and runoff/erosion.

Epyrifenacil undergoes pH-dependent hydrolysis, is stable at pH 4, and degrades slowly at pH 7 and more rapidly at pH 9. It also degrades through aqueous photolysis in clear, shallow, unshaded water and is subject to microbially-mediated degradation in terrestrial and aquatic systems. Epyrifenacil is non-persistent in aerobic soil (half-life: ≤ 1 day) and degrades rapidly under aerobic aquatic conditions (half-life: 1 to 3 days). In anaerobic aquatic environments, half-lives range from 1 to 7 days, while in anaerobic soil they range from 18 to 38 days. Terrestrial field dissipation (TFD) studies indicate that epyrifenacil dissipates via transformation or relocation from fields with half-lives of 4 to 19 days. Seven degradates, identified as S-3100-CA (*i.e.*, epyrifenacil acid), S-3100-CA-RD, S-3100-CA-UR, S-3100-DA, S-3100-DA-RD, 4"-OH-S-3100-CA, and S-3100-DP, were detected in the TFD studies with detection ranging from 0 days after treatment (S-3100-CA) to 94 days after treatment (S-3100-CA-RD), and no residues were detected in deeper soil layers at any time point.

In EPA's ERA and BE, the residues of concern (ROC) are determined by the expected degradation pathway, exposure, and toxicity of the parent compound and/or its degradates. For ecological risk assessment, epyrifenacil alone is the ROC for all taxa except aquatic plants. Environmental fate data indicate that while the parent compound has a short half-life, its degradates are more persistent in the environment. Some degradates may be as toxic as the parent compound to aquatic plants. Therefore, for the assessment of individual-level effects to aquatic plants, the ROCs include the parent compound along with seven degradates: S-3100-CA, S-3100-CA-RD, S-3100-CA-UR, S-3100-DA, S-3100-DA-RD, 4"-OH-S-3100-CA, and S-3100-DA-UR. Six of these degradates were found in the TFD studies, all except for S-3100-DA-UR, which was a major degradate (formed at >10%) reaching up to 49% and 66% in the aerobic and anaerobic aquatic metabolism studies, respectively. For PPHD effects to listed aquatic animal species that depend on aquatic plants, the ROC is epyrifenacil alone.

Ecotoxicity data for the 7 major degradates are available only for one taxon, aquatic plants. These data show that parent compound epyrifenacil has the highest and most consistent toxicity to non-vascular aquatic plants when compared to the 7 major degradates. The degradate toxicity portfolio is based on 16 applicant-submitted studies for two algal species, the green alga *Raphidocelis subcapitata* and the freshwater diatom *Navicula pelliculosa*. The two species show differing toxicity profiles with *R. subcapitata* showing similar toxicity for S-3100-CA, S-3100-DA, and S-3100-DP when compared to the parent compound, while *N. pelliculosa* consistently shows lower toxicity for all 7 degradates when compared to the parent compound. These differing plant toxicity results indicate a parent-only ROC sufficiently addresses exposure and effects to aquatic plant communities that consist of many different species, but a parent-only ROC may underestimate exposure and effects for individual plants within an aquatic plant community. Therefore, the ROC includes the 7 degradates for individual-level effects to aquatic plants but for PPHD effects to listed aquatic animal species that depend on aquatic plants, the ROC is epyrifenacil alone. Based on the available degradate toxicity data, including the degradates as ROCs in the exposure estimates would overestimate aquatic plant community-level effects and PPHD effects to populations of listed aquatic animal species that depend on aquatic plant communities.

ii. Ecological Effect Profile and Risks

The following sections summarize the toxicity of epyrifenacil (based on applicant-submitted studies) and its co-formulated active ingredients, flumioxazin and pyroxasulfone, to various taxonomic groups. Since epyrifenacil has not been in use in the United States, no incident data are available on the compound. A search of the open literature in the ECOTOX database did not result in more sensitive toxicity endpoints. As discussed above, EPA integrates toxicity data with exposure estimates to generate RQ values. **Table 5** summarizes RQs and LOC exceedances for listed and non-listed species associated with the proposed uses of epyrifenacil.

EPA used previous assessments of flumioxazin and pyroxasulfone to assess their toxicities relevant to the proposed co-formulated product. EPA modeled exposure concentrations of these co-formulated active ingredients (co-formulants) based on the proposed application rates of the product; the ROC for both active ingredients is the parent compound only.

Aquatic Vertebrates

Epyrifenacil is characterized as moderately toxic to freshwater and estuarine/marine fish on an acute exposure basis (most sensitive LC_{50} is for bluegill sunfish: 2,700 µg a.i./L) while the degradate S-3100-CA (*i.e.*, epyrifenacil acid) is classified as slightly toxic based on one available study in bluegill sunfish (LC_{50}: >50,000 µg a.i./L). Chronic exposure to epyrifenacil resulted in a 35% increase in post-hatch mortality in freshwater fish (NOAEC: 3.5 µg a.i./L; LOAEC: 7.3 µg a.i./L), while no statistically significant effects were detected in estuarine/marine fish at the highest concentration tested (*i.e.*, 8.9 µg a.i./L). Freshwater fish serve as surrogates for aquatic-

phase amphibians when amphibian toxicity data are not available; therefore, the results for fish are applicable to this taxon as well.

On an acute basis, flumioxazin and pyroxasulfone show similar toxicity as epyrifenacil. On a chronic exposure basis, flumioxazin is at least 7x more toxic to fish than epyrifenacil and pyroxasulfone. Information on the LDPH chronic NOAEC is only available for epyrifenacil and flumioxazin, as pyroxasulfone is not expected to raise LDPH concerns given its different mode of action (inhibition of very long-chain fatty acid synthesis [WSSA Group 15]). The LDPH chronic NOAEC for flumioxazin is an order of magnitude lower than that of epyrifenacil.

There were no LOC exceedances for listed and non-listed freshwater and estuarine/marine fish for all proposed uses of epyrifenacil. RQs based on estimated LDPH toxicity values did not exceed the chronic risk LOC for epyrifenacil and flumioxazin. Given that neither proposed product has uses with direct application to water and that there were no relevant effects observed in the fish studies, risk concerns were determined to be low for light-enhanced toxicity for aquatic vertebrates.

Overall, there are low risk concerns for epyrifenacil and its co-formulated a.i. for non-listed fish and for aquatic-phase amphibians and low potential for direct effects to listed fish and aquatic-phase amphibians. Therefore, no direct risks of concern are expected for these taxa.

Aquatic Invertebrates

Epyrifenacil is characterized as moderately toxic to freshwater invertebrates based on an acute study on waterflea (*Daphnia magna*; EC_{50}: >3,200 µg a.i./L). An acute toxicity study of the degradate S-3100-CA indicates that the degradate is no more than slightly toxic to *D. magnia* (limit test; EC_{50} value >48,000 µg a.i./L). Epyrifenacil is highly toxic to estuarine/marine invertebrates on an acute exposure basis based on a mysid (*Americamysis bahia*) study that reported 100% mortality at the two highest test concentrations (96-h LC_{50}: 380 µg a.i./L). Although empirical data are not available for estimating acute degradate toxicity to estuarine/marine invertebrates, EPA expects that the degradates are less acutely toxic than the parent compound based on the available freshwater invertebrate toxicity data where the degradate S-3100-CA had no effects at a concentration 15 times above the non-definitive endpoint for epyrifenacil.

Chronic exposure to epyrifenacil resulted in an increase in time to first brood in *D. magna* (NOAEC: 37 µg a.i./L; LOAEC; 75 µg a.i./L, based on a 19% increase in time to first brood) and a reduction in the number of offspring per female in the chronic mysid study (NOAEC: <2.1 µg a.i./L; LOAEC: 2.1 µg a.i./L; 22% reduction in reproduction at the lowest test concentration). Given the duration of the chronic invertebrate toxicity tests with the parent compound (*i.e.,* 21 to 28 days), EPA expects that the test organisms were exposed to the major degradates because of the likelihood of hydrolysis and aerobic aquatic metabolism occuring during these longer studies. Therefore, the chronic toxicity tests with the parent compound are expected to account for the toxicity of epyrifenacil plus the major degradates. Subchronic toxicity tests of benthic invertebrates resulted in reduced survival and growth in the midge (*Chironomus*

dilutus; NOAEC: 1.9 mg a.i./kg dw bulk sediment; LOAEC: 4.2 mg a.i./kg dw bulk sediment based on 19% reduction in dry weight) and reductions in survival and growth at the lowest concentration tested for the estuarine amphipod (*Leptocheirus plumulosus*; NOAEC: < 0.17 mg a.i./kg bulk sediment; LOAEC: 0.17 mg a.i./kg bulk sediment based on a 25% reduction in dry weight).

The most sensitive acute toxicity endpoints for epyrifenacil and flumioxazin are similar, while the most sensitive toxicity endpoint for pyroxasulfone is non-definitive (>). The lowest chronic endpoint for epyrifenacil is at least 7 times more sensitive than the lowest toxicity endpoints for the co-formulated active ingredients.

Because the acute and chronic RQs are below LOCs for listed and non-listed freshwater and estuarine/marine invertebrates for epyrifenacil and the two co-formulated active ingredients, there are low risk concerns for non-listed aquatic invertebrates and low potential for direct effects to listed aquatic invertebrates. Therefore, no direct risks of concern are expected for this taxon.

Aquatic Plants

The aquatic plant toxicity studies available for epyrifenacil include one study conducted with technical grade active ingredient (TGAI) for the vascular aquatic plant duckweed (*Lemna gibba*) and 19 studies for four non-vascular aquatic plant species that tested the TGAI as well as 8 epyrifenacil degradates. The vascular plant study resulted in an EC_{50} value for epyrifenacil of 2.6 µg a.i./L. The most sensitive non-vascular endpoint for epyrifenacil was determined in the marine diatom *Skeletonema costatum* (IC_{50}: 1.1 µg a.i./L) study. In general, epyrifenacil was equivalently toxic or more toxic to non-vascular aquatic plants than its degradates. The most sensitive endpoint among the degradate studies was for S-3100-DP (IC_{50}: 1.7 µg a.i./L).

The most sensitive vascular plant IC_{50} values determined in the duckweed studies vary across the three co-formulated active ingredients by approximately 5 times. The tested non-vascular species show similar sensitivity to epyrifenacil exposure except for the blue-green algae (*Anabaena flos-aquae*; non-definitive (>) IC_{50}). In contrast, IC_{50} values for flumioxazin for the four non-vascular plant test species vary by a factor of 20. Interspecies differences in sensitivity are more pronounced for pyroxasulfone; the IC_{50} for the most sensitive species is three orders of magnitude lower than the IC_{50} for the marine diatom, and the IC_{50} values for the other two test species are non-definitive (>). This range in sensitivity for pyroxasulfone indicates that the most sensitive endpoint may not be fully representative of the taxon and may overestimate toxicity of pyroxasulfone to other algal species.

In the aquatic environment, RQs exceed the LOC for non-listed aquatic non-vascular plants for epyrifenacil ROCs (parent compound + degradates EECs) for all uses except the bare ground uses (RQs: 0.04-3.0); there are no exceedances of the LOC for vascular plants in the aquatic plant exposure zone apart from one corn and one fallow to be planted to corn scenario (RQs: 0.02-1.3). In the wetland environment, there are non-listed species LOC exceedances for all proposed uses except the bare ground uses for both vascular and non-vascular plants (RQs: 0.15-9.1). There are no exceedances of the LOC for listed aquatic vascular and non-vascular

plants in the aquatic plant exposure zone. In the wetland exposure zone, LOC exceedances occurred for listed aquatic non-vascular plants for all uses apart from the bare ground uses (RQs: <0.01-14); LOC exceedances occurred for listed aquatic vascular plants for all uses (RQs: <0.01-20). Modeled environmental concentrations for aerial applications of flumioxazin and pyroxasulfone based on the use rates on the proposed co-formulated product label resulted in LOC exceedances for vascular aquatic plants (flumioxazin RQs: 0.25-17; pyroxasulfone RQs: 0.10-5.2). LOC exceedances also occurred for non-vascular aquatic plants (flumioxazin RQs: 0.15-9.8; pyroxasulfone RQs: 1.6-83) for all uses except for flumioxazin in the aquatic environment. Therefore, direct risks of concern are expected for this taxon, and PPHD effects may occur for species that depend on aquatic plants for food or habitat.

Terrestrial Vertebrates

Mammals. Epyrifenacil is categorized as practically non-toxic to mammals on an acute exposure basis (LD_{50} > 2,000 mg a.i./kg-bw). Chronic exposure of rats to epyrifenacil resulted in reductions in growth and delayed sexual maturation, as well as treatment-related anemia (NOAEC and NOAEL values of 100 mg/kg-diet and 6.61 mg/kg-bw, respectively, for all affected endpoints). The acute oral toxicity studies of flumioxazin and pyroxasulfone in rats both resulted in non-definitive endpoints (pyroxasulfone LD_{50} >2,000 mg a.i./kg-bw; flumioxazin LD_{50} >5,000 mg a.i./kg-bw). The chronic rat NOAEC for both flumioxazin and pyroxasulfone is the same as that for epyrifenacil (100 mg a.i./kg-diet).

Epyrifenacil poses low risk to listed and non-listed mammals on both acute and chronic exposure bases (*i.e*., RQ values below LOCs). Based on modeled environmental concentrations, flumioxazin and pyroxasulfone pose potential chronic risks to both listed and non-listed mammals because they are applied at higher rates due to higher percentages in the co-formulated product compared to epyrifenacil. Therefore, direct risks of concern are expected for this taxon from use of the co-formulated product.

Birds, Reptiles, and Terrestrial-phase Amphibians. Epyrifenacil is characterized as practically non-toxic to birds (surrogates for reptiles and terrestrial-phase amphibians) on both an acute oral and subacute dietary exposure basis. The three available acute oral toxicity studies resulted in LD_{50} values >2,250 mg a.i./kg-bw, while the two available subacute dietary studies resulted in LC_{50} values >5,406 mg a.i./kg-diet. No adverse effects were observed in any of the studies. Chronic exposure of birds did not result in any effects up to the highest dietary concentration tested (*i.e*., 994 mg a.i./kg-diet). None of the acute avian studies for flumioxazin or pyroxasulfone resulted in a definitive toxicity endpoint (lowest LD_{50}: >2250 mg/kg). The lowest chronic avian toxicity endpoint for flumioxazin (NOAEC: 250 mg/kg-diet; mallard duck), is on the same order of magnitude as that of epyrifenacil, while that for pyroxasulfone is an order of magnitude lower (60 mg/kg-diet, mallard duck).

Overall risks to listed and non-listed birds, reptiles, and terrestrial-phase amphibians from epyrifenacil exposure are low based on modeled environmental concentrations that are at least two orders of magnitude below acute oral and sub-acute dietary toxicity values and no LOC exceedances for chronic dietary risk. Similarly, acute and chronic risks from the co-formulated

active ingredients are below respective LOCs. Therefore, direct risks of concern are not expected for these taxa.

Terrestrial Invertebrates

Honey Bees and Other Terrestrial Invertebrates. Epyrifenacil is characterized as practically non-toxic to adult honey bees (*Apis mellifera*) on both an acute contact (LD_{50} > 96.8 µg a.i./bee) and oral (LD_{50} > 20 µg a.i./bee) exposure basis; the compound is also practically non-toxic to larval honey bees on an acute oral exposure basis (LD_{50}: 73 µg a.i./larva). Chronic exposure resulted in reduced food consumption and increased mortality in adult honey bees (NOAEL: 37 µg a.i./bee; LOAEL: 75 µg a.i./bee, based on 47% mortality), while chronic exposure of larvae resulted in reduced adult honey bee emergence (NOAEL: 3.0 µg a.i./larva/day; LOAEL: 6.0 µg a.i./larva/day, based on 33% larval mortality). Flumioxazin shows chronic toxicity to larval honey bees. Flumioxazin and pyroxasulfone are both considered practically non-toxic to honey bees on an acute basis, and the available acute endpoints are comparable to or less sensitive than those of epyrifenacil. Flumioxazin shows similar chronic toxicity to epyrifenacil, while pyroxasulfone is less toxic.

Overall, risks to honey bees and other non-listed bees from epyrifenacil and the two co-formulated active ingredients are expected to be low based on non-definitive endpoints that are orders of magnitude greater than calculated exposure concentrations and RQs less than LOCs where calculable. Therefore, direct risks of concern are not expected for this taxon.

Three additional terrestrial invertebrate studies are available for epyrifenacil. A chronic earthworm study reported effects on reproduction but no effects on biomass (28-day NOAEC: 484 mg a.i./kg dw soil; LOAEC: 968 mg a.i./kg dw soil based on a 27% reduction in reproduction). Acute contact limit tests conducted with a parasitoid wasp and a predatory mite resulted in less than 50% mortality in both tests (LC_{50} > 0.11 lb a.i./A). No additional terrestrial invertebrate studies are available for flumioxazin and pyroxasulfone.

Using honey bee toxicity data as a surrogate for other terrestrial invertebrates resulted in low risk concerns and low potential for direct effects to listed and non-listed terrestrial invertebrates (including bees) from exposure to epyrifenacil or its co-formulated active ingredients. Therefore, direct risks of concern are not expected for this taxon.

Terrestrial Plants

Terrestrial monocotyledonous (monocot) plants were generally less sensitive to epyrifenacil than dicotyledonous (dicot) plants in the applicant-submitted seedling emergence and vegetative vigor studies tested with epyrifenacil only (lowest monocot IC_{25}: >0.0065 lb a.i./A; lowest dicot IC_{25}: 0.00033 lb a.i./A) and with the co-formulated product containing flumioxazin and pyroxasulfone (lowest monocot IC_{25}: >0.0012 lb epyrifenacil/A; lowest dicot IC_{25}: 0.000049 lb epyrifenacil/A). Dry weight is the most sensitive endpoint in the vegetative vigor studies . EPA applied a species sensitivity distribution (SSD) approach to compare the available terrestrial

plant toxicity data for epyrifenacil and its co-formulated active ingredients, pyroxasulfone and flumioxazin, and concluded that use of the epyrifenacil data would identify risks similar to those of flumioxazin and would be protective of the potential effects of pyroxasulfone.

Based on the terrestrial plant toxicity endpoints, EPA identified LOC exceedances for non-listed plants for all proposed uses except the bare ground use for ground applications in the wetland environment (RQs: 0.2-4.2). For aerial applications, LOC exceedances occurred in the wetland environment for all proposed uses (RQs: 0.5-4.9). There are LOC exceedances in the terrestrial environment for aerial applications of all the proposed uses (RQs: 2.6-5.3). There are also LOC exceedances in the terrestrial environment for ground applications for all the proposed uses except canola (RQs: 0.7-1.8).

Based on the terrestrial plant toxicity endpoints, LOC exceedances occurred in the wetland environment for ground applications of all uses for listed dicots (RQs: 0.8-14) and for all uses except fallow to be planted to spring wheat and the non-agricultural uses for listed monocots (RQs: 0.2-3.5). For aerial applications, listed species LOC exceedances occurred for all proposed uses (listed dicot and monocot RQs: 0.4-16). In the terrestrial environment, there are listed species LOC exceedances for dicots for all proposed uses for ground applications (RQs: 2.2-5.9), and RQs for both dicots and monocots exceeded the listed species LOC for aerial applications (listed dicot and monocot RQs: 2.2-17). For ground applications, listed monocot LOC exceedances were limited to corn, soybean, and wheat (maximum RQ: 1.5). Therefore, risk concerns from direct toxicity are expected for this taxon, and PPHD effects may occur for species that depend on terrestrial or wetland plants for food or habitat.

Table 5. Summary of Risk Quotients (RQ) for Taxonomic Groups from Proposed Uses of Epyrifenacil.					
Taxa	**Exposure Duration**	**Risk Quotient (RQ) Range[1]**	**RQ Exceeding the LOC for Non-listed Species**	**RQ Exceeding the LOC for Listed Species**	**Additional Information/ Lines of Evidence**
Freshwater Fish (surrogate for aquatic-phase amphibians)	Acute	<0.01	No	No	-
	Chronic	<0.01	No	No	-
Estuarine/ Marine Fish	Acute	NC	NC	NA	Acute RQs are not calculated due to the non-definitive toxicity endpoint. EECs are at least four orders of magnitude below the non-definitive acute toxicity endpoint; therefore, the likelihood of mortality is considered low for estuarine/marine fish.
	Chronic	<0.01	No	No	-
Fish	LDPH-Chronic	<0.01	No	No	-
Freshwater Invertebrates (Water-Column Exposure)	Acute	NC	NA	NA	Acute RQs are not calculated due to the non-definitive toxicity endpoint. No sublethal effects or mortality were observed. As EECs are at least four orders of magnitude below the non-definitive endpoint, the likelihood of acute mortality is considered low.
	Chronic	<0.01	No	No	-
Estuarine/Marine Invertebrates (Water-Column Exposure)	Acute	<0.01	No	No	-
	Chronic	<0.01	No	No	-
Benthic Invertebrates	Acute	<0.01	<0.01	No	Only subchronic (10-day) benthic invertebrate toxicity studies are available. Peak pore water EECs and the LC/EC_{50} from water-column tests were used to calculate acute values.
	Subchronic	<0.01	No	No	
	Chronic	NC	NA	NA	

Table 5. Summary of Risk Quotients (RQ) for Taxonomic Groups from Proposed Uses of Epyrifenacil.					
Taxa	**Exposure Duration**	**Risk Quotient (RQ) Range[1]**	**RQ Exceeding the LOC for Non-listed Species**	**RQ Exceeding the LOC for Listed Species**	**Additional Information/ Lines of Evidence**
Mammals	Acute	NC	NA	NA	RQs are not calculated for mammals due to the non-definitive toxicity endpoint for the Norway rat. The maximum dose-based EEC is 500 times less than the non-definitive LD_{50} (when adjusted for body weight), and therefore risk to mammals on an acute oral basis is considered low.
	Chronic	<0.01-0.60	No	No	-
Birds (surrogate for terrestrial-phase amphibians and reptiles)	Acute Oral	NC	NA	NA	RQs are not calculated for birds due to non-definitive toxicity endpoints. The maximum dose-based EEC is more than 100 times less than the most sensitive non-definitive LD_{50} when adjusted for body weight of the test species (mallard), and therefore risk to birds on an acute oral exposure basis is considered low.
	Subacute Dietary	NC	NA	NA	RQs are not calculated for birds due to non-definitive toxicity endpoints. As the maximum dietary-based EEC is three orders of magnitude lower than the non-definitive LC_{50}, risk to birds on a subacute dietary basis is considered low.
	Chronic	<0.01-0.02	No	No	-

Table 5. Summary of Risk Quotients (RQ) for Taxonomic Groups from Proposed Uses of Epyrifenacil.					
Taxa	**Exposure Duration**	**Risk Quotient (RQ) Range[1]**	**RQ Exceeding the LOC for Non-listed Species**	**RQ Exceeding the LOC for Listed Species**	**Additional Information/ Lines of Evidence**
Honey Bees	Adult Contact and Oral	NC	NA	Not applicable[2]	Contact RQs could not be calculated due to a non-definitive endpoint. Dietary RQs are not calculated for bees due to a non-definitive endpoint (oral LD_{50} > 20 µg a.i./bee). The maximum calculated EEC for forager bees is an order of magnitude less than the acute non-definitive contact LD_{50}. The maximum calculated dietary EEC for adult nectar foraging bees is more than 16 times less than the acute non-definitive oral LD_{50}, indicating low likelihood of adverse effects following acute exposure.
	Acute Larval; Chronic Adult; Chronic Larval	0.01-0.17	No	Not applicable[2]	-

Table 5. Summary of Risk Quotients (RQ) for Taxonomic Groups from Proposed Uses of Epyrifenacil.					
Taxa	**Exposure Duration**	**Risk Quotient (RQ) Range[1]**	**RQ Exceeding the LOC for Non-listed Species**	**RQ Exceeding the LOC for Listed Species**	**Additional Information/ Lines of Evidence**
Other (non-honey bee) Terrestrial Invertebrates	Acute	<0.01	No	No	EECs were compared to acute and chronic dietary toxicity endpoints from honey bee tests as a surrogate for other terrestrial invertebrates.
	Chronic	<0.01	No	No	
Aquatic and Wetland Plants	Non-listed Non-vascular and Vascular[4]	Ground: 0.02-8.9 Aerial 0.04-9.1	Yes	Yes	LOC exceedances for ground and aerial applications occurred for most uses except the bare ground use for ground applications.
	Listed Non-vascular and Vascular[5]	Ground: <0.01-9.9 Aerial: <0.01-14	No	No	LOC exceedances did not occur in the aquatic plant exposure zone but occurred for all uses in the wetland plant exposure zone apart from ground applications of the bare ground use for listed non-vascular aquatic plants.
Terrestrial and Wetland Plants	Non-listed Monocots and Dicots Combined	Ground: 0.2-4.2 Aerial: 0.5-5.3	Yes	Yes	LOC exceedances occurred for most uses.
	Listed Monocots and Dicots Combined	Ground: 0.2-14 Aerial: 0.4-17	Yes	Yes	LOC exceedances occurred for all uses except the bare ground uses.

EEC=estimated environmental concentration; LOAEC=lowest observed adverse effect concentration; N/A=not applicable; NC = not calculated; NOAEC=no-observed adverse effect concentration.
Non-Listed Species Level of Concern (LOC) Definitions: Aquatic Animals: Acute=0.5, Chronic=1.0; Terrestrial Vertebrates: Acute=0.5, Chronic=1.0; Terrestrial Invertebrates: Acute=0.4, Chronic=1.0; Plants: 1.0
Listed Species LOC Definitions: Aquatic Animals: Acute=0.05, Chronic=1.0; Terrestrial Vertebrates: Acute=0.1, Chronic=1.0; Terrestrial Invertebrates: Acute=0.1, Chronic=1.0; Plants: 1.0
[1] RQs reflect exposure estimates for parent only and maximum application rates allowed on labels.

[2] As there are no listed honey bees, the potential for risk to listed bees was considered as part of the "Other Terrestrial Invertebrates" taxon.
[3] RQs for terrestrial invertebrates are applicable to honey bees, which are also a surrogate for other species of bees. Risks to other terrestrial invertebrates (*e.g.*, earthworms, beneficial arthropods) are only characterized when toxicity data are available.
[4] RQs for non-listed non-vascular and vascular aquatic plants were calculated using the parent + 7 degradates EECs.
[5] RQs for listed non-vascular and vascular aquatic plants were calculated using parent-only EECs.

Potential Population- and Community-Level Impacts

EPA followed the approach described in the Herbicide Strategy to assess potential population- and community-level impacts to terrestrial, wetland, and aquatic plants, as direct effects are expected for these taxa based on the results of the risk assessment. The potential direct effects to plants indicate potential for PPHD effects to listed animals that rely on plants for food or habitat. EPA calculated magnitude of difference (MoD) ratios by comparing population- and community-level toxicity thresholds to modeled EECs. EPA then compared the MoDs to a threshold of 1.0 to determine if population- or community-level impacts are expected.

Considering population- and community-level impacts relevant to terrestrial and wetland plants, EPA used the terrestrial plant SSD to identify population- and community-level toxicity thresholds (HC_{05}: 0.00022 lb a.i./A; HC_{25}: 0.00085 lb a.i./A; respectively). Spray drift and runoff-only EECs were calculated separately to determine the level of mitigation needed based on exposure route of drift versus runoff/erosion.

For runoff-only EECs, some MoDs for population-level impacts did exceed 1.0 but were <10. Therefore the potential for population-level impacts identified for listed terrestrial and wetland plant species would be "low" per the Herbicide Strategy. Runoff-only MoDs for community-level impacts exceeded the threshold of 1.0 only for a small number of use scenarios; overall, the maximum MoD was 2.3, and therefore the potential for community-level impacts for terrestrial and wetland plant communities would also be in the "low" category.

Based on MoDs for spray drift calculated using the single application rate and most sensitive plant endpoints (*i.e.*, for terrestrial plants: HC_{05} for effects to plants and obligates to plants; HC_{25} for effects to generalists and communities), MoDs for epyrifenacil are "medium" or "high" for population-level impacts.

Considering community-level impacts relevant to aquatic plants, spray drift and runoff-only MoDs did not exceed 1.0 in the aquatic environment across all proposed ground or aerial uses . In the wetland environment, runoff-only MoDs exceed 1.0 for non-vascular plants for both aerial and ground applications (MoDs: <0.01-4.1). Because the MoDs for aquatic plants are <10, potential community-level impacts to aquatic plant communities are "low" per the Herbicide Strategy.

See unit VI.B, below, for a discussion of the mitigations required to address the impacts described above.

D. Effects Determinations under the Endangered Species Act

For the effects determinations included in the BE, EPA first evaluated whether the proposed uses would have No Effect (NE) or May Affect (MA) an individual of a listed or proposed species or its designated CH (separate determinations are made for each species and CH). For listed species and designated CH where EPA makes a MA determination, EPA performed additional analyses to determine if the proposed uses of epyrifenacil are likely to adversely affect (LAA) or not likely to adversely affect (NLAA) those listed species and designated CHs. EPA makes NLAA determinations when effects are either discountable (extremely unlikely to occur), insignificant, or wholly beneficial. EPA makes LAA determinations when there is a discernible adverse effect to one or more individuals of a listed species or their designated CH. For those listed species and designated CHs where EPA makes an LAA determination, the BE also included EPA's prediction as to whether the proposed uses of epyrifenacil have a potential likelihood of future jeopardy (J) for a listed species or of adverse modification (AM) for any designated CH (collectively abbreviated as J/AM), consistent with 50 C.F.R. § 402.40(b)(1). Effects determinations are summarized in **Table 6**.

Table 6. Effects Determinations for Epyrifenacil for Listed or Proposed Species by Taxon and for Designated or Proposed Critical Habitats

Taxon[1]	**No Effect**	**May Affect**	**Not Likely to Adversely Affect**	**Likely to Adversely Affect, No J/AM Predicted**	**Likely to Adversely Affect, J/AM Predicted[2]**	**Total**
Plants	0	944	541	403	0	944
Mammals	26	76	40	36	0	102
Birds	5	94	53	41	0	99
Amphibians[3]	0	45	30	15	0	45
Reptiles	13	41	15	26	0	54
Terrestrial Invertebrates[4]	5	117	69	48	0	122
Fish	16	163	130	33	0	179
Aquatic Invertebrates	17	185	185	0	0	202
Total Number of Species	82	1665	1063	602	0	1747
Percent of Total Listed/Proposed Species	5%	95%	61%	34%	--	--
Total Number of Critical Habitats	78	840	626	214	0	918
Percent of Total Designated/Proposed Critical Habitats	8%	92%	68%	23%	--	--

[1] Reflects the species federally listed and proposed as endangered or threatened and critical habitats designated and proposed as of February 16,2022.

[2] Predictions of no potential likelihood of future J/AM are based on mitigation that was agreed upon with the applicant.

[3] "Amphibians" and "Reptiles" include those species that have both a terrestrial and aquatic phase.

[4] "Terrestrial Invertebrates" includes species with both a terrestrial and aquatic phase.

E. Benefits Assessment

As part of the registration process, the EPA provides a review regarding the benefits of the registration of epyrifenacil. The EPA assesses the benefits of the new pesticide as compared to available conventional control based on benefits information submitted by the applicant and publicly available scientific literature. BEAD's review includes consideration of potential benefits of the new pesticide such as greater efficacy, increased user flexibility, and/or a new mode of action (MOA) to assist in herbicide resistance management.

Overall, epyrifenacil provides control of a broad-spectrum of problematic broadleaf and grass weeds, including some biotypes resistant to PPO-inhibitor herbicides. Data reviewed by EPA suggest that epyrifenacil will provide better grass control than other PPO-inhibitor herbicides due to differences in translocation properties. EPA also reviewed epyrifenacil's efficacy against PPO-inhibitor resistant broadleaf and grass weeds and found that epyrifenacil provided effective control when compared to other active ingredients currently used on the same PPO-inhibitor resistant weeds. Epyrifenacil will be an additional broad-spectrum herbicide option in the labeled sites, and it is expected to provide control of target-site-based PPO-inhibitor resistant biotypes.

Epyrifenacil will have no preplant-interval restrictions for use in corn, soybeans, and wheat, and a 3-day preplant restriction in canola which provides benefits to users in the form of application and planting flexibility. The use of epyrifenacil as a complementary burndown herbicide in glyphosate-tolerant cropping systems would also help extend the benefits of such cropping systems.

Epyrifenacil will provide another tool for vegetation managers to maintain bare ground in non-cropped areas including areas around transportation and electrical infrastructure, and airports, brickyards, industrial plant sites, lumber yards, military installations, storage areas, farm buildings, ungrazed fencerows, wind breaks and shelter belts. Generally, herbicides like epyrifenacil control vegetation in non-cropped areas to maintain bare ground allowing for access through travel corridors, keep clear line-of-sight visibility for moving automobiles and trains, maintain infrastructure, remove vegetation that could fuel wildfires, control invasive and noxious weeds, but vegetation management is also needed to comply with federal regulations and guidelines from the Federal Highway Administration[2] and Federal Railroad Administration.[3]

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[2] Federal Highway Administration. 2008. Vegetation Control for Safety: A Guide for Local Highway and Street Maintenance Personnel. Available online at: https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-06/vegetationfv1108.pdf

[3] Federal Railroad Administration. 2026. Volume II Track Safety Standards Chapter 2 Track Safety Standards Subpart G. *in* Track and Structures Compliance Manual. Available online at: https://railroads.dot.gov/sites/fra.dot.gov/files/2026-03/Track_Structures_CM_2026_Vol_II_Ch2_Track_Safety_Standards_Subpart_G.pdf

For more detailed information on benefits for epyrifenacil, refer to the following document in the docket ID number EPA-HQ-OPP-2022-0354 *"Review of Benefits for the Proposed New Registration of the Herbicide Epyrifenacil in Corn, Soybean, Wheat and Canola"* at www.regulations.gov.

F. Greater than Additive Effects

The applicant (Valent) submitted information related to approved patents with claims of greater-than-additive (GTA) effects associated with epyrifenacil. Based on the review of the submitted information, EPA identified one patent where GTA effects are reported for terrestrial plants when epyrifenacil is co-applied with pyroxasulfone (USEPA 2022a; DP 464896). However, the underlying raw data set was not available in the patent and therefore the findings could not be further evaluated for potential quantitative use in the ecological risk assessment. As described above, EPA included applicant-submitted guideline terrestrial plant studies of the co-formulated product in the risk assessment of epyrifenacil. The results of these studies do not indicate that the proposed co-formulated product has GTA effects.

V. PUBLIC COMMENTS

The public comment period for the NOR closed on July 26, 2023, with no comments received. The public comment period for the NOF closed on closed on April 24, 2023 with no comments received. The public comment period for the proposed decision to register epyrifenacil closed on December 3, 2025 with 67 comments received. Comments are summarized and responses are included in the Response to Public Comments document posted to this docket.

VI. FINAL REGULATORY DECISION

In accordance with FIFRA, EPA registers a pesticide unconditionally when it determines that it will not cause unreasonable adverse effects on humans or the environment, while taking into account the economic, social, and environmental costs and benefits of the use of the pesticide. Under FIFRA, EPA is charged with balancing risks posed by the use of a pesticide against its benefits. EPA must determine if the benefits in light of its use outweigh the risks for EPA to register the pesticide. FIFRA Section 3(c)(5) requires EPA to approve registration if the Agency determines that:

(a) its composition is such as to warrant the proposed claims for it;
(b) its labeling and other material required to be submitted comply with the requirements of this subchapter;
(c) it will perform its intended function without unreasonable adverse effects on the environment; and
(d) when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment

A. Rationale and Risk Mitigation

EPA is issuing unconditional registrations under FIFRA Section 3(c)(5) for the following products for use on canola, field corn, soybean, wheat, fallow land (for corn, soybean, and wheat), and to maintain bare ground in non-crop areas (including guard rails, above-ground pipelines, railroads and surrounding areas, parking and storage areas, airports, industrial areas, around farm buildings, fence rows, windbreaks, shelterbelts, road surfaces, and shoulders):

- S-3100 Technical Herbicide (EPA File Symbol 59639-EAL) as a TGAI for the end-use products below.
- S-3100 0.46 EC Herbicide (EPA File Symbol 59639-EAE) for use on canola, corn, soybean, wheat, fallow land (for corn, soybean, and wheat), and to maintain bare ground in non-crop areas.
- V-10488 0.94 SE Herbicide (EPA File Symbol 59639-EAG, co-formulated with flumioxazin, pyroxasulfone, and epyrifenacil) for use on soybean, spring wheat, fallow land (for corn, soybean, and wheat), and to maintain bare ground in non-crop areas.

To determine whether the products will cause unreasonable adverse effects under FIFRA, EPA is charged with considering the economic, social, and environmental costs and benefits of the use of the pesticide. To determine the risks and benefits, the Agency reviewed a large body of information to determine how these products will be used according to the final labeling. EPA determines whether a product will generally cause unreasonable adverse effects by considering whether the benefits of the product outweigh any potential risks of concern or adverse impacts from its use.

EPA has determined that the database is complete for assessment of risks to human health and the environment for the proposed epyrifenacil uses. Based on these data, EPA has not identified any dietary, aggregate, non-occupational or occupational risks of concern for potential human health exposure.

Additionally, EPA has determined that the primary risk concerns for non-listed and listed species are effects to terrestrial, wetland, and aquatic plants, including for the co-formulated active ingredients flumioxazin and pyroxasulfone. The co-formulants also pose chronic risks to mammals. Based on the mitigation on the labels (i.e., for agricultural uses: implementation of spray drift buffers for aerial and ground applications and use of coarse droplets for aerial applications; for non-agricultural uses: small-area (less than 1/10 of an acre) applications and use of coarse droplets) and/or the lack of LOC exceedances, EPA concludes that direct effects to animal taxa are extremely unlikely to occur.

Based on the taxon-based ecological risk assessment, the applicant included spray drift and runoff mitigations on the labels and used sublabels to differentiate aerial and non-aerial uses. The applicant updated the label to include a maximum boom height of 24 inches and the use of coarse or coarser droplet size to reduce potential impacts from drift. These changes were incorporated into the current RQs summarized in Table 4. Further, to address the identified

effects to listed terrestrial plants included in the Vulnerable Species Action Plan[4] (VSAP), the Agency believes the proposed mitigations to reduce runoff, described in the ESA section below, address the initial prediction of the potential likelihood of future jeopardy for these species. The inclusion of these mitigations will also reduce the likelihood of adverse effects to individual non-listed species in those areas where the mitigations are implemented.

Epyrifenacil is a uracil PPO-inhibiting herbicide (WSSA Group 14) and acts as a light-dependent peroxidizing herbicide (LDPH) by inhibiting PPO and causing the accumulation of oxygen free radicals that destroy plant cells; LDPH chemicals may exhibit enhanced toxicity in the presence of light.

The Agency finds that the benefits of an additional broad-spectrum PPO-inhibitor herbicide outweigh any potential risks. This herbicide provides effective control of problematic weed species and target-site-based PPO inhibitor-resistant weed biotypes. The Agency is including mitigation measures to address environmental risks and poses a reduced risk to human health when used on soybeans. The inclusion of this mitigation will also reduce the likelihood of adverse effects to individual non-listed species in those areas where the mitigation is implemented. EPA reviewed the compositions of the proposed products and determined that the claims made are warranted as the data and product label align with the requirements in this final decision to support the approval of the registrations. The proposed final labeling, which has been revised to include additional mitigation measures to address ecological risks, contains all the necessary requirements and restrictions, and complies with the requirements of FIFRA.

Therefore, based on these considerations, consistent with the requirements of FIFRA Section 3(c)(5), EPA determined that epyrifenacil meets the regulatory standard under FIFRA and concludes that registering the proposed products and the use of epyrifenacil as a selective herbicide for a broad-spectrum of broadleaf and grass weeds, including some biotypes resistant to PPO-inhibitor herbicides, in canola, corn, wheat, soybean, fallow land (for corn, soybean, and wheat), and to maintain bare ground in non-crop areas would not cause unreasonable adverse effects on human health or the environment when the herbicides are used in accordance with the labels.

B. Endangered Species Assessment

ESA Section 7(a)(2) provides that "[e]ach Federal agency shall, in consultation with [FWS] insure that any action authorized, funded, or carried out by such agency. . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species. . . ."

EPA completed effects determinations for listed species for the proposed agricultural and non-agricultural uses of epyrifenacil in the areas where it may be applied. EPA evaluated whether

[4] Vulnerable Species Action Plan: https://www.regulations.gov/docket/EPA-HQ-OPP-2023-0327

the registration of this active ingredient may affect listed species and designated critical habitats within the action area in the listed species effects determination. The ESA effects determinations make use of the best available scientific and commercially available information and considered both direct and PPHD effects. The term "direct effects" refers to decreases in the survival, growth, or reproduction of individuals of a listed species due to exposure to epyrifenacil. The term "PPHD effects" refers to impacts on individuals of a listed species or designated CHs that may be the result of the effects of epyrifenacil to organisms on which the listed species depends upon for prey, pollination, habitat, or dispersal.

In the biological evaluation (BE) (*Epyrifenacil (S-3100): Ecological Risk Assessment for a Proposed FIFRA Section 3 New Chemical Registration and Final Biological Evaluation with Associated Effects Determinations for Federally Listed and Threatened Species and Designated Critical Habitat)*, EPA concluded that the use of the proposed epyrifenacil products may affect and are likely to adversely affect (LAA) multiple listed species and designated CHs. Where EPA proposed to make an LAA determination, EPA also predicted the potential likelihood of future jeopardy or adverse modification (J/AM) to help inform the formal consultation with the Services and resulting Biological Opinion developed by the Services. *See 50 C.F.R. § 402.40(b)(1).* The Services will make the final determination as to any jeopardy to listed species and any adverse modification to designated CHs.

EPA assessed 1,747 listed species and 918 designated CHs for the proposed new chemical registration of epyrifenacil. No direct effects are anticipated for birds, terrestrial-phase amphibians, reptiles, fish, aquatic-phase amphibians, aquatic invertebrates, and terrestrial invertebrates either on or off the treatment area. EPA's assessment showed that terrestrial, wetland, and aquatic plants may be impacted by epyrifenacil products via spray drift and runoff/erosion exposure. The two co-formulated herbicides, flumioxazin and pyroxasulfone, may have chronic on-field direct effects to individual mammals. EPA expects that consideration of the distances at which off-field effects to plants occur will also cover any potential off-field effects to mammals. Thus, in addition to the application sites, EPA expects that the action area extends from pesticide use sites to the point of effects to terrestrial and wetland plants.

EPA made NE determinations for 82 listed species and 78 designated CHs, based primarily on low overlap, no direct toxicity, and no dependency on plants for PPHD. EPA made MA determinations for 1,664 listed species and 840 designated CHs. Of these MA determinations, EPA made NLAA determinations for 1,063 listed species and 626 designated CHs. A majority of the NLAA determinations were based upon unlikely exposure due to the habitat (exposure is discountable) or based on the weight of evidence indicating that exposure concentrations leading to effects are extremely unlikely to occur (effects are insignificant). EPA made LAA determinations for the remaining 602 listed species and 214 designated CHs.

For the 601 listed species at LAA, EPA initially predicted that the proposed label uses were likely to jeopardize 9 listed species. After the proposed decision was published for comment, EPA identified a few areas where the original analysis could be clarified, particularly around spray drift. EPA subsequently verified spray drift modeling, reviewed spray drift-only magnitudes of

difference (MoDs), and verified the overlap analysis, and ultimately made some revisions. The number of terrestrial plant species for which EPA predicted the potential likelihood of future jeopardy decreased from 9 to 6 based on the updated analysis. These species are 6 terrestrial plants, all of which are included in EPA's VSAP. EPA did not predict the potential likelihood of future adverse modification for any CHs. To address the predicted potential likelihood of future jeopardy for these 6 listed species due to agricultural uses, EPA used the Herbicide Strategy framework to inform the level of mitigation necessary to reduce runoff/erosion and spray drift. First, EPA assessed the potential for population- and community-level impacts. Specifically, EPA used the MoD analysis to determine the potential for population-level impacts via runoff/erosion exposure and spray drift from the proposed uses. See Section IV(C)(ii) for more details related to the MoD analysis. EPA identified a "low" potential for population-level impacts to listed plant species from runoff/erosion exposure and a "medium" or "high" potential for impacts to listed species from spray drift exposure, depending on application rate. Next, EPA assigned levels of mitigation that the Agency expects will address potential impacts to the 6 listed terrestrial plants based on the level of potential impacts. EPA identified a greater level of mitigation where the potential for population-level impacts is higher and less mitigation where there is a lower potential for population-level impacts. For reducing exposure from runoff/erosion, EPA typically identifies runoff/erosion mitigation points. For reducing exposure from spray drift transport, EPA typically identifies an ecological spray drift buffer distance, and the distance associated with that buffer increases with the level of potential impacts.

For the agricultural uses of epyrifenacil, EPA identified both spray drift mitigation measures and runoff/erosion mitigation measures to reduce exposure to listed species (**Table 7**). Based on the approach described in the Herbicide Strategy for spray drift mitigation, EPA identified chemical-specific spray drift buffer distances for the "medium" MoDs and maximum spray drift buffer distances for the "high" MoDs to mitigate potential impacts. The labels for the products being registered include ecological spray drift buffers of 10-25 ft for ground applications and 50-140 ft for aerial applications (depending on the use site and application rate) for all areas where epyrifenacil can be applied in the U.S. and its territories. Additional spray drift mitigation required in species-specific Pesticide Use Limitation Areas (PULA) are identified in Bulletins Live! Two for the 6 listed VSAP plant species with potential population-level impacts prior to mitigation. This species-specific mitigation includes spray drift buffers of 25 ft for all ground applications and 130 or 170 ft for aerial applications (depending on the use site and application rate).

Based on the approach described in the Herbicide Strategy, a "low" potential for impacts to listed plant species from runoff/erosion exposure is equivalent to 3 points of mitigation. Given the runoff-only EECs and MoDs, along with consideration of species life histories as part of the effects determinations, EPA concluded that 3 points of runoff/erosion mitigation are not needed for most listed plants. The appropriate mitigation level for runoff/erosion reduction for the 6 listed VSAP plant species with potential population-level impacts prior to mitigation is in the "low" category, equating to 3 mitigation points;[5] this mitigation is relevant to these specific

[5] See EPA's Herbicide Strategy and Mitigation Measures Menu website (https://www.epa.gov/pesticides/mitigation-menu) for mitigation measures and associated point values.

species in specific geographic areas. Therefore, the runoff/erosion mitigation required in species-specific PULAs in Bulletins Live! Two is 3 points of runoff/erosion mitigation.

EPA also determined that the effects determinations for terrestrial and wetland plants based on epyrifenacil in the co-formulated product would identify effects similar to those of flumioxazin and would be protective of the potential effects of pyroxasulfone. Therefore, additional mitigation beyond what is needed for epyrifenacil alone is not needed for the co-formulated active ingredients.

Lastly, EPA considered the potential population-level and PPHD impacts of the labeled non-agricultural uses to listed species and critical habitats. The Agency concluded that population-level impacts and impacts to PPHD are not expected from the non-agricultural uses because: (1) the proposed products will be used to maintain bare ground/non-vegetated areas, which are not expected to be suitable habitat for listed plants and pollinators; (2) only ground or spot applications of the proposed products will occur; (3) a 10-ft ecological spray drift buffer for ground applications will mitigate spray drift; and (4) coarse droplets will be used, which will further reduce spray drift. The uncertainties with the spray applications for the labeled non-agricultural sites impact the assumption of exposure relative to the amount of area being treated and how it is being treated. The labels include areas that would likely be a single pass with application equipment (e.g., guardrails; fencerows) as well as potentially larger areas needing more spray passes to complete an application (e.g., airports, pumping stations, lumber yards). The more spray passes, the more concern there is from a spray drift event. Differences among application equipment related to the area covered by the sprayer (e.g., hand sprayers, pressurized mechanical sprayers, ground booms) and the direction of spray during application (i.e., nozzles facing sideways vs. downward) may also result in higher potential spray drift. Given this potential variability and uncertainty in applications to the non-agricultural use sites, a 10-ft ecological spray drift buffer is included on the labeling to mitigate concerns around potential deposition of epyrifenacil into sensitive off-site areas. This buffer distance accounts for the use of coarse droplets with ground application equipment per EPA's mitigation menu.

The implementation of the Herbicide Strategy and VSAP is part of a process that EPA has undertaken with the Services to identify early protections for listed species that should result in more efficient and effective herbicide specific consultations under ESA section 7(a)(2). If EPA determines that initiating formal consultation is triggered in the consideration of a FIFRA action, the Agency may still be able to proceed with the action before completing consultation if it determines that doing so will not result in "any irreversible or irretrievable commitment of resources . . . [that] has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would not violate [ESA section 7(a)(2)]." See 16 U.S.C. § 1536(d). As stated above, EPA initiated formal consultation with the Services. EPA will work with the Services to complete the consultation process as expeditiously as possible. Acknowledging that the final determination on jeopardy and adverse modification is made by the Services and that either (or both) of the Services may not fully adopt EPA's prediction that this action will avoid jeopardy and adverse modification, the registrations include a term to allow EPA to address any further mitigation determined to be necessary following consultation. The Agency has also concluded that granting the registrations for

epyrifenacil prior to the completion of formal consultation with the Services will not result in any irreversible or irretrievable commitment of resources that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures, in accordance with ESA section 7(d).[6]

Table 7. Final Mitigation Measures for Epyrifenacil.						
Single application rate, lb a.i./A (Uses)	**On the Product Label**			**Within the 6 Species-Specific PULAs**		
	Aerial Buffers (ft) (Coarse Droplets)	**Ground Buffers (ft) (Medium droplets)**	**Runoff/ Erosion Mitigation Points**	**Aerial Buffers (ft) (Coarse Droplets)**	**Ground Buffers (ft) (Medium droplets)**	**Runoff/ Erosion Mitigation Points**
0.018 (Canola, corn soybeans, and wheat; fallow uses for corn, wheat, and soybeans)	60	10	0	170	25	3
0.022 (Soybeans, wheat, and fallow uses for these crops)	80	15		170	25	
0.036 (Corn, soybeans, wheat, and fallow uses for these crops)	140	25		170	25	

C. Label Requirements

MITIGATION FOR BOTH AGRICULTURAL AND NON-AGRICULTURAL USE SITES

A. EPA determined that the runoff-only magnitudes of difference for epyrifenacil placed this pesticide in the low category. EPA identified that zero mitigation points are needed to avoid impacts to populations of listed species for all uses (with the exception of 3 runoff/erosion mitigation points needed within species-specific pesticide use limitation areas described in Bulletins; see #2 below). The following language is included on the label to specify the label runoff/erosion mitigation measures required for all use sites

"MANDATORY RUNOFF MITIGATION:

- DO NOT apply when soils are saturated or above field capacity.
- DO NOT apply during rain.

[6] Endangered Species Act Section 7(d) Consistency Determination with Respect to the Application for the Registration of Products Containing the New Active Ingredient Epyrifenacil.

1. *To address the potential effects to non-target vulnerable species included in the "Bulletins Live! Two" web-based system (BLT), the end-use product directs all users to access the BLT prior to application, according to the label statement below:*

   "**ENDANGERED AND THREATENED SPECIES PROTECTION REQUIREMENTS***:* Before using this product, you must obtain any applicable Endangered Species Protection Bulletins ('Bulletins') within six months prior to or on the day of application. To obtain Bulletins, go to Bulletins Live! Two (BLT) at https://www.epa.gov/pesticides/bulletins. When using this product, you must follow all directions and restrictions contained in any applicable Bulletin(s) for the area where you are applying the product, including any restrictions on application timing if applicable. It is a violation of Federal law to use this product in a manner inconsistent with its labeling, including this labeling instruction to follow all directions and restrictions contained in any applicable Bulletin(s). For general questions or technical help, call 1-844-447-3813, or email ESPP@epa.gov."

AGRICULTURAL USE SITE MITIGATION

2. *To reduce spray drift and runoff exposure from the labeled uses of epyrifenacil, EPA determined, and the applicants agreed on, a combination of measures to minimize or avoid exposure.*

   B. The following language is included under Directions for Use Section with a 'MANDATORY SPRAY DRIFT MITIGATION FOR AGRICULTURAL USE SITES' header.

MANDATORY SPRAY DRIFT MITIGATION

For Aerial and Ground Boom Applications:

- During application, the Sustained Wind Speed, as defined by the National Weather Service (standard averaging period of 2 minutes) must register between 3 and 15 miles per hour.
- Wind speed must be measured at the release height or higher, in an area free from obstructions such as trees, buildings, and farm equipment.
- Do not apply during temperature inversions.

For Aerial Application:

- For aerial applications, select nozzle and pressure that deliver coarse or coarser spray droplets as indicated in nozzle manufacturer's catalogues and in accordance with the most current version of the American Society of Agricultural & Biological Engineers standards 572.1).
- When applying to crops via aerial application equipment, the spray boom must be mounted on the aircraft to minimize drift caused by wing tip or rotor blade vortices.

- Wind speed and direction must be measured on location using a windsock, an anemometer (including systems to measure wind speed or velocity on an aircraft), or an aircraft smoke system.
- When the wind speed is between 11-15 miles per hour, 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. If the wind speed is 10 miles per hour or less, applicators must use a minimum of ½ swath displacement upwind at the downwind edge of the field. When the wind speed is between 11-15 miles per hour, applicators must use a minimum of ¾ swath displacement upwind at the downwind edge of the field.
- Do not release spray at a height greater than 10 ft above the crop canopy unless a greater application height is required for pilot safety.

For Ground Boom Application:

- For ground applications, select nozzle and pressure that deliver medium or coarser spray droplets as indicated in nozzle manufacturer's catalogues and in accordance with the most current version of the American Society of Agricultural & Biological Engineers standards 572.1).
- Spray at the appropriate boom height based on nozzle selection and nozzle spacing, but do not exceed a boom height of 24 inches above target pest or crop canopy. Set boom to lowest effective height over the target pest or crop canopy based on equipment manufacturer's directions.
- Wind speed and direction must be measured on location using a windsock or anemometer (including systems to measure wind speed or velocity using application equipment).

For aerial and ground applications, always maintain a no-application area (buffer) from the downwind edge of the last spray row and any non-managed (i.e. protection area). Non-managed areas are defined as anything that is not part of the "managed areas" listed below.

Downwind Managed Areas that Can Represent Spray Drift Buffers

When spray drift buffers are identified as mitigation, the following managed areas can be included as part of the buffer footage if they are downwind and are immediately adjacent/contiguous to the treated field, and people are not present in those areas (including inside closed buildings/structures). If the pesticide product label or bulletin, or the state or local government in which the application area is located has a requirement that prohibits or restricts spray drift in any area, including these specific managed areas, that prohibition/restriction must be followed.

a. Agricultural fields, pastures, forage fields, and private rangelands, including untreated portions of the treated field;
b. Roads, paved or gravel surfaces, mowed grassy/fallowed areas adjacent to field, and areas of bare ground from recent plowing or grading that are contiguous with the treated area;
c. Buildings and their perimeters, silos, or other man-made structures with walls and/or roof;
d. Areas present and/or maintained as a runoff/erosion measure as listed on EPA's Mitigation Menu website. Examples include vegetative filter strips, field borders, grassed waterways, vegetated ditches, riparian areas, managed/constructed wetlands, or other areas of intentional habitat improvement;
e. Areas present and/or maintained as a drift buffer reduction measure as listed on EPA's Mitigation Menu website. Examples include vegetative windbreaks, hedgerows, shelterbelts, riparian areas, private forests, woodlots, and shrublands;
f. Conservation Reserve Program and Agricultural Conservation Easement Program lands; and
g. On-site contained irrigation water resources that are not connected to adjacent water bodies, including on-farm irrigation canals and ditches, water conveyances, managed irrigation/runoff retention basins, farm ponds, and tailwater collection ponds.

Application Method	**Droplet Size Distribution (DSD)**	**Application Rate in fl oz (lb ai/A)**	**Buffer Distance**
Aerial	Coarse	24 (0.018)	60 ft
		28 (0.022)	80 ft
		48 (0.036)	140 ft
Ground	Medium	24 (0.018)	10 ft
		28 (0.022)	15 ft
		48 (0.036)	25 ft

Ensure that people are not present within the application exclusion zone during the application, and they will not be contacted by the pesticide, either directly or through drift (see Worker Protection Standard requirements at 40 CFR 170.405(a) and 40 CFR 170.505(a)).

[1] *Growers must ensure that pesticide use does not cause degradation of the CRP habitat.*

ADVISORY SPRAY DRIFT INFORMATION:

This section is intended to provide additional information for applicators to assist in implementing the mandatory spray drift mitigation above. 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. Consider 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

- Volume – Increasing the spray volume so that larger droplets are produced will reduce spray drift. Consider using 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 – Using the lowest spray pressure recommended for the nozzle that will produce the target spray volume and droplet size.
- Spray Nozzle – Consider using a spray nozzle that is designed for the intended application, as well as using nozzles designed to reduce drift.

Controlling Droplet Size – Aircraft

- Adjust Nozzles – Applicators should follow nozzle manufacturers' recommendations for setting up nozzles. Generally, to reduce fine droplets, nozzles should be oriented parallel with the airflow in flight.

Release height – Ground Boom

For ground equipment, the boom should remain level with the crop and have minimal bounce. Automated boom height controllers are recommended with large booms to better maintain optimum nozzle to canopy height. Excessive boom height will increase the potential for spray drift.

Release height – Aircraft

Higher release heights increase the potential for spray drift.

Hooded (or shielded) sprayers

Shielding the boom or individual nozzles can reduce spray drift. Consider using hooded sprayers. Applicators should 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, consider using 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.

Wind

Drift potential generally increases with wind speed.
Applicators need to be familiar with local wind patterns and terrain that could affect spray drift.

Best Practices for Measuring wind speed and wind direction

- Applicators should check and acquire the predicted wind speed and direction for the application site within 12 hours prior to conducting applications to determine the time periods wind speed is likely to fall outside the applicable thresholds.
- Applicators should reassess wind speed and direction at the application site at least every hour while applications are in progress.
- Measuring wind speed and direction can be done by:
    - Relying on equipment on the application equipment that measures wind speed (e.g., aerial equipment).
    - Using a tower anemometer with telemetry or handheld anemometer. Users should read user manual on how to calibrate, operate and interpret the output from an anemometer. Ground applicators should stop at least every hour to take a reading with a tower anemometer with telemetry or handheld anemometer. Some anemometers may have software that would allow users to view wind measurements in real time while making an application, and, those cases, applicators would not have to stop to take measurements.
    - Using a windsock. Wind can be estimated with a windsock using the strips on a windsock. The applicator should consult the user manual for the windsock on wind speed estimation and direction of wind. Applicators should look at the sock at least every hour to estimate wind speed and direction. The windsock should be pointed in the opposite direction of the windbreak and the non-managed area.

- Using an aircraft smoke system. Laying down several puffs of smoke along different lines using an aircraft smoke system can provide an accurate view of what the wind speed and direction for the application.
- Checking behind the spray rig at least every hour to see if the spray has changed direction from when the application started.

NON-AGRICULTURAL USE SITE MITIGATION

C. To address spray drift for non-agricultural use sites

MANDATORY SPRAY DRIFT MITIGATION

Ground Boom Applications:

- Do not apply when wind speeds exceed 15 miles per hour at the application site.
- For ground applications, select nozzle and pressure that deliver coarse or coarser spray droplets as indicated in nozzle manufacturer's catalogues and in accordance with American Society of Agricultural & Biological Engineers standards 572.1 and ASABE S572.
- During application, the Sustained Wind Speed, as defined by the National Weather Service (standard averaging period of 2 minutes) must register between 3 and 15 miles per hour.
- Wind speed must be measured at the release height or higher, in an area free from obstructions such as trees, buildings, and farm equipment.
- Do not apply during temperature inversions.
- Spray at the appropriate boom height based on nozzle selection and nozzle spacing, but do not exceed a boom height of 24 inches above target pest. Set boom to lowest effective height over the target pest based on equipment manufacturer's directions.
- Wind speed and direction must be measured on location using a windsock or anemometer (including systems to measure wind speed or velocity using application equipment).

Mandatory Spray Drift Buffers

For aerial and ground applications, always maintain a no-application area (buffer) from the downwind edge of the last spray row and any non-managed (i.e. protection area). Non-managed areas are defined as anything that is not part of the "managed areas" listed below

Application Method	Droplet Size Distribution (DSD)	Application Rate in fl oz (lb ai/A)	Buffer Distance
Ground	Coarse	48(0.038)	10 ft

Managed areas include all areas with the following exceptions which can be included in the buffer footage:

- Agricultural fields, including untreated portions of the treated field.
- Roads, paved or gravel surfaces, mowed grassy areas adjacent to field, and areas of bare ground from recent plowing or grading that are contiguous with the treated area.
- Buildings and their perimeters, silos, or other man-made structures with walls and/or roof.
- Areas maintained as a mitigation measure for runoff/erosion or drift control, such as vegetative filter strips (VFS), field borders, hedgerows, Conservation Reserve Program lands (CRP), and other mitigation measures identified by EPA on the mitigation menu.[1]
- Managed wetlands including constructed wetlands on the farm.
- On-site contained irrigation water resources that are not connected to adjacent water bodies, including on-farm irrigation canals and ditches, water conveyances, managed irrigation/runoff retention basins, and tailwater collection ponds.

Ensure that people are not present within the application exclusion zone during the application, and they will not be contacted by the pesticide, either directly or through drift (see Worker Protection Standard requirements at 40 CFR 170.405(a) and 40 CFR 170.505(a)).

[1] *Growers must ensure that pesticide use does not cause degradation of the CRP habitat.*

ADVISORY SPRAY DRIFT INFORMATION:

This section is intended to provide additional information for applicators to assist in implementing the mandatory spray drift mitigation above. 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. Consider 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

• Volume – Increasing the spray volume so that larger droplets are produced will reduce spray drift. Consider using 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 – Using the lowest spray pressure recommended for the nozzle will produce the target spray volume and droplet size.
• Spray Nozzle – Consider using a spray nozzle that is designed for the intended application, as well as using nozzles designed to reduce drift.

Release height – Ground Boom
For ground equipment, the boom should remain level with the crop and have minimal bounce. Automated boom height controllers are recommended with large booms to better maintain optimum nozzle to canopy height. Excessive boom height will increase the potential for spray drift.

Hooded (or shielded) sprayers
Shielding the boom or individual nozzles can reduce spray drift. Consider using hooded sprayers. Applicators should 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, consider using 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.

Wind
Drift potential generally increases with wind speed.
Applicators need to be familiar with local wind patterns and terrain that could affect spray drift.

Best Practices for Measuring Wind Speed and Wind Direction

- Applicators should check and acquire the predicted wind speed and direction for the application site within 12 hours prior to conducting applications to determine the time periods wind speed is likely to fall outside the applicable thresholds.
- Applicators should reassess wind speed and direction at the application site at least every hour while applications are in progress.
- Measuring wind speed and direction can be done by:

- Relying on equipment on the application equipment that measures wind speed (e.g., aerial equipment).
- Using a tower anemometer with telemetry or handheld anemometer. Users should read user manual on how to calibrate, operate and interpret the output from an anemometer. Ground applicators should stop at least every hour to take a reading with a tower anemometer with telemetry or handheld anemometer. Some anemometers may have software that would allow users to view wind measurements in real time while making an application, and, those cases, applicators would not have to stop to take measurements.
- Using a windsock. Wind can be estimated with a windsock using the strips on a windsock. The applicator should consult the user manual for the windsock on wind speed estimation and direction of wind. Applicators should look at the sock at least every hour to estimate wind speed and direction. The windsock should be pointed in the opposite direction of the windbreak and the non-managed area.
- Using an aircraft smoke system. Laying down several puffs of smoke along different lines using an aircraft smoke system can provide an accurate view of what the wind speed and direction for the application.

D. *EPA determined (based on MoD approach) that epyrifenacil use will result in runoff/erosion risks from non-agricultural large-scale applications. The applicant will prohibit aerial applications. The following language is to be added to the label in the non-ag use directions.*

PRODUCT RESTRICTIONS (for non-agricultural uses):

- DO NOT apply when soils are saturated or above field capacity.
- DO NOT apply during rain.
- DO NOT apply directly to water
- DO NOT apply using aerial equipment
- The user must NOT apply within 10 feet of a managed areas (as defined in section C), exceptions include:
  - Spot treatment applications (defined as an area smaller than 1/10th of an acre).
  - Applications to areas that have water retention systems (i.e., sediment basins, catch basins, sediment traps, water retention ponds)

VII. SUPPORTING DOCUMENTS

All supporting documents can be found in docket ID number EPA-HQ-OPP-2022-0354 at https://www.regulations.gov/docket/EPA-HQ-OPP-2022-0354.

Appendix A. List of counties affected by PULAs.

Species Common Name (Scientific Name)	State	County
Leedy's roseroot (*Rhodiola integrifolia ssp. Leedyi*)	Minnesota	Fillmore, Olmsted, Wabasha
	New York	Schuyler, Tompkins, Yates
	South Dakota	Pennington
Mead's milkweed (*Asclepias meadii*)	Illinois	Ford, Gallatin, Hancock, Hardin, Henry, Iroquois, Johnson, Pope, Saline, Vermilion, Will
	Indiana	Lake
	Iowa	Adair, Adams, Clarke, Dallas, Decatur, Lucas, Madison, Polk, Ringgold, Taylor, Union, Warren, Wayne
	Kansas	Allen, Anderson, Bourbon, Cherokee, Coffey, Crawford, Douglas, Franklin, Jackson, Jefferson, Johnson, Labette, Leavenworth, Linn, Miami, Neosho, Osage, Shawnee, Woodson, Wyandotte
	Missouri	Adair, Barton, Bates, Benton, Bollinger, Buchanan, Caldwell, Camden, Carroll, Carter, Cass, Cedar, Chariton, Clinton, Dade, Dallas, Daviess, DeKalb, Gentry, Grundy, Harrison, Henry, Hickory, Iron, Jackson, Jasper, Johnson, Lafayette, Lawrence, Linn, Livingston, Macon, Madison, Mercer, Moniteau, Morgan, Newton Perry, Pettis, Polk, Putnam, Ray, Reynolds, St. Clair, Ste. Genevieve, St. Francois, Shannon, Sullivan, Vernon, Washington, Wayne, Worth
	Wisconsin	Dane, Grant, Green, Iowa, Lafayette
Palmate-bracted bird's beak (*Cordylanthus palmatus*)	California	Alameda, Colusa, Contra Costa, Fresno, Glenn, Madera, Sacramento, San Joaquin, Sutter, Yolo
Spring Creek bladderpod (*Lesquerella perforata*)	Tennessee	Wilson
White Bluffs bladderpod (*Physaria douglasii ssp. Tuplashensis*)	Washington	Franklin, Grant

Species Common Name (Scientific Name)	State	County
Whorled sunflower (*Helianthus verticillatus*)	Alabama	Cherokee
	Georgia	Floyd
	Mississippi	Alcorn, Benton, Carroll, Clay, Grenada, Holmes, Humphreys, Lafayette, Lee, Leflore, Lowndes, Marshall, Monroe, Oktibbeha, Pontotoc, Sunflower, Tallahatchie, Tippah, Tishomingo, Union, Yalobusha, Yazoo
	Tennessee	Chester, Madison, McNairy